

Rehabilitation Works at Monasterevin Bridge, Co. Kildare

NATURA IMPACT STATEMENT



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TABLE OF CONTENTS

1. INTRODUCTION	3
1.1 CONSULTATION	3
1.2 LEGISLATIVE CONTEXT	3
2. METHODOLOGY	6
2.1 DESKTOP REVIEW	6
2.2 SITE SURVEY	6
2.3 APPROPRIATE ASSESSMENT METHODOLOGY	6
2.3.1 <i>Natura Impact Assessment</i>	7
2.4 CONSULTATION	7
3. DESCRIPTION OF THE PROJECT	8
4. RECEIVING ENVIRONMENT	9
4.1 BACKGROUND DESK STUDY	9
4.1.1 <i>Fish</i>	10
4.1.2 <i>Water Quality</i>	10
4.1.3 <i>Other Ecology</i>	11
4.2 DESCRIPTION OF NATURA 2000 SITES AFFECTED	13
4.2.1 <i>River Barrow and River Nore SAC</i>	13
5. IMPACT ASSESSMENT	19
5.1 RIVER BARROW AND RIVER NORE SAC	19
5.1.1 <i>Atlantic salmon (1106)</i>	19
5.1.2 <i>Otter (1355)</i>	19
5.1.3 <i>Lamprey Species (1095, 1096, 1099)</i>	20
5.1.4 <i>White-clawed Crayfish (1092)</i>	20
6. MITIGATION	22
6.1 BEST PRACTICE PROCEDURE AND GUIDELINES	22
6.2 AVOIDANCE	22
6.3 WATER QUALITY PROTECTION	23
6.4 BIOSECURITY	24
6.5 SITE ECOLOGIST	24
6.6 HABITAT ENHANCEMENT	25
7. IMPLICATIONS FOR CONSERVATION OBJECTIVES	25
7.1 CONSERVATION OBJECTIVES FOR RIVER BARROW AND RIVER NORE SAC	25
8. CONCLUSION STATEMENT	27
REFERENCES	30
PLATES	32
APPENDIX 1 SCREENING FOR APPROPRIATE ASSESSMENT MATRIX	36
APPENDIX 2 NPWS SITE SYNOPSES	38
APPENDIX 3 METHOD STATEMENT	44



1. INTRODUCTION

Kildare County Council proposes to carry out rehabilitation works on Monasterevin Bridge. This bridge crosses the River Barrow which is located within the River Barrow and River Nore SAC (Code 002162). The location of the proposed development is presented in Figure 1. A Screening for Appropriate Assessment Matrix is provided in Appendix 1. Only one Natura 2000 site is likely to be affected - the River Barrow and River Nore SAC. The site synopsis for this SAC is provided in Appendix 2.

The Screening for Appropriate Assessment concluded that there was the potential for direct, indirect and cumulative impacts on this SAC and therefore a Natura Impact Statement was required. Potential direct impacts were identified as water quality and disturbance impacts. Potential indirect impacts were comprised of water quality, disturbance and non-native invasive species impacts. Cumulative impacts were also identified concerning water quality pollution, due to background pressures in the River Barrow. Mitigation is required for the proposed works and therefore a Natura Impact Statement is required.

An Article 6 Appropriate Assessment is required under the Habitats Directive (92/43/EEC), in instances where a plan or project may give rise to significant effects upon a Natura 2000 site. Natura 2000 sites are those identified as sites of European Community importance designated under the Habitats Directive (1992) and EC Birds Directive (2009/147/EC); transposed into Irish legislation as the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). The Habitats Directive, in combination with the Birds Directive (2009), establishes a network of internationally important sites designated for their ecological status; identified as Special Areas of Conservation (hereafter referred to as SACs) designated under the Habitats Directive for the protection of flora, fauna and habitats and as Special Protection Areas (hereafter referred to as SPAs) designated under the Birds Directive to protect rare, vulnerable and migratory birds. These sites together form a Europe-wide 'Natura 2000' network of designated sites, referred to in this report as Natura 2000 sites.

The preparation of this NIS follows the Habitats Directive 92/43/EEC, Article 6(3) and the guidance published by the National Parks and Wildlife Service (NPWS, 2010) '*Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*'. The current NIS report was prepared by Ecofact Environmental Consultants Ltd. on behalf of Kildare County Council and presented to inform the Appropriate Assessment for the proposed bridge works.

1.1 Consultation

The following statutory bodies provided information via publically available sources for this report:

- National Parks and Wildlife Service (NPWS);
- Inland Fisheries Ireland (IFI);
- Environmental Protection Agency (EPA);

1.2 Legislative context

The current assessment takes account of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora - '*The Habitats Directive*' which was transposed into Irish law by the '*European Community (Natural Habitats) Regulations 1997*' (S.I. No. 94/1997). The most recent



transposition of this legislation in Ireland is the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The Birds Directive (2009/147/EC) which is now included in the former Regulations seeks to protect birds of special importance by the designation of SPAs whereas the Habitats Directive does the same for habitats and other species groups within SACs, which are designated or proposed as candidate Special Areas of Conservation (cSACs). It is the responsibility of each member state to designate SPAs and SACs, both of which will form part of Natura 2000, a network of protected areas throughout the European Community. Article 6, paragraphs 3 and 4 of the EC ‘Habitats’ Directive (1992) state that:

6(3) ‘Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site’s conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.’

6(4) ‘If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and / or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.’

In addition, the European Court of Justice in Case C-127/02 (the “Waddenzee Ruling”) has made a relevant ruling in relation to Appropriate Assessment and this is reflected in the current assessment:

‘Any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site’s conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects’ and that the plan or project may only be authorised “where no reasonable scientific doubt remains as to the absence of such effects.’



Figure 1 Location of Monasterevin Bridge, Monasterevin, Co. Kildare.



2. METHODOLOGY

2.1 Desktop Review

A desktop study was undertaken to identify the extent and scope of the potentially affected designated Natura 2000 sites within the current study area, in relation to the proposed remedial works at Monasterevin Bridge in Co. Kildare. The desktop study identified the conservation interests of the designated sites with respect to the qualifying interests (species and habitats) relevant to the designated sites within the area.

A review of published literature was undertaken in order to collate data on the receiving environment, including aquatic species and habitats of conservation concern in the study area. A range of additional sources of information including scientific reports produced by, and information on the websites of the EPA, NPWS and other agencies were also reviewed. A full bibliography of information sources reviewed is given in the reference section.

2.2 Site Survey

Monasterevin Bridge was visited on the 13th to 14th September 2019 to conduct field surveys. These surveys included habitat surveys, mammal survey (including Otters), aquatic ecology surveys and bird surveys. General protected species surveys were also undertaken to identify any species of ecological importance within the study area. The bridge was surveyed for the presence of otters or other mammals from 100m upstream of the bridge to 100m downstream of the bridge (with further general checks to 200m from the bridge). Any evidence of mammal usage was recorded. The bridge was checked for any evidence of bat usage such as droppings, staining or smearing. Any birds or evidence of birds nesting were recorded. Dip net (kick) sampling surveys were undertaken to assess the presence or absence of small fish and lampreys. Habitat in the area was assessed for the potential to have reptile, amphibian or protected terrestrial invertebrate habitat. The flora and fauna at the site were identified and evaluated for ecological importance.

2.3 Appropriate Assessment Methodology

The preparation of this NIS for Appropriate Assessment follows the guidance published by DoEHLG (2010) '*Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*'. According to these guidelines, assessing the impacts of a project or plan on a Natura 2000 site is a four staged approach, as described below:

- **Stage One: Screening / Test of Significance** - The process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;
- **Stage Two: Appropriate Assessment** - The consideration of the impact of the project or plan on the integrity of the Natura 2000 site, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;
- **Stage Three: Assessment of Alternative Solutions** - The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site; and



- **Stage Four: Assessment Where Adverse Impacts Remain** - An assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

The safeguards set out in Article 6(3) and (4) of the Habitats Directive are triggered not by certainty but by the possibility of significant effects. Thus, in line with the precautionary principle, it is unacceptable to fail to undertake an appropriate assessment on the basis that it is not certain that there are significant effects.

2.3.1 Natura Impact Assessment

A Natura Impact Statement (NIS) considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a Natura 2000 site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The current report is set out in the format of a NIS and comprises a scientific examination of the plan / project and the relevant Natura 2000 sites; to identify and characterize any possible implications for the site in view of the site's conservation objectives, structure and function, taking account of in combination effects. The requirements for Appropriate Assessment derive directly from Article 6(3) of the EU Habitats Directive (1992).

Direct and indirect impacts in isolation or in combination with other plans and projects on the identified Natura 2000 sites in view of the sites' conservation objectives have been examined. Case law of the European Court of Justice (ECJ) has established that Appropriate Assessment must be based on best scientific knowledge in the field. These are the qualifying interests i.e. Annex I habitats, Annex I bird species (EU Birds Directive, incorporated into the EU Habitats Directive) and Annex II species hosted by a site and for which that site has been selected. The conservation objectives for Natura sites (SACs and SPAs) are determined under Article 4 of the Habitats Directive and are intended to ensure that the relevant qualifying interests i.e. Annex I habitats, Annex I bird species and Annex II species present within the designated sites are maintained in a favourable condition. The current assessment of the proposal for rehabilitation works at Monasterevin Bridge provides a description of the project and the receiving environment. The conservation objectives of Natura 2000 sites potentially affected by the proposal are listed and potential impacts outlined with respect to the integrity of the Natura 2000 site. Mitigation measures have been proposed for the protection of the conservation interests and the avoidance of impacts to Natura 2000 sites occurring within the study area.

2.4 Consultation

The following statutory bodies provided information via publically available sources for this report:

- National Parks and Wildlife Service (NPWS);
- Inland Fisheries Ireland (IFI);
- Environmental Protection Agency (EPA);
- National Biodiversity Data Centre online database



3. DESCRIPTION OF THE PROJECT

Monasterevin Bridge is a five-arch bridge along which the main road (R445) in Monasterevin in County Kildare crosses over the main channel of the River Barrow. The limestone square cut, masonry arch structure is supported by two Masonry abutments and four Masonry piers. The proposed project relates to remediation works of the bridge. The proposed works are outlined in the method statements prepared by O'Connor, Sutton, Cronin Multidisciplinary Consulting Engineers (OCSC, 2019 and 2020). The work that is required involves both in-stream and out-of-stream works on the walls of the structure itself, as well as on the embankments and the surface of the bridge. As stated in the remediation methodology, "*The proposed repair works consists of repointing of the parapets, relaying of the bridge surface, reconstruction of the riverbed under some of the arches, removal of vegetation from embankments and the inclusion of underpinning repairs to the upstream cutwaters of the R445 bridge*" (OCSC, 2020). All works will be complete between July 1st and September 30th 2020.

The road surface on the bridge is currently uneven due to past patch repairs; the proposed works involves planning and resurfacing the road on the bridge, not including the footpaths which are currently in good condition.

De-vegetation and cut-back of overgrowth is required for the upstream and downstream embankments, including the removal of a tree on the upstream east embankment.

Much of the walls of the structure require raking and re-pointing of the joints this includes walls of the parapets (approximately 60%), both upstream and downstream and both river and roadside. It also includes the abutments (approximately 30/40%) and the spandrel walls. Vegetation growth on the structures surfaces and in the joints must also be removed before raking and repointing. Removal and reinstatement of the capping on the parapet walls, both upstream and downstream, will be required in some sections, in order to remove vegetation growing underneath the capping. According to the methodology the masonry surfaces that are undergoing repairs will be cleaned with a high pressure jet to remove dirt, surface deposits and surface vegetation from the structure. Raking may involve the use of plugging chisel and hammer or brushing with a stiff wire brush while keeping surrounding masonry suitably damp and ensuring that there is no weeping flow / pooled water. It is also stated in the methodology that no lime mortar re-pointing will be carried out if temperatures are expected to fall below 5°C within 1 week of this being undertaken. Re-pointing and vegetation removal will be carried out in sections, coinciding with the timing of the underpinning works on each pier to avail of the existing protection measures.

In-stream, the river bed erosion will be addressed by removing debris and re-grading the river bed, under Arch 1 and under Arch 4. Evident scouring on several of downstream piers resulted in the inclusion of scour protection measures in the proposed works. Some piers also require reconstruction or additional repairs as well as the joint raking and re-pointing, including Pier 2 and Pier 3 which are settling away from the bridge, new concrete skirts and masonry cutwater repairs are required. Dry works areas for the works under the bridge will be created with sheet piling. There will be one dry works area in place at any given time, i.e. one pier will be worked on at a time. On completion of one section all debris / material will be removed from the area, any river bed disturbance will be reinstated and the sheet piling will be removed to allow the flow in the channel to return to normal before the next dry works area for the next pier will be prepared. Grouting will be required for some of these in-stream works and silt curtains will be installed to prevent accidental grout entering the water. Some material for the masonry cutwaters and concrete skirt works will be removed and disposed of off-site



while some will be stored and used in the reconstruction. Steel dowel bars and sheets are to be drilled through the existing piers. Cast-in-situ concrete will be required for the new concrete skirt.

Reconstruction of an outfall pipe on the east downstream bank which has collapsed will be carried out. The wall at the outfall of a culvert has also collapsed and requires reconstruction on the upstream side. The proposal involves constructing a 15 m section of rock armour along the downstream east bank to address scouring at this area. To install the rock armour a dryworks area is to be created using sand bags. Geotextile (terram), granular backfill and stone will be used to form the armour with a toe trench at the base and a plateau at the top, both of 0.9m wide.

Holes in the bridge decks of all five arches are to be assessed with drainage sections to confirm if they are used in conjunction with the drainage system for the road surface. The holes will be filled if it is confirmed that they are not used in conjunction with the road drainage system (OCSC, 2019).

Access to the riverbed for in-stream works will be from the downstream west embankment.

4. RECEIVING ENVIRONMENT

4.1 Background desk study

Monasterevin Bridge is located on the 5th order River Barrow (EPA Segment Code: 14_10474) in the town of Monasterevin in County Kildare where the R445 road crosses the main channel of the Barrow. The bridge is located just upstream of the confluence of the 2nd order Passlands watercourse (EPA Segment Code: 14_1410) with the River Barrow. The EPA monitor biological water quality in this stretch of the River Barrow with a station located on the next bridge upstream (Station Code S14BO11000). This site was rated as being Q3-4 (Moderate) in 2017. This site is located 1km upstream of the subject bridge site. The Monasterevin Waste water Treatment Plant is located on the right bank of the river downstream of Monasterevin Bridge. A NIS for this plant was prepared in 2011 (Ecofact, 2011) and it was concluded that “*the ongoing operation of the WwTP is therefore evaluated as affecting the integrity of the cSAC downstream*”.

Monasterevin Bridge is located within the River Barrow and River Nore SAC. The River Barrow and River Nore SAC (site code 002162) is selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive, 1992. The site is also selected as a SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. As well as habitats, the SAC has been selected due to the presence of invertebrate, fish and mammal species which are listed under Annex II of the EU Habitats Directive, including freshwater pearl mussel (*Margaritifera margaritifera* and its hardwater form *M. durrovensis*), freshwater crayfish (*Austropotamobius pallipes*), Atlantic salmon (*Salmo salar*), twaite shad (*Alosa fallax fallax*), the three Irish Lamprey species - sea (*Petromyzon marinus*), brook (*Lampetra planeri*) and river (*Lampetra fluviatilis*), the Desmoulin's whorl snail *Vertigo moulinsiana* and Eurasian otter (*Lutra lutra*).

The River Barrow rises on the northern slopes of the Slieve Bloom Mountains and flows north and then east past Mountmellick and Portarlinton to Monasterevin. At Monasterevin it turns south and flows through Athy, Carlow, and Leighlinbridge, past Bagenalstown, Goresbridge, Borris, and Graiguenamanagh, before reaching the tide at Saint Mullin's. The Barrow is about 120 miles long and drains a huge catchment area consisting of mountain, bog, pastureland, and tillage farming. It is a river that has had recurring serious water pollution problems in recent times, and fish kills have



occurred. Some of the tributaries and part of the upper river have had arterial drainage schemes carried out in the past. The history of dredging and modification, in combination with water pollution issues in the River Barrow system, influences the present characteristics of the river. The salmon fishing in the Barrow is generally regarded as poor, and what fish are taken are mostly grilse, taken either during the summer or late in the season (IFI website).

4.1.1 Fish

Inland Fisheries Ireland (IFI) carried out an electrofishing survey of the entire River Barrow Catchment as part of the National Research Survey Programme in 2015, including 35 sites on the main river channel and canal cuts and 118 sites across 21 sub-catchments. In the survey Dace and Roach were found to be widely distributed throughout the main River Barrow channel being recorded at 91% and 80% of sites respectively. Atlantic salmon occurred at 57% of sites surveyed. The numbers of juvenile Atlantic salmon were generally low and that they seemed to be largely confined to fast-flowing, non-navigable areas downstream of weirs, as were Brown Trout which were only recorded at 46% of the main channel sites. Perch were widely distributed in the main channel, recorded at 74% of survey sites, but were poorly represented in the sub-catchments. Pike were also scarce in the sub-catchment watercourses. Although no Bream were recorded in the survey there were Roach x Bream hybrids found in the main channel indicating their presence. Minnow and Gudgeon were widely distributed. European Eel, Stone Loach, Flounder and Three-spined Sticklebacks were also recorded in the 2015 survey.

The IFI survey identified a trend across the Barrow sub-catchments whereby the sub-catchments of the upper area of the Barrow Catchment tended to be assigned a fish status of moderate or less compared to better status in the downstream sub-catchments. The likely cause of the poorer fish stocks is mainly due to poor water quality, poor habitat, barriers impeding migratory fish passage and competition with invasive Dace. In the entire survey of the catchment there were only 5 sites of the 153, that were assessed, i.e. 3% of the survey sites, that had a High fish stock status. More than 50% of the survey sites across the entire Barrow Catchment were recorded as having Moderate or lower fish status. The recurring problems in the Barrow Catchment relating to water quality in the past were also noted in this assessment (Delanty *et. al*, 2017).

The IFI assessment of the Barrow Catchment also stated that a *"high proportion of the negative sites was recorded in tributaries discharging to the River Barrow between Monasterevin and Carlow"* (Delanty *et. al*, 2017).

4.1.2 Water Quality

Monasterevin Bridge is located on the 5th order River Barrow (EPA Segment Code: 14_10474). The EPA monitor biological water quality in this stretch of the River Barrow with a station located on the next bridge upstream (Station Code S14BO11000). This site was rated as being Q3-4 (Moderate) in 2017. This site is located 1km upstream of the subject bridge site.

The EPA's most recent assessment of the River Barrow overall is as follows: *"The Barrow was sampled across 2017 and 2018 due to the outbreak of crayfish plague. Of the 12 stations sampled along the Barrow in 2017, stations 0200, 0780, 1300, 1500, 2900 were in Good ecological condition, while the two uppermost stations maintained High ecological quality (0050 & 0100). A decline to unsatisfactory Moderate quality occurred at Station 1000 (Pass Bridge) and the lowermost station at Graiguenamanagh (3500). In 2018, station 0300 (Twomile Br) improved to High ecological quality, while station 1900 (Tankardstown Br) declined to unsatisfactory Poor quality. The latter site had an overabundance of Potamopyrgus snails and too much instream algae. Station 0700 (Kilnahown Br)*



retained Good ecological quality and stations 0500, 2200, 2455, 2600 and 2680 all remained at unsatisfactory Moderate ecological quality".

4.1.2.1 Monasterevin WwTP

The Monasterevin Wastewater treatment plant is located to the south west of Monasterevin bridge. The WwTP discharges directly into the River barrow, approximately 200m downstream of Monasterevin Bridge. Additionally, there are multiple storm water overflows in the vicinity of the bridge. During the current surveys records of sewage fungus were noted and there was a sewage pipe noted to the north of the bridge, which is likely to be the storm water overflow for the plant. There is no Annual Environmental Report available for this WwTP.

A NIS for this plant was prepared in 2011 (Ecofact, 2011) and it was concluded that *"the ongoing operation of the WwTP is therefore evaluated as affecting the integrity of the cSAC downstream"*. This report states that there is no assimilative capacity for the current loading of the plant (in 2011), or for future loadings of the plant, in the River Barrow.

The most recent numbers for the plant, from 2015, indicate that the design capacity of the plant is 9,000 p.e. and the actual p.e. is 6,239 p.e. The plant also has tertiary treatment. It appears that the Monasterevin Waste water treatment plant is currently operating within capacity. However, background water quality issues in combination with the impacts of the plant may still be having an impact on the River Barrow and the River Nore SAC.

4.1.3 Other Ecology

According to the Monasterevin Local Area Plan (2016 - 2022); *"substantial areas of high biodiversity value and habitat connectivity are found in Monasterevin. Habitat and landscape features have an important role to play as ecological corridors as they allow for the movement of species, and help to sustain the habitats, ecological processes and functions necessary to enhance and maintain biodiversity."* The protection of these important habitat and landscape features were emphasised in the LAP and it was noted that development of the town would involve particular attention to the preservation and management of green infrastructure and a requirement for appropriate ecological assessment for all projects was also emphasised. In the Tidy Towns Adjudication Report for Monasterevin in 2018 a score of 72% was awarded for the 'nature and biodiversity' category. Bird boxes and bat boxes introductions in the area were acknowledged as having a significant positive contribution to the locality.

An 'assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds of six SAC river systems in Ireland' (Cummins et. al., 2010), including the River Barrow and River Nore SAC, commissioned by NPWS reported: there were several kingfisher sightings on the Barrow just downstream of Monasterevin. In the section immediately downstream of the town, there are heavily forested areas along the river. In this area there were several sightings and also possible Kingfisher nests recorded. This area was identified as 'Probable' King fisher habitat. Further downstream of this, as far as Dunrally Bridge, was considered 'Possible' Kingfisher habitat with several sightings of the species recorded. The assessment also noted that the bird showed preference for higher, vertical banks which was a likely reason that the numbers of individuals recorded in the sightings was fewer in the Barrow compared to the Nore where there were more suitable river banks in most of surveyed sections. Kingfisher is not a Qualifying Interest of the River Barrow and River Nore SAC.

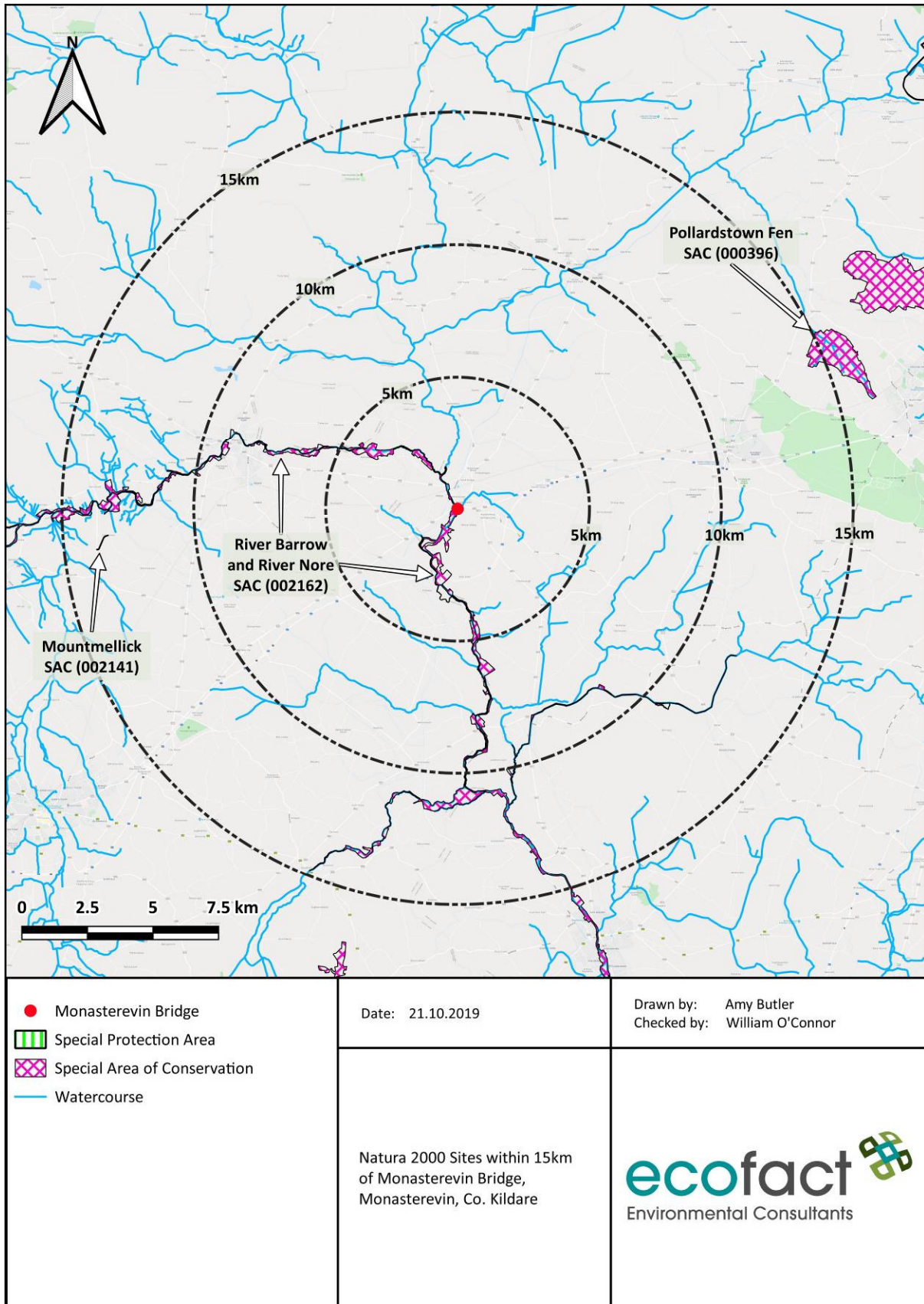


Figure 2 Natura 2000 Sites within 15km of Monasterevin Bridge, Monasterevin, Co. Kildare.



4.2 Description of Natura 2000 sites affected

The River Barrow and River Nore SAC has been identified as being potentially affected by the proposed works (see Screening for Appropriate Assessment Matrix in Appendix 1). The qualifying interests of this site with regard to their presence within the study area and their conservation status are discussed below.

4.2.1 River Barrow and River Nore SAC

The River Barrow and River Nore SAC (site code 002162) is selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive, 1992. The site is also selected as a SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. As well as habitats, the SAC has been selected due to the presence of invertebrate, fish and mammal species which are listed under Annex II of the EU Habitats Directive, including freshwater pearl mussel (*Margaritifera margaritifera* and its hardwater form *M. durrovensis*), freshwater crayfish (*Austropotamobius pallipes*), Atlantic salmon (*Salmo salar*), twaite shad (*Alosa fallax fallax*), the three Irish Lamprey species - sea (*Petromyzon marinus*), brook (*Lampetra planeri*) and river (*Lampetra fluviatilis*), the Desmoulin's whorl snail *Vertigo moulinsiana* and Eurasian otter (*Lutra lutra*). The qualifying interests of the River Barrow and Nore SAC are presented in Table 2 and are discussed individually below. The site synopsis for the River Barrow and River Nore SAC is included in Appendix 2. The NPWS details the conservation objectives of the River Barrow and River Nore SAC (NPWS, 2011).

4.2.1.1 Annex I Habitats

The site is a SAC selected for alluvial wet woodlands and petrifying springs which are priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as an SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herb communities, all habitats listed on Annex I of the E.U. Habitats Directive.

A number of the habitats in Table 1 are not considered further due to distance / geographical separation and / or a lack of pathways for effects. Any marine habitats are located over 90km downstream of the proposed works and do not have the potential to be affected at this distance. Therefore, estuaries, mudflats and sandflats not covered by seawater at low tide, reefs, *Salicornia* and other annuals colonising mud and sand, atlantic salt meadows and Mediterranean salt meadows are not discussed further. Annex I habitats and floral species that may occur in the study area are discussed below.

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

This habitat does not occur in the upper section of the River Barrow and/or in the vicinity of Monasterevin Bridge. The habitat occurs along the left bank of the main River Barrow channel upstream of Graiguenamanagh which is c. 80km downstream of Monasterevin. There are also some areas of this woodland habitat in Co. Kilkenny along the River Nore part of the SAC.

When surveyed by Perrin *et al.* in (2008), the area of this habitat was stable or increasing, subject to natural processes. Perrin *et al.* (2008) noted that further un-surveyed areas of this habitat maybe present within the River Barrow and River Nore SAC.



The overall assessment of this habitat has been evaluated as Unfavourable – Bad due to the assessment of three of the four parameters (Area, Structure and Functions, and Future Prospects) as Unfavourable – Bad (NPWS, 2013a).

Table 1 Qualifying interests of the River Barrow and River Nore SAC, their occurrence/potential to occur in the vicinity of Monasterevin Bridge.

	Natura Code	Item Description	Occurring within the proposed works areas
Habitats	91A0	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles	
	91E0	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	
	3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	
	1310	<i>Salicornia</i> and other annuals colonizing mud and sand	
	1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)	
	1410	Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	
	4030	European dry heaths	
	7220	Petrifying springs with tufa formation (<i>Cratoneurion</i>)	
	6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	
	1320	<i>Spartina</i> swards (<i>Spartinion maritima</i>)	
	1140	Mudflats and sandflats not covered by seawater at low tide	
	1170	Reefs	
1130	Estuaries		
Species	1095	Sea lamprey (<i>Petromyzon marinus</i>)	✓
	1096	Brook lamprey (<i>Lampetra planeri</i>)	✓
	1099	River lamprey (<i>Lampetra fluviatilis</i>)	
	1102	Allis shad (<i>Alosa fallax</i>)	
	1106	Atlantic salmon (<i>Salmo salar</i>)	✓
	1103	Twaite shad (<i>Alosa alosa</i>)	
	1355	Otter (<i>Lutra lutra</i>)	✓
	1092 *	White-clawed crayfish (<i>Austropotamobius pallipes</i>)	✓
	1029	Freshwater pearl mussel (<i>Margaritifera margaritifera</i>)	
	1990	Nore Freshwater pearl mussel (<i>Margaritifera durrovensis</i>)	
1016	Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>)		
1421	Killarney Fern (<i>Trichomanes speciosum</i>)		

*White-clawed Crayfish were not present at the site during the current assessment. However, it is included, as this species did normally occur here until the recent introduction of Crayfish plague.

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

Alluvial Forests are typically woodlands of alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*), often with willows (*Salix* spp.) and sometimes oak (*Quercus robur*). This habitat occurs in areas subject to periodic flooding along rivers and on lake shores.

This habitat does not occur in the vicinity of the proposed project. The nearest area of this Alluvial forest habitat along the main channel of the Barrow is located just upstream of Athy, more than 20 km downstream of Monasterevin Bridge. There are some more sections of the habitat along the Barrow banks further downstream from this area.

This habitat is evaluated as being of overall 'Bad' conservation status (NPWS 2013a); where the range and area for this habitat are identified as being 'Bad'.



4.2.1.1.3 *Water courses of plain to montane levels with the Ranunculon fluitantis and Callitricho-Batrachion vegetation (3260)*

This Annex I habitat type occurs frequently within the River Barrow, where suitable gradient and flow occurs. "Crowfoot-dominated stretches frequently have low diversity, are of low conservation value and indicate damage. Of greater conservation interest are lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers." (NPWS 2013). This habitat does not occur on the low gradient section of the river in the vicinity of Monasterevin Bridge. However, mitigation measures to protect water quality will be in place which will protect downstream habitats.

At a national level the range of floating river vegetation habitat is evaluated as being 'favourable'. However, overall nationally it is evaluated as being of 'inadequate' conservation status (NPWS, 2013a); due to failures in relation to specific structures and functions and also in relation to future prospects, principally in relation to impacts affecting the aquatic environment.

4.2.1.1.4 *European Dry Heath (4030)*

This habitat occurs mainly on the foothills of the Blackstairs Mountains in County Wexford, over 80 km downstream and c. 67km as the crow flies, from Monasterevin Bridge. This habitat does not occur at the proposed site and will not be affected by the works as no potential pathways exist.

This habitat is currently evaluated as being of overall 'Bad', stable conservation status (NPWS 2013a); with the range for this habitat considered 'Favourable' but the area 'Inadequate'.

4.2.1.1.5 *Petrifying Springs with tufa formation (Cratoneurion) (7220)*

The distribution of this habitat in the River Barrow and River Nore SAC is not well known. It has been described at one location on the River Nore channel however, between Thomastown and Inistioge (NPWS, 2011).

This habitat does not occur in the vicinity of the proposed project.

This habitat is evaluated as being stable and of overall 'Inadequate' conservation status (NPWS 2013a); where the range and area of this habitat is identified as being 'Favourable'.

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

The distribution of this Annex I habitat in the River Barrow and River Nore SAC is generally unknown. It is considered to occur in association with some riverside woodlands, on unmanaged islands and in narrow bands along the flood plain of slow-flowing stretches of river (NPWS, 2011). Eutrophic tall herb vegetation occurs in association with various areas of alluvial forest, which are located downstream in the River Barrow and River Nore SAC. The habitat does not occur in the vicinity of the proposed works.

This habitat is evaluated as being stable and of overall 'Bad' conservation status (NPWS 2013a); where the range of this habitat is identified as being 'Good'.

4.2.1.2 Annex II Species

Species listed as qualifying interests of the River Barrow and River Nore SAC and listed on Annex II of the E.U. Habitats Directive include: sea lamprey *Petromyzon marinus*, river lamprey *Lampetra*



fluviatilis, brook lamprey *Lampetra planeri*, freshwater pearl mussel *Margaritifera margaritifera*, Nore freshwater pearl mussel *Margaritifera durrovensis*, white-clawed crayfish *Austropotamobius pallipes*, twaite and allis shad *Alosa fallax* and *Alosa alosa* respectively, Atlantic salmon *Salmo salar*, otter *Lutra lutra*, Desmoulin's whorl snail, *Vertigo moulinsiana* and the Killarney fern *Trichomanes speciosum*.

A number of the species listed in Table 1 are also not considered further due to distance / geographical separation and/or a lack of pathways for effects. Desmoulin's Whorl Snail is located over 80km from the proposed works and no habitat for this species is present in the vicinity of the works. Killarney Fern is not present at this site and the conservation objectives maps show the nearest record as being c. 90km from the works. Freshwater pearl mussels do not occur in the River Barrow and there is not suitable habitat present. Therefore they are not in the vicinity of the proposed project. The relevant species are discussed below.

4.2.1.2.1 Brook lamprey (1096) / River lamprey (1099)

The brook lamprey is the smallest of the three lamprey native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992). All three species of lamprey spawn in fresh waters, and juveniles of all three species, known as ammocoetes, are found within the same catchments, using similar microhabitats, but with varying geographical distribution. Lampreys show a preference for gravel-dominated substratum for spawning, and mainly silt and sand-dominated substratum for nursery habitat (Harvey & Cowx, 2003). The spawning season of brook lampreys starts when the water temperatures reach 10–11°C (Maitland, 2003). This usually occurs in March/April. King (2006) gives the distribution of the three species of lampreys in the River Barrow SAC and found brook lampreys to be sparsely distributed in the main channel of the River Barrow. No lamprey was recorded at the site during the current investigation. However, it is noted that there is potential habitat that may support small numbers of juveniles.

4.2.1.2.2 Sea lamprey (1095)

Sea lamprey (1095) and river lamprey (1099) are anadromous species, spending part of their life cycle in the marine environment and returning to natal watercourses to spawn. Sea and river lampreys are poor swimmers and cannot jump or climb (Reinhardt *et al*, 2009), so will have significant difficulty getting past the main stem weirs on the River Barrow. These species are likely to be generally confined to the lower reaches of the River Barrow. Spawning of river lampreys starts when the water temperature reaches 10–11°C, usually in March and April (Morris & Maitland 1987). The sea lamprey usually spawns in late May or June, when the water temperature reaches at least 15°C (Maitland, 2003).

In the NPWS Irish Wildlife Manuals No. 21 (King, 2006), the sea lamprey is indicated as occurring as far upstream as Carlow on the main channel of the River Barrow. King (2006) notes the presence of river / brook lampreys in the Barrow upstream of Portarlinton. It is considered that these lampreys were most likely brook lampreys, taking account of the distance from the tide and the number of weirs on the river.

Monasterevin is downstream of Portarlinton, but is still also located upstream of the Barrow navigation scheme and a considerable distance from the tidal area. Thus, the fish distribution upstream to this site is therefore affected by weirs and barriers. It is not expected that Sea Lamprey or



River Lamprey would be found at this location. King (2006) recorded no lamprey at Monasterevin during the quantitative fish surveying of the Barrow Channel.

The NPWS (2013b) overall assessment of the conservation status of sea lamprey is 'Bad', with the overall trend in conservation status and the habitat status 'Good'. The status of river lamprey is evaluated as being of 'Favourable' conservation status nationally (NPWS, 2013b).

4.2.1.2.3 *Twaite shad (1103) and Allis shad (1102)*

Twaite Shad (1103) and Allis Shad (1102) are one of the rarest fish species which breed in Irish freshwaters. Shad have an anadromous life cycle and have been recorded in the lower reaches of the River Barrow. The favourable reference range of Twaite shad was calculated based on barriers to upstream migrations. The first impassable barrier was taken to represent the upstream extent of favourable range. On the River Barrow, this was St. Mullins weir (NPWS, 2013b), which is located just above the tidal head in the lower reaches of the River Barrow. Therefore, the site at Monasterevin Bridge is not a Twaite Shad habitat. There is no potential for the presence of Shad in the vicinity of the proposed works.

It is considered that the Allis shad is an opportunistic spawner in Irish waters; and until evidence of an established breeding population is found, the species is considered a vagrant (NPWS, 2013b). The Twaite shad population, although strong in the Barrow, is poor in some rivers and assessed as 'Inadequate' overall. Overall, the status of Twaite shad is considered Inadequate – Bad (NPWS, 2013b).

4.2.1.2.4 *Atlantic salmon (1106)*

Salmon are present throughout the Barrow catchment. The Salmon Conservation Limit (CL) in any river is the number of spawning salmon required to maintain a sustainable population and is used to indicate the number of salmon in a river system above which a harvestable surplus can be considered. Salmon conservation limits are set similarly for all of Ireland's 143 salmon rivers. When the average threshold level of 17 salmon fry is not reached over a four year period, fisheries have been opened for catch and release angling only.

A catchment wide electrofishing survey (CWEF) of juvenile salmon abundance was undertaken on the River Barrow during summer 2011 by Inland Fisheries Ireland staff. CWEF is a method of assessing salmon stocks in the absence of other stock information. This was the fourth year of the CWEF survey in the River Barrow catchment. A total of 79 sites were included in the 2011 analysis. The mean catch in 2011 was 24.75 salmon fry which is considered a high abundance level and is a significant increase on previous years. The mean catch over the four years sampled was 15.35 salmon fry. The River Barrow is below the conservation limit and consequently only catch and release fishing for salmon and sea trout is currently permitted.

There is no potential for salmon spawning at the study site. There is some potential salmon spawning habitat located downstream of the bridge – but in general this is a sluggish river and does not provide suitable spawning and nursery habitat for salmonids.

The conservation status of salmon in the River Barrow is dependent on good water quality status; as this species requires clean water (Q4) for spawning and early life stages. This species is evaluated as being of overall 'Bad' conservation status nationally (NPWS 2013a).



4.2.1.2.5 Otter (1355)

Otter is widespread in the River Barrow and River Nore SAC. Otters have two basic requirements: aquatic prey and safe refuges where they can rest. This species is dependent on fish stocks which are ultimately dependent on water quality. An important component of the otter diet in the study area is White-clawed Crayfish, which until the recent introduction of the Crayfish plague, occurred in this area. No otter holts were found in the vicinity of the proposed works area, however, it is likely that the species still use the site for foraging and commuting. No evidence of Otter activity was found at the site.

The overall assessment of the conservation status of otter is 'Favourable' (NPWS, 2013b).

4.2.1.2.6 White-clawed Crayfish

The River Barrow was a stronghold for White-clawed Crayfish *Austropotamobius pallipes* (Demers *et al.*, 2005). White-clawed Crayfish would normally occur at this location; however, the introduction of the invasive Crayfish plague has resulted in a major loss of Crayfish numbers in the Barrow. There are no Crayfish currently present at the survey site.

The overall assessment of the conservation status of White-clawed Crayfish is 'Unfavourable Inadequate' (NPWS, 2013b).



5. IMPACT ASSESSMENT

At NIS stage, mitigation to offset potential negative impacts can be provided. In addition, the impact of the project / plan affecting the *integrity* of a Natura 2000 site is considered with respect to the conservation objectives of the site. Integrity is defined as: *'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'*. Therefore, the integrity of a site is principally related to the structure and function of the site with regard to its Annex I habitats and Annex II species listed as the qualifying interests. The conservation status of these qualifying interests comprises the primary conservation objectives for all designated Natura 2000 sites.

5.1 River Barrow and River Nore SAC

5.1.1 Atlantic salmon (1106)

There is no Salmon spawning habitat at the proposed works site. It is noted that there is some potentially suitable spawning habitat (marginal habitat only) downstream of the bridge site.

The instream works have the potential to result in direct water quality and disturbance impacts. Water quality impacts may arise due to an increase in suspended solids, with background levels already high, and accidental spillages of oil / fuel from machinery and / or concrete / cement. It is noted that water quality at the site during the current survey was noted as poor, with evidence of sewage fungus and heavy siltation. Cumulative impacts have the potential to arise in combination with existing background water quality pressures such as the storm water overflow from the Monasterevin WwTP. Instream works may also lead to the creation of a barrier to migration upstream for Atlantic salmon. Mitigation is required to limit the timing of the works to minimise disturbance and ensure that water quality is protected during the works. The instream works must also ensure that there is no barriers for fish, as juvenile salmon are mobile and will move out of the way of machinery provided there is safe access for them.

It is noted that there is a small section of Japanese Knotweed at the site, which can be easily spread to other areas and could impact aquatic habitats in the long term by populating the banks of the river. The de-vegetation works and cutback of overgrowth on the embankments could lead to significant invasive species impacts. Biosecurity mitigation measures are provided to avoid invasive species impacts.

5.1.2 Otter (1355)

No Otter holts are present in the vicinity of the proposed site (to 100m+ upstream and downstream). However, it is likely that otters use this area for foraging and / or commuting. Direct disturbance impacts are not considered to have the potential to be significant as in-stream works will take place during daytime hours when Otters are not active or passing through the site. However, works at the arches could affect otters moving upstream and downstream through the bridge, particularly if multiple arches were worked on and closed at the same time. This would create a barrier to movement for Otters.

Indirect water quality impacts could potentially affect fish populations which are a food source for this species. An increase in suspended solids and accidental spillages of oil / fuel machinery and / or spillages of concrete / cement, if required, could impact on water quality in the River barrow. Cumulative impacts have the potential to arise in combination with existing background water quality



pressures such as the storm water overflow from the Monasterevin WwTP. The Japanese Knotweed present near the site can be easily spread to other areas and could impact aquatic habitats in the long term by populating the banks of the river. The de-vegetation works and cutback of overgrowth on the embankments could lead to significant invasive species impacts. Mitigation measures required include limiting the footprint of the works to minimise disturbance, leaving arches open to maintain accessibility and mitigation to protect water quality and biosecurity.

5.1.3 Lamprey Species (1095, 1096, 1099)

There are some areas at the site which hold suitable lamprey habitat, which consists of silted areas. Although no lampreys have been recorded here, it is considered likely that brook lampreys are present in low densities at the proposed works site. It is unlikely that Sea lampreys and river lampreys would be present here due to the number of barriers to fish migration, i.e. weirs, present downstream along the River barrow. There is no lamprey spawning habitat present at the site. There is potential for direct disturbance impacts arising from the instream works. Juvenile lampreys burrow into silt and can be killed easily by machines tracking over their habitats, or from the regarding works on the river bed for arches 1 and 4. Direct water quality impacts, arising from increased suspended solids or accidental spillages as mentioned above, may also arise. These water quality impacts may also be indirect, affecting further areas downstream. If areas are dewatered, lampreys may become stranded and die. Cumulative impacts have the potential to arise in combination with existing background water quality pressures such as the storm water overflow from the Monasterevin WwTP. Mitigation measures are required to ensure water quality is protected and that there is free and safe passage for lampreys during the works.

The Japanese Knotweed present near the site can be easily spread to other areas and could impact aquatic habitats in the long term by populating the banks of the river. The de-vegetation works and cutback of overgrowth on the embankments could lead to significant invasive species impacts. Mitigation is required to ensure biosecurity is protected.

5.1.4 White-clawed Crayfish (1092)

Reynolds (1998) identifies disease as major threat and has occurred in Ireland even in the absence of alien vectors. The most serious infection is the crayfish fungal plague caused by the fungus *Aphanomyces astaci* Shikora. This disease originated in North America and one strain was spread to Europe via Italy over 100 years ago. Other strains were introduced from California with western American Signal crayfish, and from Louisiana. European crayfish possess no resistance to this fungus, which attaches to thin areas of cuticle as a spore and then grows through the tissues, leading to death in around two weeks. The swimming spores have no resting stage and must be transmitted directly from an infected or recently dead crayfish.

It is known that crayfish plague has already affected the River Barrow. Although Crayfish are not currently present in the vicinity of the site, they have been present in the past and are still a qualifying interest of the River Barrow and River Nore SAC, therefore impacts on this species must be considered. No direct impacts would arise as this species is not present at the site. Potential indirect impacts may arise in relation to water quality. Increased suspended solids and accidental spillages of oil / fuel and / or concrete / cement, if required for the works, can lead to water quality impacts downstream. Cumulative impacts have the potential to arise in combination with existing background water quality pressures such as the storm water overflow from the Monasterevin WwTP. The Japanese Knotweed present near the site can be easily spread to other areas through the de-vegetation works and could impact aquatic habitats in the long term by populating the banks of the river. These impacts may also lead to a reduction of plant habitats for other macroinvertebrates, which



crayfish feed on, and therefore could lead to a further indirect impact on the species. The crayfish plague present in the River barrow at the site could also be transported to other catchments via machinery that has worked on site. Mitigation to protect water quality and biosecurity, to prevent the spread and / or introduction of invasive species and crayfish plague, is required.

5.1.5 Floating River Vegetation

Although floating river vegetation habitat is not present at the site, this habitat may be present downstream in the River barrow and could therefore be impacted by indirect and cumulative water quality impacts. These impacts may arise through the same pathways as mentioned above, i.e. increased suspended solids from instream works and accidental spillages. This habitat may also be impacted by the introduction and / or spread of non-native invasive species. It is noted that there is a small section of Japanese Knotweed at the site, which can be easily spread to other areas, especially through the de-vegetation works. The water quality protection and biosecurity mitigation that is required for the protection of aquatic species would also be sufficient to avoid potential impacts on this Annex I habitat, if present downstream.



6. MITIGATION

6.1 Best practice procedure and guidelines

Mitigation measures for the protection of the riparian and aquatic environment have been prepared for the protection of the conservation interests of the River Barrow and River Nore SAC. The proposed rehabilitation works to Monasterevin bridge have been identified as having the potential to cause direct disturbance and water quality impacts, indirect water quality impacts and non-native invasive species impacts and the spread of crayfish plague as well as cumulative impacts on water quality due to existing background water quality pressures in the River Barrow and Monasterevin Bridge.

The main mitigation measure to be taken is that a site ecologist should be appointed to monitor the works and compliance with the mitigation provided below and detailed in the site-specific method statement. The method statement provides the details of how each process adheres to the mitigation measures: timing of works, limiting access outside of the proposed works area, biosecurity protocols and water quality protection measures. The methodology will be confirmed with the site ecologist for each step of the works to ensure the relevant precautions are taken. The best practice methods included should have due regard to the relevant sections of the following guidelines.

- IFI, (2010) '*Biosecurity Protocol for Field Survey Work*'
- IFI, (2016) '*Guidelines of protection of Fisheries during construction works in and adjacent to waters*'
- NRA, (2010) '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*'
- NRA, (2008) '*Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*'
- CIRIA (2006) '*Control of Water Pollution from Linear Construction Projects- Site Guide (C649)*'
- CIRIA (2005) '*Environmental Good Practice – Site Guide (C650)*'

6.2 Avoidance

Access to the river for the in-stream bridge works should be limited to a single access route to minimise the footprint of works. This access point will be from the downstream west bank, as stated in the current method statement.

The proposed works will be undertaken outside of the salmonid close season and outside of the lamprey spawning season. The project is scheduled for all works to be completed between July and September. The salmonid close season begins on the 30th of September and therefore works will have to be completed before this date. Works will not be undertaken during dark hours to avoid potential disturbance on Otters or other mammals foraging in the area, with works permitted from 8am to 5pm.

The footprint of the works will be limited and works areas will be surrounded by silt fences and sand bags. Appropriate set back distances from sensitive ecological and cultural heritage sites and the River Barrow will be maintained. The main site compound will not be located within 10 m of the river and will be located on dry land.

The required tree removal will not be undertaken during the bird nesting season, which runs from 1st of March to the 31st of August. Although no suitable nesting habitat for Kingfishers was noted in the



vicinity of the bridge during the current surveys, this habitat may be present downstream and Kingfishers may use this stretch of river for foraging. Free access through at least some arches of the bridge must be provided at all times to allow kingfisher safe passage up through the bridge. It is advised that only one arch at a time should be undergoing works.

6.3 Water Quality Protection

Any oiling or refuelling of machinery that may be required will be undertaken away from the River Barrow. Any oils or fuels that may be required for minor machinery used during the proposed works will be stored appropriately in bunded tanks in the site compound (which should be fenced off 10 m from the river) to ensure no spillages occur. The site compound will have security to deter vandalism, theft and unauthorised access. Machinery will be checked for leaks prior to its use on site and prior to working in-stream.

Prior to any instream works occurring, the site ecologist will agree a 5-day weather window of low flow conditions with the contractor to minimise the risk of works in the river during a flood event. Silt fences will be placed on the outside of the works area first, with sand bags placed inside to ensure no impacts regarding suspended solids arise. Details of the sandbags will be included in the method statement. The site ecologist will ensure the sand bags and silt fences are erected correctly.

The works area will be fenced to avoid trampling or disturbance by personnel outside of the works area or by public access to the site.

An Emergency Contingency Plan will be drawn up for the removal of the sand bags during a flood event, detailing how long the removal of sand bags will take, how it will be done, and what measures will be taken if there is a flood event on a weekend when there are no workers on site. It is noted that the Barrow is a spate river and flood events can happen in a short period of time.

Works should be carried out on a single pier / arch at a time at Monasterevin Bridge. When the works on one pier is complete the works area will be removed appropriately and the normal flow returned before the works area for the next pier is assembled. This will allow flow to be diverted easily and will ensure that any risk posed by a potential flood event will be reduced, as fewer sandbags will need to be removed, and there will be less risk in relation to release of silt into the River Barrow.

The site ecologist will over-see the set-up of dry works areas. Any lamprey and fish species potentially caught behind the dammed area will be translocated upstream by the ecologist who will have obtained a section 14 license for this activity.

No concrete / cement mixing will be carried out at the river bank area; mixing within the mixing area in the site compound will be controlled by the contractor, with all wash water, tool washings and any waste / grey water stored securely and removed; no waste will be stored on site; concrete / cement and grout work must be carried out behind the silt fencing and sandbags, in the dry works area. Storage areas for concrete / cement and grout required for the works will be included in the site compound. The waste from any vegetation removal will also have to be dealt with appropriately away from the River Barrow.

The site ecologist will monitor water ingress and the cleanliness of the works area within the dewatered area. Although works will be undertaken during low water levels, in the unlikely event that a significant ingress of water occurs, all works within the dewatered area will stop. If required, the concrete / cement works will not be undertaken if there is a flow of water into the dewatered section,



taking account of the dewatering volume to be passed through the silt bags at the end of the pumping pipes, if required.

If there is a requirement for pumping out water from the dammed works area silt bags will be installed at the end of the pumping pipes to filter water to be pumped from the dammed section of the river. The specifications of the silt bags required to adequately cope with the volume of water will need to be included in the detailed method statement. The pumping will have to be maintained so it is operating effectively with suspended solids loadings at the end of pipe at less than 10 mg/l and any de-watering, passing through a silt bag should be similar in nature to flood water in the area.

6.4 Biosecurity

Biosecurity measures will follow NRA guidelines *'The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads'* (NRA, 2010) and the IFI guidelines *'Biosecurity Protocol for Field Survey Work'* (IFI, 2010). Japanese Knotweed is present at the site with a stand of the invasive plant located on the left (east) bank just upstream of the bridge. Crayfish plague is also known to occur in the River Barrow.

De-vegetation works and clearance of overgrowth on the embankments is required, which may affect or come into close proximity to the Japanese Knotweed at the site. In any case the small section of Japanese Knotweed is to be eradicated on site prior to the commencement of works. This will prevent the further spread of this invasive plant in the area, and to stop it spreading elsewhere. Common control options for Japanese knotweed include; herbicide treatment screening / sifting, rhizome fragmentation and cultivation, burial on site, root barrier membrane, removal to landfill and biological control.

Particular attention will have to be given to sterilising all equipment / work gear that will come in contact with the river, by using suitable disinfectants such as Virkon aquatic, to ensure no spread of crayfish plague occurs. All equipment to be used on site will be steam cleaned before dispatching to site, and all hired equipment will be treated on site with an approved biocide / cleaning agent. If sand bags are required for the instream works, they will only be sourced from a quarry that has a biosecurity certificate. A disinfection / cleaning station will be set up next to the site compound and 10 m back from the river.

6.5 Site ecologist

A site ecologist will need to be appointed for the duration of the proposed works. The site ecologist will work with the contractor to ensure the precise site-specific method statement complies with relevant mitigation. The method statement includes details of the works: timing / equipment / machinery / materials / procedures etc.. Specific methodology and adherence to mitigation will be confirmed with the ecologist for each individual stage of the project. Overall the ecologist will ensure that the works are carried out following the best practice guidelines and the mitigation measures provided in this document with minimal impacts on the River Barrow and Nore SAC. The ecologist will be on site on a regular basis to ensure compliance with the environmental and ecological protection measures specified in the method statement.

A site induction will be carried out by the site ecologist for all contractors' personnel including sub-contractor staff attending the site. The site induction will ensure that any person working on site is aware of the mitigation measures that will be implemented on site. This will include limiting access to



within the works area, timing of works, water quality protection measures and biosecurity protocols. This will be the first element of the works undertaken.

6.6 Habitat enhancement

It is recommended that a line of random small boulders is placed instream under the outer arches to create habitat for, and improve of, lamprey species and eels.

The removal of trees and vegetation should be minimal. Any trees / shrubs removed to facilitate the works should be replaced when the works are complete. The banks should be reinstated and a native seed mix should be used for replanting. The river should then be fenced off again to protect it from access by farm animals and allow the area to recover.

7. IMPLICATIONS FOR CONSERVATION OBJECTIVES

Favourable conservation status is defined for Annex I habitats and Annex II species in the Habitat Directive (1992):

Article 1 (e)

Conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species within the territory referred to in Article 2.

The conservative status of a natural habitat will be taken as 'favourable' when: its natural range and areas 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.

Article 1 (i)

Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2;

The conservation status will be taken as 'favourable' 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.

7.1 Conservation Objectives for River Barrow and River Nore SAC

The Conservation Objectives for the River Barrow and River Nore SAC has been prepared by the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (NPWS, 2011). 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 SACs and SPAs 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.



Site-specific conservation objectives aim 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 population on a long-term basis.

In the document outlining the conservation objectives for the River Barrow and River Nore SAC (NPWS, 2011), each conservation interest is discussed separately as a conservation objective. Attributes and targets given in these conservation objectives were based on best available information at the time of writing.

The proposed rehabilitation works at Monasterevin Bridge in the River Barrow have been identified as having the potential for water quality impacts with regard to the requirement for in-stream works and the potential requirement of cement / concrete for the works on the bridge. The implementation of the mitigation measures prescribed for the works will result in these impacts being reduced to imperceptible in scale.

There are no impacts arising from the proposed works which would have the potential to affect the conservation status of the Annex I habitats or Annex II species listed as qualifying interests of the River Barrow and River Nore SAC. The proposed works will not affect the conservation objectives of this site or have an adverse effect on the requirements to meet the conservation objectives with regard to the restoration of Annex I habitats and Annex II species to favourable conservation status. Water quality is identified as a key sensitivity of the water-dependent qualifying interests of the SAC site. Measures to protect water quality to avoid impacts affecting the aquatic species of the SAC have been included in the mitigations section of the current report.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the: 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or population of species for which the site is or will be classified'.

With regard to the integrity of the River Barrow and River Nore SAC, this SAC is affected by a history of impacts on water quality and barriers to fish migration, which has direct impacts on the conservation interests of the site. The proposed works are limited in scale and will comply with the required mitigations to ensure that there will be no further impacts arising which would affect the coherence of the SACs ecological structure and function; particularly with regard to the Annex II populations recorded from within the study area. The proposed works are not identified as having the



potential to adversely affect the conservation objectives of the River Barrow and River Nore SAC or with the integrity of the site affected, provided mitigation measures are followed.

8. CONCLUSION STATEMENT

The current NIS has been undertaken to evaluate the potential impacts of the proposed development with regard to the effects upon the conservation objectives and qualifying interests (including habitats and species) of the River Barrow and River Nore SAC. The proposed rehabilitation works at Monasterevin Bridge in Co. Kildare are located on the River Barrow, within the River Barrow and River Nore SAC. The works required involve reconstruction and repairs to piers and outfall pipes, raking and repointing joints in the structure walls, regrading of sections of the river bed, as well as cleaning and removal of vegetation. The road surface of the bridge is also to be relaid.

The works are considered to be limited in scale and a site-specific method statement outlining the procedures to follow, as well as guidance and supervision from an assigned site ecologist will ensure the correct procedures are followed at each stage. The method statement details how the procedures will adhere to the mitigation measures (timing of works, biosecurity protocols and water quality protection measures). The method statement includes details of the river access, overall timeframe of the project, the treatment of machinery, site layout and other pollution prevention precautions. The protection measures will need to be applied to each exact procedure as relevant. There should also be an Emergency Contingency Plan for a flood event drawn up prior to works. In addition, to the inclusion of mitigation in the method statement, ongoing monitoring of the works by the site ecologist will ensure that the correct procedures as detailed in the method statement are adhered to. The ecologist will also carry out lamprey surveying during instream works and will hold a section 14 licence which will permit them to translocate any lamprey which may potentially get caught behind dammed areas. They will also translocate other fish species that may be trapped.

Taking cognisance of the sensitivity of the water-dependent Annex II species listed as qualifying interests of the SAC, mitigations must be implemented at the site during the proposed rehabilitation works at Monasterevin Bridge. The works are to be undertaken outside of the salmonid closed season and lamprey spawning season. Works will also not take place after dark when there is potential to disturb Otter foraging activity. Strict water quality protection measures will be implemented throughout the project to mitigate impacts on all aquatic Annex II species in the affected area, including Atlantic Salmon, Otter, Lamprey. White-clawed crayfish may be present downstream but were not present at the site; it is known that crayfish plague is present in the River Barrow. The only Annex I habitat that may be affected by the proposed works is Floating River Vegetation, which although is not present at the site, may be present downstream and therefore could be impacted by water quality.

Table 2 below provides a summary of the potential impacts, mitigation measures required and potential for residual impacts, for each of the qualifying interests of the River Barrow and River Nore SAC that have the potential to be affected by the proposed works at Monasterevin Bridge.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. The mitigation measures proposed are considered to be sufficient to ensure that potential impacts regarding water quality, invasive species and disturbance are minimised. From the evidence presented in the current assessment, it is concluded that the potential direct, indirect and cumulative impacts that may arise from the proposed works do not have the potential to affect the integrity of the River Barrow and River Nore SAC.



Table 1 Potential impacts on qualifying interests of the River Barrow and River Nore SAC that have potential to be affected by the proposed works at Monasterevin Bridge, with mitigation measures required and residual impacts identified.

Qualifying Interest	Potential Impact	Mitigation Measures	Residual Impacts
Atlantic Salmon	Juveniles present at the proposed works site; there is the potential for disturbance impacts, invasive species and water quality impacts.	Works will take place outside the salmonid close season; a site ecologist employed for the works; silt fences and sand bags will be used to protect water quality; if pumping is required to dewater the works area silt bags will also be used; the site ecologist will monitor suspended solids downstream of the works; no concrete / cement mixing or refuelling of machinery will take place near any watercourse; site compound not located within 10m of the river;; machinery checked for leaks prior to its use on site; emergency contingency plan for flood events; consider working on one arch at a time to maintain access for aquatic species; Japanese knotweed at site will be eradicated prior to works; biosecurity guidelines will be followed; all equipment / work gear will be sterilised; disinfection / cleaning station set up next to site compound 10m from the river	No residual impacts.
Otter	No holts are present at the site, however Otter are likely to use the site for foraging/commuting; there is the potential for disturbance impacts, invasive species and water quality impacts	Works will not be undertaken during hours of darkness; a site ecologist employed for the works; silt fences and sand bags will be used to protect water quality; if pumping is required to dewater the works area silt bags will also be used; the site ecologist will monitor suspended solids downstream of the works; no concrete / cement mixing or refuelling of machinery will take place near any watercourse; site compound not located within 10m of the river; machinery checked for leaks prior to its use on site; emergency contingency plan for flood events; consider working on one arch at a time to maintain access for aquatic species; Japanese knotweed at site will be eradicated prior to works; biosecurity guidelines will be followed; all equipment / work gear will be sterilised; disinfection / cleaning station set up next to site compound 10m from the river	No residual impacts.
Lamprey Species	Brook lamprey present at the proposed works site in low densities; there is the potential for disturbance impacts, invasive species and water quality impacts	Works will be undertaken outside the lamprey spawning season; site ecologist employed for the works and will hold a section 14 license to translocate lampreys from works areas instream; silt fences and sand bags will be used to protect water quality; if pumping is required to dewater the works area silt bags will also be used; the site ecologist will monitor suspended solids downstream of the works; no concrete / cement mixing or refuelling of machinery will take place near any watercourse; site compound not located within 10m of the river; machinery checked for leaks prior to its use on site; emergency contingency plan for flood events; consider working on one arch at a time to maintain access for aquatic species; Japanese knotweed at site will be eradicated prior to works; biosecurity guidelines will be followed; all equipment / work gear will be sterilised; disinfection / cleaning station set up next to site compound 10m from the river	No residual impacts.
White-clawed Crayfish	Currently not present but it is generally Crayfish habitat, crayfish plague known in the River Barrow;	Site ecologist employed for the works; silt fences and sand bags will be used to protect water quality; if pumping is required to dewater the works area silt bags will also be used; the site ecologist will monitor suspended solids downstream of the works; no concrete / cement mixing or refuelling of machinery will take place near any watercourse; site compound not located within 10m of the river; machinery checked for leaks prior to its use on	No residual impacts.



Qualifying Interest	Potential Impact	Mitigation Measures	Residual Impacts
	there is the potential for water quality impacts	site; emergency contingency plan for flood events; consider working on one arch at a time to maintain access for aquatic species; Japanese knotweed at site will be eradicated prior to works; biosecurity guidelines will be followed; all equipment / work gear will be sterilised; disinfection / cleaning station set up next to site compound 10m from the river	
Floating River Vegetation	Not present at the site but may be present downstream; there is the potential for indirect water quality impacts	Site ecologist employed for the works; silt fences and sand bags will be used to protect water quality; if pumping is required to dewater the works area silt bags will also be used; the site ecologist will monitor suspended solids downstream of the works; no concrete / cement mixing or refuelling of machinery will take place near any watercourse; site compound not located within 10m of the river; machinery checked for leaks prior to its use on site; emergency contingency plan for flood events; consider working on one arch at a time to maintain access for aquatic species; Japanese knotweed at site will be eradicated prior to works; biosecurity guidelines will be followed; all equipment / work gear will be sterilised; disinfection / cleaning station set up next to site compound 10m from the river	No residual impacts.



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PLATES



Plate 1 Monasterevin bridge viewed from downstream.



Plate 2 River Barrow downstream of Monasterevin bridge.



Plate 3 River Barrow looking upstream from Monasterevin bridge.

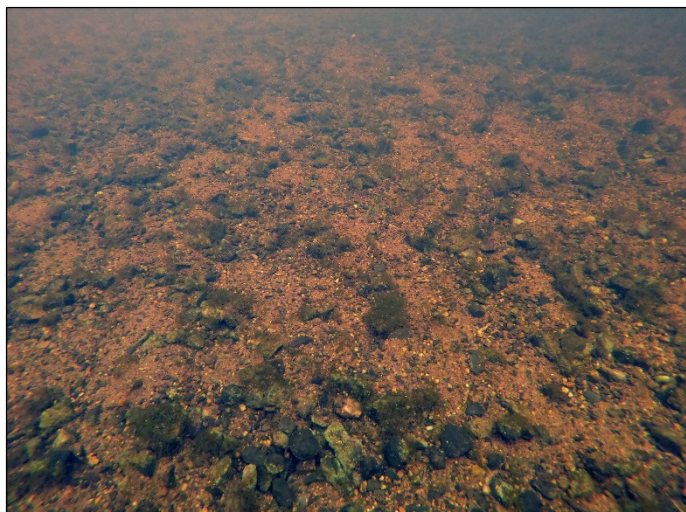


Plate 4 Example of substrate at bridge site – dominated by sand with cobbles. This is not a salmonid or lamprey spawning area and is also a sub-optimal habitat for juvenile lampreys.

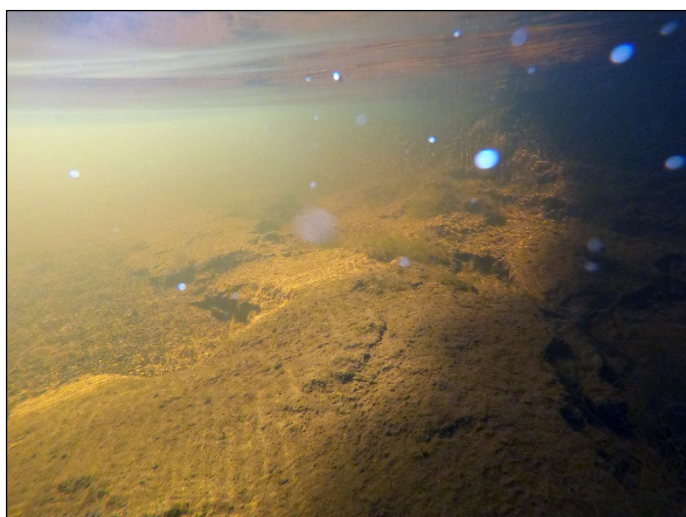


Plate 5 Example of substrate at bridge site – heavy siltation. No juvenile lampreys were present here (sampled by kick sampling) but low densities of juvenile lampreys are likely to be present.



Plate 6 Eutrophication and siltation in the river upstream of Monasterevin Bridge.



Plate 7 Silt plumes visible in the river at the site.



Plate 8 Sewage inlet flowing over litter and debris into the Barrow channel on the upstream left bank.



Plate 9 Japanese knotweed *Fallopia japonica* upstream of the site on the left bank.

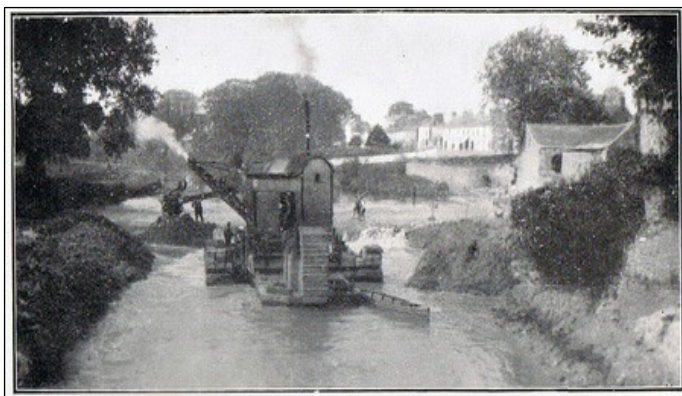


Plate 10 Dredging works at Monasterevin in the 1930s. This is the stretch of river immediately upstream of the subject bridge (Source: Irish Waterways History).

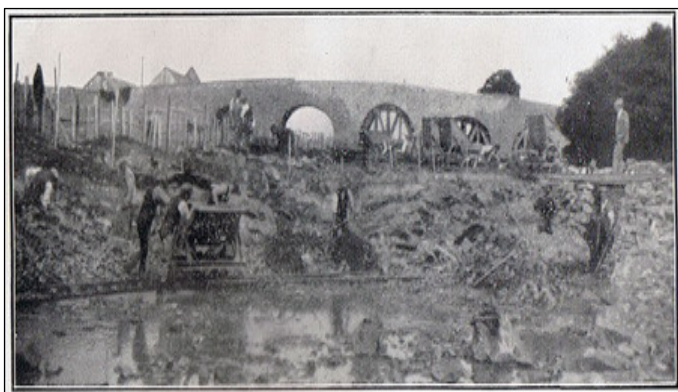


Plate 11 Dredging works at Monasterevin in the 1930s. This entire stretch of river was dredged and channelised and the effects of this scheme are still apparent today (Source: Irish Waterways History).



Plate 12 Dredging works at Monasterevin in the 1930s. The dredging works were undertaken using drag lines and the river was also diverted and dried out during the works. This scheme permanently altered the physical character the river (Source: Irish Waterways History).



APPENDIX 1 Screening for Appropriate Assessment Matrix

<p>Brief Description of the Project or Plan</p>	<p>The proposed project relates to remediation works on Monasterevin Bridge. Monasterevin Bridge is a five-arch bridge along which the main road in Monasterevin in County Kildare crosses over the main channel of the River Barrow. The limestone square cut, masonry arch structure is supported by two Masonry abutments and four Masonry piers. The work that is required involves both in-stream and out-of-stream works on the walls of the structure itself, as well as on the embankments and the surface of the bridge.</p>
<p>Brief Description of the Natura 2000 Sites within 15km</p>	<p>River Barrow and River Nore SAC (002162): This site consists of the freshwater 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. This site is of special conservation interest for a variety of aquatic species and habitats, as well as some terrestrial and marine habitats and species. <i>Included in the current Screening:</i> Yes – Monasterevin Bridge is located over the River Barrow, there is a direct pathway for potential impacts.</p> <p>Pollardstown Fen SAC (000396): Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay. <i>Included in the current Screening:</i> No – this site is located c. 14.3km from Monasterevin Bridge. There is no potential pathway for impacts. There is no hydrological connection with this SAC.</p> <p>Mountmellick SAC (002141): This site comprises a disused stretch of the Grand Canal between Dangan’s Bridge and Skeagh Bridge, approximately 3 km east of Mountmellick in Co. Laois. The whorl snail <i>Vertigo moulinsiana</i> is a glacial relict with a disjunct European population that is considered Vulnerable due to loss of habitat, caused in particular by drainage of wetlands. It was first recorded at this site in 1971. This site is selected for the special conservation interest of Desmoulin’s Whorl Snail. <i>Included in the current Screening:</i> No – this site is located c. 13.3km from Monasterevin Bridge. There is no potential pathway for impacts. There is no hydrological connection with this SAC.</p> <p>No SPAs within 15km of the proposed development. Only the River Barrow and River Nore SAC has a potential pathway for impacts.</p>
<p>Potential Impacts that May Arise</p>	<p>Direct impacts may arise that could affect sea lamprey, river lamprey, brook lamprey, atlantic salmon, otter and crayfish. It is noted that no lampreys were recorded during the current surveys or in previous surveys, however there are considered to be present in low densities. There is no salmon spawning habitat at the site. Juvenile salmon may be present and adult salmon may occasionally pass through the site. No Otter signs were found during the current surveys upstream or downstream of the bridge and no otter holts are present. White-clawed crayfish used to be present at the site but were not recorded during the current surveys due to the outbreak of crayfish plague. Indirect impacts may arise regarding water quality and non-native invasive species. Japanese knotweed is present upstream of the bank on the left hand side. Cumulative impacts may also arise regarding invasive species and water quality. The River channel has a history of channelization and instream works, the river is uniform but also highly silted. There is also a storm water outflow for the Monasterevin WwTP upstream of the bridge, the primary discharge for this plant is located downstream.</p>
<p>Conclusion</p>	<p>The potential for impacts on the River Barrow and River Nore SAC has been identified. The proposed bridge site is located over the River Barrow. There is potential for direct, indirect and cumulative impacts to arise as a result of the works. Mitigation will be required. In a pre-assessment Screening, mitigation cannot be provided. Therefore, a Natura Impact Statement is required for the proposed remedial works in Monasterevin.</p>

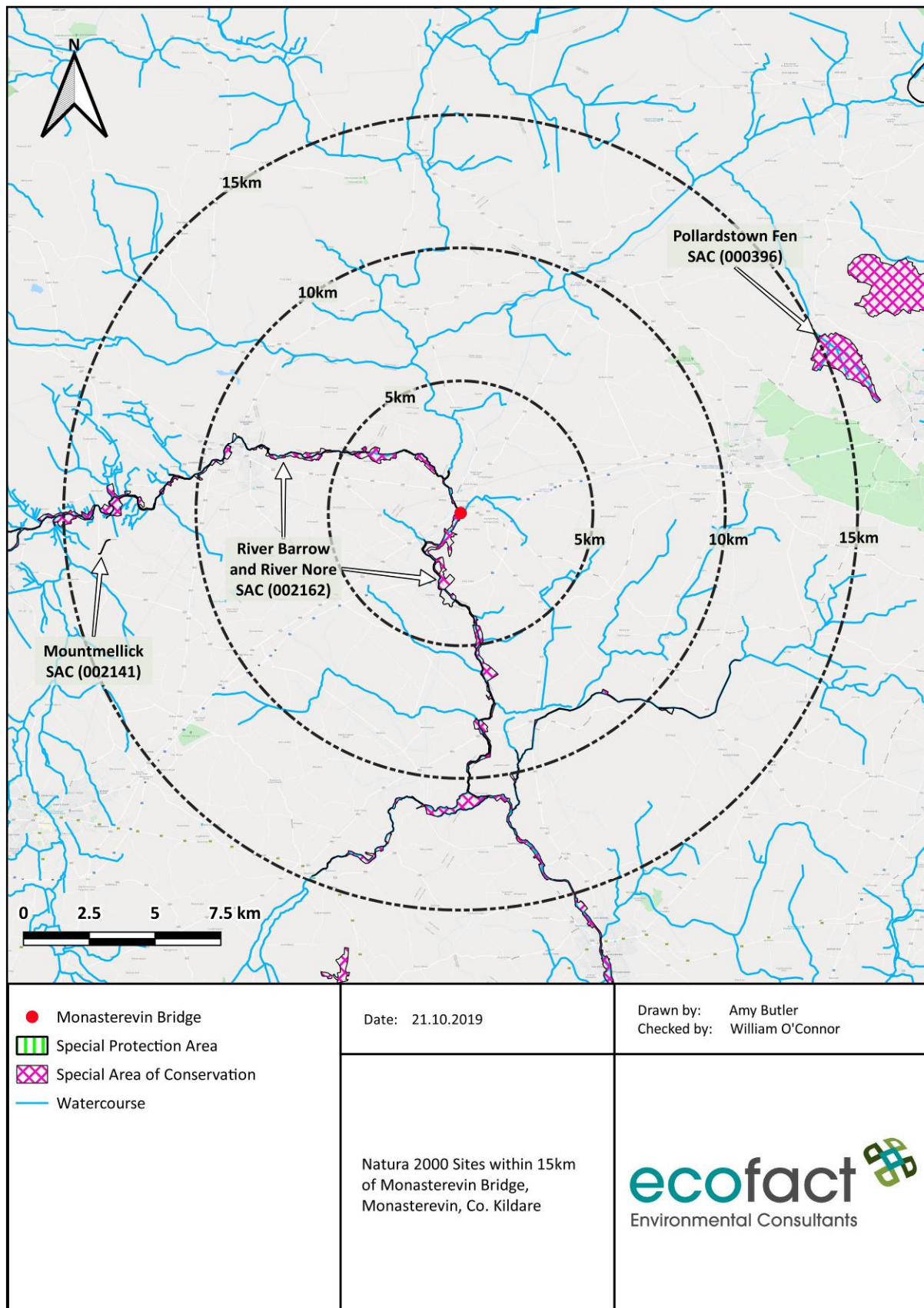


Figure A1.1 Natura 2000 sites within 15km of Monasterevin Bridge, Co Kildare.



APPENDIX 2 NPWS Site Synopses

Site name: River Barrow and River Nore SAC
Site code: 002162

Qualifying interests:

Annex I habitats

- Estuaries (1130)
- Tidal Mudflats and Sandflats (1140)
- Reefs (1170)
- *Salicornia* Mud (1310)
- Atlantic Salt Meadows (1330)
- Mediterranean Salt Meadows (1410)
- Floating River Vegetation (3260)
- Dry Heath (4030)
- Hydrophilous Tall Herb Communities (6430)
- Petrifying Springs* (7220)
- Old Oak Woodlands (91A0)
- Alluvial Forests* (91E0)

Annex II species

- Desmoulin's Whorl Snail (*Vertigo moulinsiana*) (1016)
- Freshwater Pearl Mussel (*Margaritifera margaritifera*) (1029)
- White-clawed Crayfish (*Austropotamobius pallipes*) (1092)
- Sea Lamprey (*Petromyzon marinus*) (1095)
- Brook Lamprey (*Lampetra planeri*) (1096)
- River Lamprey (*Lampetra fluviatilis*) (1099)
- Twaite Shad (*Alosa fallax*) (1103)
- Atlantic Salmon (*Salmo salar*) (1106)
- Otter (*Lutra lutra*) (1355)
- Killarney Fern (*Trichomanes speciosum*) (1421)
- Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) (1990)

This site consists of the freshwater 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 – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlinton, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks



poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

Good examples of alluvial forest (a priority habitat on Annex I of the E.U. Habitats Directive) are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Crack Willow (*S. fragilis*) and Osier (*S. viminalis*), along with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Common Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides*. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Downy Birch (*Betula pubescens*), with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*), Great Wood-rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore, about 5 km west of New Ross, in Co. Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown, a small, mature oak dominated woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understory is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Common Cow-wheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is quite a high degree of natural regeneration of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also on the Barrow,



consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understory of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam *Sorbus devoniensis* has also been recorded here.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places.

Floating river vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include water-starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), water-milfoils (*Myriophyllum* spp.), the pondweed *Potamogeton x nitens*, Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (*Ulex europaeus*) with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove, Common Sorrel (*Rumex acetosa*) and Creeping Bent (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry and Great Wood-rush are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather, Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites australis*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) are found. The very rare and also legally protected Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present.



Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Glassworts (*Salicornia* spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. It is formed by the polychaete worm *Sabellaria alveolata*. This intertidal *Sabellaria alveolata* reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sand grains, in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs including: *Enteromorpha* sp.; *Ulva* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Polysiphonia* sp.; *Chondrus crispus*; *Palmaria palmate*; *Coralinus officinalis*; *Nemertea* sp.; *Actinia equine*; *Patella vulgate*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, willowherbs (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs.

The dunes which fringe the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other species present include Wild Clary/Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge, Clustered Clover, Basil Thyme (*Acinos arvensis*), Red Hemp-nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed (*Groenlandia densa*), Meadow Saffron/Autumn Crocus (*Colchicum autumnale*), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (*Serratula tinctoria*), Bird



Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Ivy Broomrape (*Orobanche hederarum*) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Divided Sedge was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge, Field Garlic (*Allium oleraceum*) and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria*. The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. m. durrovensis*), White-clawed Crayfish, Salmon, Twaite Shad, three lamprey species – Sea Lamprey, Brook Lamprey and River Lamprey, the tiny whorl snail *Vertigo moulinsiana* and Otter. This is the only site in the world for the hard water form of the Freshwater Pearl Mussel, *M. m. durrovensis*, and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*.

Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River. These are: *Neoascia obliqua* (Order Diptera: Syrphidae), *Tetanocera freyi* (Order Diptera: Sciomyzidae) and *Dictya umbrarum* (Order Diptera: Sciomyzidae). The rare invertebrate, *Mitostoma chrysomelas* (Order Arachnida), occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies (Order Diptera) *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur at this woodland.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Land use at the site consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also



popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (*Prunus laurocerasus*) and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.



APPENDIX 3 METHOD STATEMENT