Appendix C

Report 1: Assessment of significant effects on the environment in respect of Biodiversity

Report 2: Appropriate Assessment

Foynes to Limerick Road (including the Adare Bypass)

Assessment of significant effects on the environment in respect of Biodiversity.

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1.1. Biodiversity: Introduction and Background

1.1.1. Chapter 7 of the EIAR provides an assessment of the likely impacts of the proposed Foynes to Limerick Road, including the Adare bypass on Biodiversity including flora, fauna and fisheries. The ecological baseline of the area likely to be impacted by the road scheme has been evaluated and significant effects identified. Mitigation measures have been proposed to avoid, reduce or remedy significant impacts on biodiversity and monitoring measures are included.

1.1.2. A number of other chapters in the EIAR are also of relevance to the biodiversity impact assessment including Soils and Geology (8), Hydrogeology (9) Hydrology (10) Landscape (11) Air quality and climate (13) and the chapter on Interactions and Cumulative Impacts (17). Chapter 19 includes mitigation and monitoring for Biodiversity and a detailed Environmental Operating Plan (EOP) has been prepared and included in Appendix 4.1 of Volume 4A of the EIAR.

1.1.3. A Natura Impact Statement (NIS) has been prepared to inform Appropriate Assessment under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC), which assesses the implications of the proposed development on the integrity of European Sites designated Special Areas of Conservation (SAC) and Special Protection Areas (SPA) in view of the sites conservation objectives. It comprises two volumes including Volume 1 (Main Text) and Volume 2 (Figure). While there are overlaps between the Biodiversity assessment and the Appropriate Assessment, they are considered separately in view of the different tests required.

1.1.4. Further information was submitted by the applicant (30th September 2020) in response to a request from An Bord Pleanála. This included a NIS addendum which updated information on the presence of Sea Lamprey in the River Maigue and

updated mitigation measures required. An extended period of pre-construction monitoring of watercourses was also submitted as part of the further information submitted.

1.1.5. At the oral hearing, the principal Ecologists involved in the preparation of the EIAR and NIS presented briefs of evidence summarising the main biodiversity issues associated with the proposed road development and also addressed submissions received at that time.

1.1.6. This report and assessment have been prepared by Dr Maeve Flynn MCIEEM, Inspectorate Ecologist, providing expert support to the case inspector and to inform the EIA process for the Board. The assessment comprises an examination and evaluation of the information prepared and submitted by the applicant as part of the EIA process, including the EIAR, additional information supplied related to Biodiversity, expert witness statements and clarifications at the oral hearing. The assessment considers both direct and indirect effects, with particular attention to species and habitats protected under the Habitats and Birds Directives. The assessment takes account of submissions related to biodiversity and has been undertaken in line with the *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*[1], (DHPLG, 2018) and CIEEM *Ecological Impact Assessment Checklist*[2] as relevant to Irish legislation and guidance.

1.1.7. I have also had regard to the assessments carried out by Mr. Jer Keohane, external consultant for the Board with regard to soils and geology, hydrogeology and hydrology where these topics interact with ecological receptors, including sites designated for nature conservation.

1.1.8. As part of the assessment, I undertook a site visit of the area on 7th and 8th September 2020. I was also in attendance at the Oral hearing (conducted remotely) for both module 1 of the Approval Application (commenced 8th February 2021) and module 2 Approval for the road schemes under Section 49, both under the 1993 Roads Act, as amended.

[1] Department of Housing, Planning and Local Government (2018). Guidelines for Planning Authorities and An Bord Pleanála on carrying out environmental Impact Assessment
[2] Chartered Institute of Ecology and Environmental Management (CIEEM) 2019. Ecological Impact Assessment (EcIA) Checklist: https://cieem.net/wp-content/uploads/2019/11/EcIA-Checklist.pdf

1.1.9. This assessment is made in context of the declared National Climate and Biodiversity Emergency (Irish Government, May 2019), the requirements of the EIA Directive (Directive 2014/52/EU amending the EIA Directive 2011/92/EU) as it relates to avoiding or minimising significant effects on biodiversity and also the National Biodiversity Action Plan 2017-2021. The assessment takes account of the measures proposed to avoid, prevent, reduce and, where possible, offset any significant adverse effects on biodiversity, in particular species and habitats protected under the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC).

1.2. General Description of the Proposed Road Development

1.2.1. A full and detailed description of the proposed road development (PRD) is provided in Chapter 4 of the EIAR and in the Inspectors Report. The PRD is 35km comprising 15.6km of Type 2 Dual Carriageway from Foynes to Rathkeale, 1.9km of single carriageway link road from Ballyclogh towards Askeaton, 17.5km of dual carriageway M21 Motorway from Rathkeale to Attyflin, of which 14km is new build (and the remainder of which is improvement of existing N21 to Motorway standard). The PRD also includes a new clear span bridge over the River Maigue at Adare. The final route design of November 2018 was informed by constraints study, route selection and design refinement in line with the TII Guidance *Environmental Impact Assessment of National Road Schemes – A Practical Guide* (NRA,2008). Construction compounds and haul routes have been identified and assessed as part of the overall PRD.

1.2.2. In addition to the bridge crossing of the River Maigue, there are four other major river bridges proposed over the Robertstown, Deel and Greanagh (two crossings) Rivers and a further 16 river/ stream bridges including crossings of the Ahacronane and Clonshire Rivers. The PRD includes for 16 overbridges and underbridges with 22 underpasses incorporated into the scheme. Some of these underpasses are designed specifically for wildlife passage and others serve multiple purposes.

1.2.3. The PRD traverses 35km of countryside, primarily agricultural in nature with areas of intervening natural and semi-natural habitats. The major bridge crossing over the River Maigue is within the Lower River Shannon SAC and is the only area of direct impact on European Site, part of the Natura 2000 network of sites. All watercourses

impacted by the PRD are within the catchment of the SAC. The River Shannon and river Fergus Estuaries SPA is also within the zone of influence of the PRD.

1.2.4. In developing the road alignment through the constraints and route selection process, sensitive ecological sites between Limerick and Foynes were taken into consideration including avoidance of direct impacts on the extensive Askeaton Fen Complex SAC, Curraghchase woods SAC and Barrigone SAC.

1.3. Submissions

Statutory submissions

1.3.1. **Inland Fisheries Ireland (IFI, ENV-15)** made a detailed submission (14.02.2020) including the requirements and obligations under the Water Framework Directive whereby all necessary measures to prevent the degradation of the status of all surface waters must be considered in the approval of the road scheme. The submission emphasised the need for the protection of the fishery resource and all associated riparian habitats with particular reference to the Lower River Shannon SAC and the importance of the River Maigue for protected aquatic species including salmonids, lamprey species, European Eel and White Clawed Crayfish. IFI confirmed the presence of suitable (fish) spawning and nursery habitat within the development footprint. The submission also included confirmation of records of **sea lamprey** in the River Maigue as far upstream as Adare and requested that the applicant include this species in the detailed assessment as part of the NIS as it was unclear in the EIAR and NIS as to whether the species occurred in the Maigue. The importance of the River Maigue for European Eel was also emphasised. The use of temporary and any permanent culverts must facilitate fish passage and specifications for culvert design provided. The submission also provides specifications for management of silt at watercourses with monitoring required to ensure that any discharge to surface waters has suspended solid concentrations of no more than 25mg/l.

1.3.2. Recommendations on appropriate mitigation measures were provided including the adherence to standard IFI Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI 2016) and Biosecurity protocol for field survey work (IFI 2010). The submission included a request that pre-works water quality monitoring be undertaken over a period 12 months and not six as detailed by the

Applicant. The timing for any instream works is strictly July to September and IFI require consultation on the final CEMP, EOP and any specific works methods statements.

IFI Submission on Further Information (Dec 2020)

1.3.3. Submission FI-5 by **IFI** acknowledged the Applicants response in relation the presence of Sea Lamprey within the River Maigue system and the revised surface water quality monitoring programme. At the oral hearing, IFI stated that they were satisfied by the response and requested an additional provision that a soft start/ ramp up procedure be employed during any piling activities at the River Maigue bridge crossing to allow fish to move out of direct area of works.

1.3.4. An Taisce made a detailed submission as part of the consultation phase (ENV-3), further information (FI-1) and a further detailed submission at the Oral Hearing. Reference was made to biodiversity loss and the biodiversity crisis in the context of the IPBES (2019) report on Biodiversity[3] and the need for a robust assessment under the provisions of the Habitat Directive.

Observations (public)

1.3.5. There were a number of written submissions and observations from the public specific to biodiversity. Further observations/submissions were made in this regard during the oral hearing. Submissions and observations of relevance to biodiversity have been taken into account in my overall assessment and include the following:

- General statements on incomplete information in the EIAR and NIS
- Loss of trees and hedgerows and effects on native wildlife
- Loss of wetland habitats and impacts on watercourses
- Fragmentation of habitats and the barrier effect for flora and fauna
- Use of native trees and wildflower seed in landscape and allowing natural regeneration where possible

[3] IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673

- Impacts on Badgers
- Impacts on Lesser horseshoe bat population
- Concerns relating to pollution of local streams and rivers
- Lack of information on Invasive alien plant species including Japanese knotweed.
- Timing and adequacy of ecological surveys
- Adequacy of survey for protected species (including freshwater pearl mussel, White clawed crayfish, smooth newt)
- Specific concerns at discrete locations including River Deel, Doohyle Lough, Blossomhill
- Impacts on Lower River Shannon SAC- location of road bridge on River Maigue
- Impacts on qualifying interest species of Lower River Shannon SAC, including Sea lamprey, River lamprey and Brook lamprey, white clawed crayfish, Atlantic Salmon and Otter.
- Impacts on European Eel
- Concerns regarding adequateness of mitigation measures and proposals for monitoring

1.4. Competent Experts and Technical content

1.4.1. Information on the individual specialists involved in the biodiversity assessment and its constitutive surveys are detailed in Appendix 1.1 EIAR Study Team and were reconfirmed at the oral hearing. Specialists in a number of ecological fields were appointed by the applicant to undertake specific scientific assessments and provide mitigation measures for fauna groups including bat species, breeding and wintering and birds including Barn Owl, and Whorl snails (*Vertigo* species).

1.4.2. I consider the technical content of the biodiversity chapter (and associated appendices) and ecological impact assessment prepared by the by ROD-AECOM appointed specialists adequate to undertake a full assessment of the direct and indirect effects of the proposed development.

1.4.3. The scope, structure and content of the biodiversity assessment including ecological evaluation and impact assessment methodology is in accordance with published good practice including the following:

- Assessment of Ecological Impacts on National Road Schemes Rev 2 (TII/NRA, 2009),
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM 2016) and
- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (*draft* EPA,2017)

1.4.4. Ecological survey methods for habitats, flora and fauna are clearly described and are in accordance with best practice and data presented is up to date. Methodologies followed industry specific guidelines including Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (2009) and habitat / species specific guidance as relevant. Industry specific guidance developed by TII for mitigating effects of national road schemes on biodiversity including bats, badgers, otters and management of noxious weeds (page 7/4 EIAR) have been integrated into the overall assessment.

1.4.5. **Consultations** undertaken with statutory and non-statutory nature conservation organisations are detailed. The applicant provided evidence of significant engagement with staff from the National Parks and Wildlife Service in the course of the development of the preferred route, the planning of ecological survey and in the application for derogation licences required for survey of protected species and mitigation measures. There was also engagement with Inland Fisheries Ireland and the Maigue Rivers Trust. Consultation with the Vincent Wildlife Trust was undertaken in relation to Lesser horseshoe bats and with Birdwatch Ireland in relation to Barn Owl.

1.4.6. The **adequateness of surveys and methodologies** was raised in a number of submissions. Issues raised in relation to specific species are dealt with in the assessment below. However, overall, I am satisfied that in general the applicant followed best practice in defining the scope and survey requirements and in the methodologies employed.

1.5. The Receiving Environment

General overview of the receiving environment

1.5.1. Habitats throughout the area affected by the PRD have been characterised using the standard Heritage Council guidance (Fossitt, 2000) and habitat mapping of the entire route is presented in Figures 7.2 to 7.24 of Vol 3 of the EIAR.

1.5.2. Grassland habitats dominate with dry calcareous grasslands, typical of the underlying limestone geology, present where less intensive agricultural practices occur. Areas of wet grassland and alkaline fen occur in low lying areas, particularly section C, below the Rathkeale junction. Areas of mixed woodland and scrub occur throughout the PRD area, particularly along mature hedge banks, along railway embankments and riparian corridors.

1.5.3. Watercourses within the zone of influence of the PRD run primarily in a northern direction to the River Shannon Estuary and include the River Deel and the River Maigue. The River Maigue is influenced by estuarine conditions as far as Adare.

1.5.4. Nature Conservation Sites, Habitats and Species

1.5.5. All **sites designated for nature conservation** including SAC, SPA, and proposed Natural Heritage Areas within a wide zone of possible influence (15km) are identified by the Applicant.

1.5.6. The PRD involves one significant bridge crossing of the River Maigue which is within the Lower River Shannon SAC and all watercourses impacted by the road scheme are connected to the SAC.

1.5.7. The qualifying interests for the Lower River Shannon SAC comprise a large number of habitats and species including estuaries and mudflats, alluvial forests, Atlantic Salmon, Lamprey species and European Otter. A full list of the qualifying interests of the site is presented in EIAR Table 7.3 and a summary of those present within the area affected by the PRD and wider possible zone of influence is presented below. Three plant species listed in the Flora Protection Order (Triangular Club-rush, Opposite-leaved Pondweed and Meadow Barley) are also recorded from the River Maigue estuary. Specific flora surveys (releves) were conducted under license at the River Maigue crossing point for these species.

1.5.8. The Shannon and Fergus Estuaries SPA overlaps to a large extent with the main estuarine area of the SAC and therefore is within a zone of influence of the PRD. The most western part of the PRD is within close proximity to an estuarine area of importance to wintering birds.

1.5.9. Other European Sites within the area but not directly impacted include the woodland complex of Curraghchase Woods SAC which supports a population of Lesser Horseshoe Bat (Annex II, IV species), Askeaton Fen Complex and Barrigone SAC.

1.5.10. Proposed NHAs within the study area but not directly impacted include the Adare Woods pNHA) which occurs as six separate blocks of woodland to the east and west of Adare village, Inner Shannon Estuary - South pNHA (contained within the boundaries of the Lower River Shannon SAC), Dromore and Bleach Loughs pNHA, Loughmore Common Turlough pNHA, Ballinvirrick Marsh pNHA, Cappagh Fen pNHA, Ballymorrisheen Marsh pNHA and Gorteennamrock Fen pNHA, of which the latter four sites are all part of the Askeaton Fen Complex SAC. A summary of these sites is presented in Table 1 below.

Table 1: Summary of designated sites for nature conservation within a possible zone of influence of the PRD.

Site Name (code)	**List of qualifying interests within zone of influence of the PRD (i.e. <u>not</u> full list- see Appropriate Assessment for SAC and SPA sites)** * Priority habitat	**Connections with PRD**
Lower River Shannon SAC [002165] Also Inner Shannon Estuary South pNHA [000435]	Estuaries [1130] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mudflats and sandflats not covered by seawater at low tide [1140**]** Water courses of plain to montane levels with the *Ranunculion*	River Maigue bridge crossing within the SAC and wider hydrological/ecological connections with all watercourses crossed by the proposed road

	fluitantis and *Callitricho-Batrachion* vegetation [3260] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] Sea Lamprey (*Petromyzon marinus*) [1095] River Lamprey (*Lampetra fluviatilis*) [1099] Atlantic Salmon (*Salmo salar*) [1106] European Otter (*Lutra lutra*) [1355	
River Shannon and River Fergus Estuaries SPA [004077]	**Wintering waterbirds including** Cormorant, Whooper Swan, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed, Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Black-headed Gull Wetlands and Waterbirds [A999]	Within close proximity at western extent of scheme (200m) and hydrological connections throughout the wider area. Possible ex-situ sites for SCI species **Whooper Swan** in proximity to the PRD
Curraghchase Woods SAC [000174]	Lesser Horseshoe Bat (*Rhinolophus hipposideros*) [1303]	Possible habitat connections with linear habitats in the wider area (outside of SAC) affected by the proposed road

Askeaton Fens Complex SAC [002279] Also includes pNHA sites: Ballinvirrick marsh [001427], Cappagh Fen[001429], Ballymorrisheen Marsh [001425], Gorteennamrock Fen[001433]	*Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]	Possible hydrological/ hydrogeological connections
Barrigone SAC [000432]	*Juniperus communis* formations on heaths or calcareous grasslands Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) Limestone pavements Marsh Fritillary (E*uphydryas aurinia*)	Within 0.5km of PRD No connections identified
Adare Woods [00429]	Series of woodland blocks around Adare Village	Within 1km, no connections identified
Dromore and Bleach Loughs [001030]	Two freshwater lakes and wetland habitat: North of Kildimo	6.5km, no connections
Loughmore Common Turlough [000438]	Turlough and wetlands habitats: south of Mungret	5km no connections

Key ecological Sites

1.5.11. The Ecological Receptor evaluation system employed follows the TII Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009). This is a site-based assessment where an ecological site may comprise of a mosaic of habitat types that together contribute to the overall ecological significance of site. A total of 27 separate sites were initially identified as potential Key Ecological Receptors (KERs) along the length of the PRD. All KERs are described in section 7.3.6 of the EIAR (see Table 7.5 for summary) and presented on figures 7.25 to 7.46. These sites were subject to detailed survey to assess their habitat composition and biota and to determine their ecological value in accordance with criteria detailed in the TII Guidelines. Key habitats that increase the ecological importance or value of a site include Annex I listed habitats such as alluvial woodland (91E0) and areas of rich fen habitat that conform to alkaline fen (7230) and/or calcareous fens with *Cladium nariscus* and species of the *Caricion davallinanae*, a priority habitat (7210). Areas of woodland habitat occur in mosaics with other habitats including along riparian banks and along railway embankments. Semi natural grassland habitats also feature in the list of KERs.

1.5.12. Following detailed survey and evaluation, seven of the sites (KERs 1, 4, 6, 8, 12, 13 and 22) rated as being of Local Importance (Lower Value) were excluded from the final list of KERs, in accordance with the TII Guidelines. **The applicant has determined that the PRD will impact directly or indirectly upon 20 sites identified as KERs with a value of or greater than local importance. Of these, four are evaluated as being of international importance, one of National importance, one of County importance and 14 of Local Importance (Higher Value).**

Hedgerows and treelines

1.5.13. In the primarily agricultural landscape of relatively low biodiversity value, hedgerows and treelines are key habitats, both in terms of their own intrinsic composition and the faunal groups they support. The applicant acknowledges that they function as corridors for movement and connectivity within the landscape for all types of fauna and impacts on this network by road developments without appropriate mitigation can have profound implications for many species. A specific hedgerow survey is not

reported, however an estimated 23.3kms of hedgerow and 15.8km of treelines will be cleared to allow for the PRD.

Watercourses and protected aquatic species

1.5.14. EIAR Chapter 7, biodiversity, states that 20 watercourses are crossed by the PRD and a description of these is presented in EIAR 7.3.8 and summarised in Tables 7.7 and 7.8. (see also Hydrology Chapter 10 and assessment). I note that Chapter 10, Hydrology lists 21 watercourse crossings, however the difference can be explained in the way Chapter 7 counted waterbodies as opposed to actual crossing points. Many of the watercourses are also included in the KERs. Water quality in the receiving watercourses is rated as Q3-4 which is moderate water quality, showing some evidence of nutrient enrichment and/or sediment loads.

1.5.15. The most significant river crossing is of the River Maigue, within the Lower River Shannon SAC which is described as being estuarine at this location however, freshwater habitats of freshwater swamp and reed swamp occur on the lower banks / below flood embankments. The river is of importance for Atlantic Salmon, trout and Sea, River and Brook Lamprey species and European Eel, however the applicant does not consider the habitat at this location suitable for spawning. Subsequent to information submitted by IFI and following a request for further information by the Board, the NIS was updated by way of an addendum to include for and assess impacts on Sea Lamprey, a species for which the IFI have records in this stretch of the River Maigue. I note that the EIAR does identify the 'potential' for this species. The presence of other protected species including White clawed Crayfish, Otter (no holts recorded) and Kingfisher add to the ecological importance of this watercourse.

1.5.16. Other rivers of significance (National to County importance) include the River Deel, the Greenagh River, Clonshire River, and Ahacronane River, which all support trout and likely support brook lamprey, minnow, eel, three spined stickleback. The occurrence of Atlantic Salmon (various age groups) in the wider catchment including these rivers is not confirmed by the applicant. Specific instream surveys for fish, lamprey or white-clawed crayfish were not considered necessary (See section 1.8.2 of this report).

Species

1.5.17. Mammals

1.5.18. Dedicated mammal surveys were undertaken (Nov 2016-April 2017) with emphasis on identifying Otter holts and Badger setts and any signs of these species. These are key species for consideration in the assessment due to their protected status and ecological requirements which may make them vulnerable to road developments. Signs of other mammals including Deer, Red Squirred, Pine Martin, Hedgehog and Irish Hare were also recorded.

1.5.19. European Otter (Lutra lutra) listed on Annex II and IV of the Habitats Directive was found to be widespread in the area along watercourses including the River Maigue, Deel, Clonshire, Greanagh and Ahacronane rivers and likely to be widespread on other rivers and streams with a high probability of movement along drainage channels between areas of wetlands and watercourses. The surveys did not find evidence of otter holts within the PRD alignment or within circa 500m of river crossing points.

1.5.20. Five active badger setts were recorded within footprint / boundary of CPO line, none of which were considered main breeding sets.

1.5.21. Bats

1.5.22. Bat activity along the PRD was determined over the course of a comprehensive four-season bat survey employing various survey methods including direct searching of buildings and structures, night-time bat survey with bat detector and passive static bat surveys. There are no known major hibernation sites with large numbers of bats along or within several kilometres of the PRD and the four-season bat surveys did not identify any new major roosts. Evidence of bat roosts were found at three buildings/ structures and two potential roost sites identified. Surveys of trees identified 103 *potential* bat roosts.

1.5.23. All nine bat species that are resident to Ireland were recorded in the wider study area (all are Habitats Directive Annex IV listed species, requiring a system of strict protection). Of these, Lesser Horseshoe Bat (LHB) which is listed on Annex II and IV of the Habitats Directive is the most notable from a nature conservation perspective and it is a qualifying interest species of the Curraghchase Woods SAC. The static passive survey undertaken showed that LHB occur widely across the area

that would be included in the PRD, closely associated with the disused railway line, rivers and woodlands. One of the main issues for LHB commuting in the landscape is the need for continuous linear habitats to fly along (i.e. flight corridors). Section 5.3 of the four-season Bat Survey Report lists those areas considered to be important for commuting bats, including LHB and Section 5.4 lists those areas considered important for foraging bats.

Bat species recorded in wider PRD study area:

- Lesser horseshoe bat: widespread in low numbers
- Leisler's bat: widespread
- Brown long eared bat: occasionally recorded but can be difficult to detect
- Natterer's Bat: recorded in low numbers
- Nathusius' pipistrelle: only one record
- Whiskered Bats: recorded in low numbers
- Daubenton's Bat: recorded along watercourses
- Common pipistrelle: most commonly recorded
- Soprano pipistrelle: second most commonly recorded

1.5.24. Invertebrates

1.5.25. Desk studies and field surveys were focused on invertebrate species of conservation significance including those species listed on Annex II and IV of the Habitats Directive.

1.5.26. The watercourses within the study area provide suitable conditions for White Clawed Crayfish which require alkaline influenced watercourses. There are records of this species from many of the watercourses crossed by the PRD but incidences of crayfish plague (*aphanomycosis*) have significantly affected their distribution throughout the catchment. During field surveys, white-clawed crayfish were recorded in the Doohyle Stream and are likely to occur in the River Deel.

1.5.27. There are records of both Narrow-mouthed Whorl Snail (*Vertigo angustior*) and Desmoulin's whorl Snail (*Vertigo moulinsiana*) from Curraghchase SAC (NPWS 2005). While there were no records of Desmoulin's snail from the wider area,

surveys of potentially suitable Fen habitat were undertaken by a specialist in the identification of these species (full survey EIAR Appendix 7.4, volume 4A). Desmoulin's snail was recorded at three Fen sites, Ballyellinan (KER7), Lismakeery (KER 11) and Blossomhill (KER21). These are new records of this Annex II species in this part of County Limerick.

1.5.28. Existing records for the Marsh Fritillary butterfly (*Euphydrya aurinia*) within the wider study area prompted survey at habitats where suitable food plant Devils-bit Scabious (Succia pratensis) was recorded. This Annex II listed species is a qualifying interest feature of Barrigone SAC, which is unaffected by the PRD. The SAC population could potentially be a source population for the wider area. An area of wet grassland within the key ecological receptor site at Kyletaun (KER20) supports Devils-bit Scabious which is the main plant food for the caterpillar stage of the Marsh Fritillary. KER20 was surveyed for larval webs but none were recorded. The applicant asserts that while the species composition is potentially suitable, the structure of the habitat and current management is not suitable for the species.

1.5.29. Birds

1.5.30. The identification of key bird species of particular conservation importance or at risk from effects of the PRD was established by the applicant through a combination of desk studies, dedicated surveys methods, records of birds identified in the course of multidisciplinary surveys.

1.5.31. **Kingfisher** (Annex I of Birds Directive and Amber listed on Birds of Conservation Concern-BoCCI) were recorded (in flight) along the Greanagh River and are expected to occur along most watercourses within the footprint of the PRD. Riverbanks were examined for potential nest sites but only one Kingfisher nest site was recorded on affected watercourses, within 400m of the proposed River Deel bridge crossing.

1.5.32. **Barn Owl** (BoCCI Red list) has suffered dramatic declines in breeding numbers over the past 40 years. I note that this species is susceptible to mortality along roads and evidence from a number of road schemes in the southwest of the country show high numbers of mortalities. A desk study of know records of Barn Owl was used to inform further detailed survey for this species. Breeding was not confirmed at any know/ potential sites within a 2km zone of the PRD. However, signs of Barn Owl

(pellets, feathers, droppings) were recorded at two locations near Clonshire Beg within 1km of the PRD confirming their presence in the wider area. (Barn Owl report: EIAR Appendix 7.3 Vol 4A).

1.5.33. **Whooper Swan** (Annex I and BoCCI Amber List) were identified as a species requiring survey and assessment for potential effects due to their widespread foraging dispersal during the wintering period in the wider area. A special conservation interest species of the River Shannon and River Fergus Estuaries SPA, their nearest known foraging site to the PRD is at Cloonanna, 3km. A series of winter counts from known foraging sites in the vicinity of the PRD were undertaken by an ornithologist (Gerry Murphy, chairperson of Irish Whooper Swan Study Group) and a summary of results is presented in EIAR Ch.7 7/61. (Note, no separate report on this study is included in the EIAR). There was no evidence of Whooper Swans using areas close to the PRD for foraging. Doohyle Lough (within 800m of PRD) is occasionally used as a night-time roost.

1.5.34. **The River Shannon and River Fergus Estuaries SPA** is of international importance for Wintering waterbirds, regularly supporting in excess of 50,000 wintering waterfowl. The only area in the vicinity of the PRD that supports significant numbers of wintering waterbirds is at Churchfield (Robertstown) Estuary KER2 which is part of the wider SPA. The applicant has relied on survey data collected between November 2015 and March 2017 for the EIAR prepared for the development of the Shannon-Foynes Port. Peak numbers recorded over that period showed a maximum of 2,150 of a variety of wintering birds including Golden Plover, Dunlin, Lapwing, Widgeon, Real and Black-headed Gull. The limited extent of intertidal muds at the area of the proposed River Maigue bridge crossing supports low numbers of wintering waterbirds.

1.5.35. Dedicated **breeding bird** surveys were not undertaken and incidental recordings of countryside birds and waterbirds along watercourses were recorded during multidisciplinary surveys. There was no evidence of breeding waders in the KERs supporting fen habitat. Similarly, raptors observed during field surveys were recorded, however with the exception of Barn Owl, they are not considered a key ecological consideration or at any significant risk from the PRD.

1.5.36. Invasive species

1.5.37. The presence of invasive plant species listed on the Third Schedule of the Habitat Regulations (2011) were checked for and recorded during all field surveys undertaken. At the River Maigue embankments in the vicinity of the proposed crossing, both Giant Hogweed (*Heraculeum mantegazzianum*) and floating Fairy Fern (*Azolla filiculoides*) were recorded. Himalayan Balsam (*Impatiens glandulifera*) was recorded along the river Deel, the Cloghatrida Steram and at KER 17 (Barringarrane).

1.6. Applicants approach to biodiversity (Ecological impact assessment)

1.6.1. A description of the predicted impacts for biodiversity is provided in section 7.4 of the EIAR, followed by section 7.5 mitigation measures to ameliorate impacts and any residual impacts are detailed in section 7.6. Figures illustrating the location of mitigation measures are presented in EIAR Appendices, Vol 3 - 7.25-7.47. The Environmental Operating Plan (EOP) provides greater level of detail on the mitigation measures to be applied and that can be easily transferred into the eventual contractor management plans. For example, Chapter 6 of the EOP provides a very detailed description of erosion and sediment control and specific detail on measures to protect individual watercourse crossings and sensitive groundwater receptors.

1.6.2. The following is a summary of predicted direct and indirect impacts on biodiversity during construction and operation of the PRD and mitigation measures designed to reduce those impacts. I have taken the impact predictions from the Applicants descriptions in EIAR section 7.4. Mitigation measures are summarised from section 7.5 (see also Chapter 19 for mitigation measures and the Environmental Operating Plan). Residual impacts are taken from EIAR sections 7.5 and 7.6.

Designated Sites

1.6.3. The implications of the PRD in terms of a specific assessment against the conservation objectives of the European Sites is considered under a sperate Appropriate Assessment, informed by the NIS.

1.6.4. The NIS contains detailed information and assessment of the PRD on the qualifying interest species and habitats of the European Sites screened in for the need for

Appropriate Assessment in view of their conservation objectives. Potential for adverse effects on selected habitats, water quality and protected aquatic species associated with the Lower River Shannon SAC, wintering waterbirds and their habitats associated with the River Shannon and Fergus Estuaries SPA, and the detailed assessment of possible ecological connections with sites in the wider area are key considerations. The conclusion of the Appropriate Assessment is that with the application of proven mitigation measures, adverse effects (alone or in combination with other plans and projects) on the integrity of those sites in view of their conservation objectives can be excluded. No reasonable doubt remains as to the absence of such effects. This in line with the findings of the applicants NIS which concludes that, in view of best scientific knowledge and on the basis of objective information, the proposed road development either individually or in combination with other plans or projects, will not result in adverse effects any European sites.

1.6.5. EIAR section 7.4.1 and 7.4.2 examines construction and operational impacts at the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. The summary in Tables 2 and 3 below is more general, encompassing the wider aspects of the sites affected.

Table 2: Summary of predicted construction and operational and impacts on the Lower River Shannon SAC, summary of proposed mitigation and any residual impacts.

Lower River Shannon SAC			
Construction impacts	**Operational impacts**	**Mitigation**	**Residual impact**
Direct impacts on QI habitats avoided in design of clear span bridge. Temporary supports inside flood embankments during construction	Localised shading of habitats (non-QI) under bridge deck: Not significant	Avoidance measures: location of piers etc. Construction method statement and erosion and sediment control measures- see	Negligible

– sheet piling to be installed Temporary disturbance to vegetation and topsoil within the SAC on the riverbanks outside of the tidal mudflats, but this will have no impact on the integrity of the protected habitats		EOP, supervised by site ecologist. Site boundary delineated, retained interests to be protected on both sides of the alignment during construction. 2 bat tubes to be installed on bridge	
Direct and indirect ingress of construction related pollutants at various points along the PRD: **short-term moderate to significant negative impacts**	surface water run-off, accidental spillages: Significance dependant on event- *worst case :***long term moderate negative**	Detailed measures set out for pollution prevention including: uction method statement and erosion and sediment control measures- see EOP bunds to contain surface water and silt trap to treat water- will not exceed 25mg/l upon release to river. t response plan established for any pollution incidents on site	Negligible

		Run off: spill containment and Hydrocarbon interceptors (operation) Sustainable drainage system to be installed (operation)	
Disturbance of otter- short term, localised not significant No impediment to otter movement, no permanent loss of habitat	Mortality of otter, decline in prey due to deterioration of water quality	Pre-construction surveys (where 36 months elapse from most recent survey) Mammal passage retained Pollution prevention measures Mammal resistant fencing No lighting over bridge to reduce disturbance	Negligible
Fish and lamprey species may be affected by decreased water quality during construction Disturbance for resident and	No impediment to fish movement- Water quality during operation Disturbance caused by lighting	See water quality measures (EIAR 7.3) Soft start / ramp up when inserting sheet piling/ piers during construction No lighting on bridge	Negligible

migrating fish species. Noise and lighting during construction			
Spreading of invasive species		Biosecurity protocol developed and included in EOP	Imperceptible
	Air quality and Nitrogen deposition (NOx): Negative, long term (worst case) but not considered significant in view of habitats present	None	Not significant

Table 3: Summary of predicted construction and operational and impacts on the River Shannon and River Fergus Estuaries SPA: summary of proposed mitigation and any residual impacts.

River Shannon and River Fergus Estuaries SPA			
Construction impacts	**Operational impact**	**Mitigation**	**Residual impact**
Direct and indirect ingress of construction related pollutants at various points along the PRD: **temporary moderate to**	Polluted runoff, accidental spillages: **long term moderate negative**	Water quality protection measures as detailed Chapter 7, chapter 19 and EOP	Negligible

significant negative impacts			
Low risk of disturbance of wintering birds at Churchfield Estuary (KER2): short term slight impact	Risk of disturbance impacts to ex situ feeding sites of whooper swan excluded	No specific measures Distance and intervening habitats will buffer potential impacts-	Negligible
	Air quality and Nitrogen deposition (NOx): *Long term, positive, not significant*	None	Negligible

Other Designated Sites

1.6.7. The potential for direct and indirect effects on other SAC sites including **Askeaton Fen complex SAC and Barrigone SAC** have been ruled out. Hydrological assessment of possible connections to the Askeaton Fen Complex demonstrated that no drawdown or alteration of the existing hydrological regime will occur. No direct ecological or hydrological pathways connect the Barrigone SAC with the PRD and despite its proximity to the PRD (within 05.km) no operational effects are considered likely.

1.6.8. **Curraghchase Woods SAC** is 3.6kms north of the PRD and is outside the range of any direct impacts from the PRD. Host to an internationally important winter and summer roosts for Lesser Horseshoe bats, the requirement to maintain connectivity of suitable habitat within the wider area is of importance. While research shows that the species normally forage within 2.5kms of their roosts, they are capable of undertaking longer movements therefore there is the possibility of indirect impacts both at construction and operation of the PRD on commuting bats linked to the SAC

population. In addition, maintaining connectivity between the SAC population and LHB in the wider area is important to maintain the population in County Limerick. This is illustrated by a map prepared by the Vincent Wildlife Trust of potentially important flightpaths for LHBs in the Limerick landscape, linking the Curraghchase SAC to the south of the county (Figure 21 four season Bat Report). Ensuring unimpeded movement of LHB across the road alignment through the provision of underpasses and reconnecting linear habitat features of importance for bats for commuting and foraging will reduce potential impacts to non -significant levels for the SAC and wider LHB population.

Protected Plant Species

1.6.9. Three protected plant species for which there are historical records and were either recorded or have a probability of occurring in suitable habitat are detailed in Table 4.

Table 4: Summary of predicted impacts, proposed mitigation measures and any residual impacts on protected plant species.

Protected plant species	**Predicted impact**	**Mitigation**	**Residual impact**
Triangular Club-rush (*Schoneoplectus triqueter*) (River Maigue)	Potential disturbance during construction. Indirect effect from shading of bridge deck- not considered significant – no change in distribution or area	River banks at River Maigue not directly affected – temporary sheet piling set back from river banks Site boundary and working areas clearly defined. Supervision by ecologist	Imperceptible
Opposite leaved pondweed (*Groenlandia densa*)	Indirect effect from shading of bridge deck- not considered	No specific measures- see above	None

(River Maigue)	significant – no change in habitat distribution or area.		
Hairy violet (*Viola hirta*) (calcareous grassland: Robertstown, Craggs, Rincuilla)	Not recorded- No impact	None	None

Key Ecological receptors (KERs)

1.6.10. Construction impacts on key ecological receptors include direct habitat loss and habitat fragmentation associated with clearance and loss of vegetation for construction of the road including accommodation works and drainage. The applicant has endeavoured to minimise land take where possible, however I note that the proposed road development will result in direct habitat loss and habitat fragmentation at 16 of the 20 KERs.

1.6.11. A quantitative assessment of the extent of habitat that will be lost (in hectares or % of the overall scheme) is not presented in the impact assessment with the amount of habitat loss only provided for one site (KER 11, Lismakeery) where 0.5ha of fen habitat will be lost representing 20% of that site. Construction and operational impacts will also result in disturbance of fauna species present at those sites caused by loss of habitat and by increased human presence and activity during construction and noise during operation. Risks to habitats also arise from construction related pollutants including fuels, oils and lubricants and cementitious leachate. The generation of significant amounts of dust during construction can also have negative effects on vegetation. Groundwater dependant habitats can also be negatively affected where hydrological connections are altered.

1.6.12. A summary of predicted impacts is presented below (Table 5) with focus on sites of International and National importance.

Table 5: Summary of predicted impacts, proposed mitigation measures and any residual impacts on Key Ecological Receptors (KERs).

Key Ecological Receptors	**Predicted impact**	**Mitigation:** See EIAR 7.5.3 , EOP and schedule of commitments	**Residual impact**
International importance			
KER 2: lower River Shannon at Churchfield	Indirect impacts-water quality. **Temporary moderate to significant** during construction **Long term moderate negative** during operation	(see Table above for designated sites) Water pollution prevention measures	Imperceptible/negligible
KER 7 Ballyellinan (Annex I alkaline Fen)	**Permanent slight negative** (no habitat loss but sensitive to alteration of hydrology)	Embankment designed not to encroach on fen habitat	Temporary slight negative
KER 11 Lismakeery (Annex I alkaline Fen and *V. moulinsiana)*	**Permanent moderate negative** due to loss of habitat (20%) and	Maintenance of hydrological functioning under the road Inclusion of remaining area of	**Permanent moderate negative**

	fragmentation of site	fen habitat within curtilage of the PRD-	
KER 26 Lower River Shannon SAC at Islandea (Bridge crossing at river Maigue)	**Short term moderate – significant negative** impacts No direct impacts on QI features Long term moderate negative during operation	(see Table above for designated sites)- water quality protection measures, habitat exclusion zones, design of bridge crossing	Slight negative
National Importance			
KER 21 Blossomhill (mosaic of lake and fen habitat -Annex I)	**Permanent moderate negative** (slight negative if impacts confined to temporary)	Design to avoid hydrological impacts on site. Water pollution prevention measures	Slight negative
County Importance			
KER 5 Craggs (mosaic of alluvial woodland- Annex I)	**Permanent moderate negative** due to loss of habitat and dissection of the site- habitat fragmentation affecting fauna	Habitat protection of riparian habitat required. Water quality protection measures	**Permanent moderate negative**

Local Importance (Higher Value)			
KER 3 Robertstown, KER 9 Cloonreask, KER 14 Nanatinan, KER 15 Feeagh, KER 16 Graigenn, KER 17 Graigenn/Ballingarrane, KER 18 Ballingarrane, KER 19, Kyletaun, KER 20 Kyletaun, KER 24 Gortnagrour, KER25 Rower More	**Permanent moderate negative** due to loss of habitat and dissection of the site	Habitat exclusion zones to protect remaining habitat, retaining or creating continuity of habitat where possible and/or with mitigation planting	**Permanent moderate negative (n= 6 sites)** Slight negative (n= 5)
KER 10 Ballycullen, KER 23 Clonshire More, KER27 Gortaganniff	**Permanent slight negative** (due to habitat loss/dissection of site/ disturbance/ construction impacts	As above	Permanent slight negative

Impacts on other ecological sites

1.6.13. Seven ecological sites rated of local importance (lower value) will be impacted through habitat loss and fragmentation. The applicant concludes that mitigation measures comprised of habitat exclusion zones during construction and the eventual off-setting of habitat loss by landscaping will lessen the impact on these sites to non-significant levels: permanent slight negative.

1.6.14. The applicant estimates that 23.3km of hedgerows and 15.8km of treeline will be lost from the area taken up by the PRD. The significance of this loss of seminatural habitat and natural network of connectivity for flora and fauna is assessed by the applicant under the fauna assessment for birds and bats in particular. The overall impact of this loss is considered of moderate to significant negative for bats and slight negative for countryside birds with impacts reduced to non-significant levels through the application of landscaping measures.

Watercourses and aquatic species

1.6.15. The 20 watercourses crossed by the PRD, their associated riparian habitats and species are among the most significant ecological receptors to be affected by the PRD. In addition, as all watercourses are within the catchment of the Lower River Shannon SAC, cumulative effects on these watercourses could result in adverse effects on the downstream SAC receiving waters and habitats. The table below provides a summary of the direct and indirect impacts that could arise during the construction and operational phase of the PRD and the mitigation measures proposed to reduce such effects.

1.6.16. In the absence of mitigation measures, moderate to significant negative effects are likely. However, the avoidance of in-channel works and in stream structures is a key consideration wherever feasible to protect fisheries habitat. Clear span bridges are proposed for all major watercourse crossings with reduced need for riparian habitat clearance and the maintenance of mammal passage along all Rivers and streams. Culvert design ensures that all culverts are embedded and will maintain the natural channel gradient, stream width and substrate configuration and be of a minimum size of 900mm. Pollution prevention is the key approach to managing works at watercourse crossing points and during the operation of the PRD. Mitigation measures are clearly laid out in Chapters 7, 10 and 19. The Environmental Operating

Plan (EOP) details each water course crossing and the measures to be applied, ecological supervision and monitoring of same e.g., double silt fence, soil management, water quality monitoring etc. and the full implementation of TII and other industry specific guidance[4].

Where watercourses (minor) require realignment, the applicant states that they will tie in with existing upstream and downstream channels with landscaping measures to reinstate riparian type habitats. Stretches will be electro-fished to salvage fish and White-clawed Crayfish (under license).

Table 6: Summary of predicted impacts, proposed mitigation measures and any residual impacts on watercourses and aquatic species.

Summary of Impacts on Watercourses and aquatic species			
Construction impacts	**Operational impact**	**Mitigation** **See EIAR 7.5.3, EOP and Schedule of commitments**	**Residual impact**
Direct and indirect impacts on water quality due to ingress of construction related pollutants at various points along the PRD: **short term moderate to significant impacts**	Polluted runoff, accidental spillages: aerial N deposition Significance dependant on event but **moderate to significant effects could occur**	Water quality protection measures as detailed (EOP) Drainage design (EIAR Chapter 10 Hydrology): run off management including attenuation pones and spill containment facilities,	Negligible

[4] Guidelines for the crossing of watercourses during the construction of national road schemes (TII, 2006) and Control of water pollution from construction sites: guidance for consultants and contractors (SP156) CIRIA 2001) and Guidelines for the protection of fisheries during construction works (IFI, 2016)

		hydrocarbon interceptors at sensitive locations	
Temporary direct and indirect degradation of water quality from sediment run off, accidental spillage etc- downstream impacts on spawning habitats, instream aquatic fauna: fish species including Atlantic Salmon, white-clawed Crayfish and River and Brook lamprey and Sea Lamprey (Maigue)	Degradation of water quality from road run off and accidental spillage	As above Timing of works: confined to July to September Engagement with IFI	Negligible
Disturbance of protected aquatic species / obstructions to movements including otter, Atlantic salmon: lamprey species due to noise, lighting and vibration,	Disturbance/ obstruction of free movement of species Direct mortality	Site management and exclusion of retained habitats from works areas Retention of river bank habitat at clear span structures, culvert design – mammal ledge/ mammal culvert (otter)-	Imperceptible

		Mammal fencing Slow start/ramp up when piling activities occurring to allow fish species to move out of area	
Spreading of invasive species	Not specified	Invasive species and biosecurity measures detailed in EOP: TII guidelines on management of noxious weed and non-native plant species	Imperceptible
Modifications of channel morphology (culverting, channel realignment)	Shading of habitats-may result in localised changes in riparian vegetation	Avoidance of impacts on riparian habitats where ever possible and landscaping measures to reconnect habitats where feasible.	Moderate negative impact (worst case)
Moderate to significant negative effects		Adherence to all best practice methodologies as detailed and site-specific mitigation measures as detailed in EOP	**Imperceptible**

		and schedule of commitments	
		Monitoring: pre-construction mitigation over 12 months to and during construction monitoring	

Fauna

1.6.20. A summary of the potential significant impacts (direct and indirect) on fauna is presented below. Mitigation measures are summarised, and any residual effects identified. As with all other ecological aspects of the PRD, impact assessment and mitigation measures follow TII guidance including TII Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (2006a), TII Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (2006b), TII Guidelines for Crossing of Watercourses During the Construction of National Road Schemes (2005) and the Highways Agency Design Manual for Roads and Bridges (Highways Agency, 2001a and b).

1.6.21. Multiuse mitigation will be employed which utilises structures: culverts, agricultural underpasses and bridges, for wildlife passage and protection. It is stated that all measures will be in place in advance of the opening and operation of the PRD.

1.6.22. A summary of all mitigation measures for fauna is provided in tables 7.12a to 7.12d- see also figures 7.25-7.47. Landscaping measures are illustrated in Figures 11.1-11.24 (EIAR vol 3). Fish and other protected aquatic species are addressed in previous section.

Table 7: Summary of predicted impacts, proposed mitigation measures and any residual impacts on Fauna.

Summary of Impact on Fauna				
Fauna /group	**Construction impacts**	**Operational impact**	**Mitigation (summary)** **See EIAR 7.5.3, EOP and Schedule of commitments**	**Residual impact**
Otter	Short term Localised disturbance, displacement Water quality effects on prey abundance (no holts affected)	Risk of mortality Disturbance from noise, lights Interruption of movements, habitat fragmentation Water quality effects on prey abundance	Continued movement facilitated- retained riparian habitat/ culverts with ledges or mammal pass culverts, mammal fencing Water quality protection measures (EOP) Pre-construction surveys	Imperceptible
Badger	Direct impacts on 5 setts (no main setts) temporary disruption of territory, slight negative-	Risk of mortality, ongoing disturbance	Mitigation prior to and during construction: pre-construction survey, sett monitoring, sett protection, sett exclusion	Slight negative

	temporary- short term (setts require exclusion under license)		Mammal fencing, provision of mammal passage to allow movements and decrease habitat fragmentation post construction monitoring	
Bats (general)	Slight - moderate negative impact: Disturbance and Impacts on commuting and foraging bats: hedgerow and treeline loss. 3/10 buildings to be demolished have bat roosts: derogation licences attained 103 mature trees: possible	Moderate negative impact Loss and fragmentation of commuting and foraging habitats, reduced availably of roost sites Disturbance from lights	Full mitigation set out in four season bat report Pre-clearance survey Derogation licenses Sensitive tree felling- timing and approach Demolition plan for buildings and structures to be removed- timing, alterative roosts, surveys, supervision by bat expert	Slight negative

	bat roost affected		Provision of alterative roost sites Landscaping measures to reconnect linear features Underpass for bats Detailed lighting plan	
Lesser Horseshoe Bat (outside of SAC)	Loss and fragmentation of commuting habitat and connections in the wider countryside (flight corridors) Moderate negative	Fragmentation of commuting habitat along/ across prd Further isolation of Limerick population Moderate to significant negative	As above: Connection of linear features to proposed landscaping, facilitating movements and provision of underpasses	Slight negative
Birds (general)	Loss of nesting and foraging habitat, disturbance of breeding birds Impact level not specified	Permanent loss and fragmentation of nesting and foraging habitats Mortality of birds	Landscaping measures to provide alternative nesting and foraging habitat	Slight negative (reducing over time)

Barn Owl	Negligible: no direct impacts	Increased risk of mortality In absence of mitigation: 21 Barn Owls/yr over length of road (based on Tralee bypass): **permanent significant negative effect**	Specific measures: landscape design See **plate 7.15** reproduced below A 3m buffer of unsuitable foraging conditions in immediate vicinity of road- will discourage birds from foraging and decrease risk of collision of wake of HGV. Scrub band to form natural buffer	**Not quantified** ***Significantly reduced mortality compared to other road schemes in SW.***
Amphibians and reptiles	Direct impacts on ponds at Robertstown- potentially suitable for frogs and newts Slight negative	No negative impacts Attenuation ponds may provide additional breeding habitat	No specific measures	Imperceptible

Invertebrates *Vertigo moulinsiana*	Direct impacts- loss of habitat 20% at Lismakeery	Changes to hydrogeology of the site	Maintenance of hydrological conditions at sites. Retention of remaining habitat at Lismakeery	**Permanent moderate negative-** reduced to **slight negative** if additional Fen habitat acquired for protection of remaining fen habitat

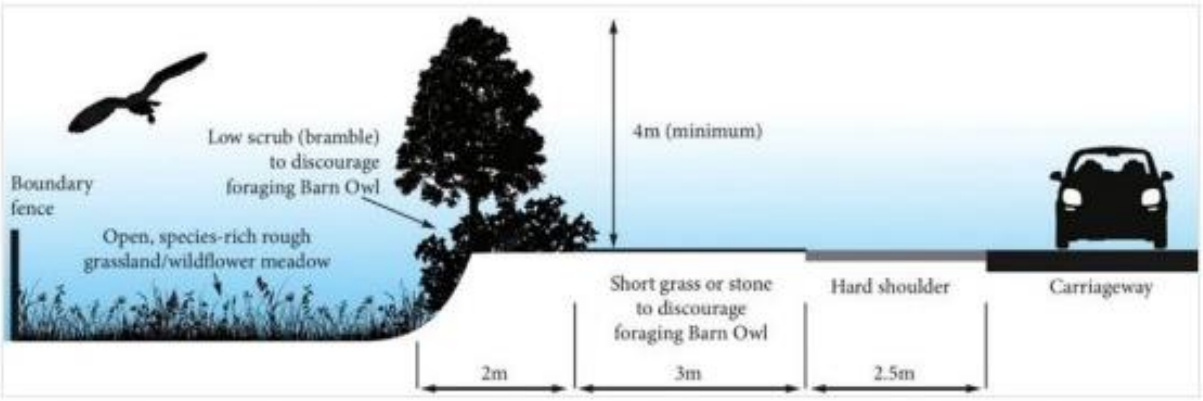

Plate 7.15 Schematic landscape design to reduce risk of Barn Owl traffic mortality.

Diagram from EIAR Plate 7.15 *Schematic landscape design to reduce risk of Barn Owl Traffic mortality*.

1.6.26. The risk of accidental transfer of non-native invasive species and diseases will be minimised by the implementation of measures that have been incorporated into the Environmental Operating Plan: EOP Section 9.

1.6.27. A detailed update of the schedule of commitments was supplied by the applicant at the oral hearing and commitments of particular relevance to biodiversity are repeated here for ease of reference for the Inspector and for the Board. These are additional commitments which, in addition to the Mitigation Measures document, comprise the

Schedule of Commitments (however, I note that many of these measures are in the original text of the EIAR e.g., culvert specifications).

Table 8: Updated schedule of commitments of relevance to biodiversity- from information submitted at the oral hearing.

OH.4	Water quality monitoring in the receiving watercourses listed in section 6.8.2 of the Environmental Operating Plan (Appendix 4.1 of the EIAR) shall entail 12 no. monthly samples to be taken prior to construction to establish baseline conditions. This testing shall include (but not be limited to) those parameters listed in Section 6.8.2 of the abovementioned plan.
OH.5	IFI will be consulted by the appointed contractor in relation to the final Environmental Operating Plan and specific works method statements for watercourse crossings.
OH.6	Culverts, whether they are temporary or permanent structures, will not pose a barrier to fish migration.
OH.7	All culverts will be embedded.
OH.8	Where culvert installation is agreed, maintain the natural channel gradient, stream width and substrate configuration and be of a minimum size of 900mm
OH.9	Culverts will be buried to a minimum of 300mm (preferably 500mm) below the stream bed at the natural gradient and sized to maintain the natural stream channel width.
OH.10	Box culverts should be embedded to a minimum of 500mm
OH.11	We confirm that the usable gradient range recommended for embedded pipe culverts is less than three percent (3%).
OH.12	Stone pitching or rock armour will be provided at the end of each culvert to prevent scour and provide for transition from the culvert to the realigned stream channel.

OH.13	Embedment of the culvert and back-filling will be done with clean gravel/cobble approach to establish fish passage.
OH.14	The detail of construction methods and any necessary habitat/fishery protection/enhancement works associated with culverts will be agreed in advance.
OH.15	A layer of stone of 40 to 50mm depth will be placed on the bed of any temporary stream alignment to prevent scour and silt loss.
OH.16	Both permanent and temporary river crossings will only be installed during the open season for fisheries works, during the months of July to September inclusive.
OH.17	Silt traps will be constructed at locations that will intercept run-off to streams. A sufficiently sized and protected buffer zone will remain between the silt trap and the watercourse with natural vegetation left intact so as to assist silt interception.
OH.18	Traps will not be constructed immediately adjacent to natural watercourses
OH.19	The design of silt traps or settlement ponds will facilitate the bypassing of individual cells for maintenance/solids removal if and when required.
OH.20	The silt traps/settlement ponds will have turbidity monitors at the inflow to allow advance warning of silt-laden waters entering.
OH.21	In constructing and designing silt traps, particular attention will be paid to rainfall levels and intensity.
OH.22	The silt traps will be designed to minimise the movement of silt especially during intense precipitation events where the trap maybe become hydraulically overloaded.
OH.23	They will be located with good access to facilitate monitoring sampling and maintenance. Settlement ponds will be sized to allow for a minimum 24-hour retention time.
OH.24	All drainage will be designed to achieve a discharge to surface waters with a suspended solid concentration of no more than 25mg/L. This

	will be noted in the EOP and any associated Works Method Statements.
OH.25	The pH of receiving waters will remain in the range of 6-9 unless baseline monitoring shows it is normally outside of this range.
OH.26	Daily visual inspections of all settlement ponds, surface water and drainage systems will be provided for IFI with checks twice daily in periods of heavy rainfall.
OH.27	Final design of drainage and silt trapping systems will be agreed with IFI
OH.28	The recommendations included in the both the IFI document Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016) and the Biosecurity Protocol for Field Survey Work (IFI, 2010) will be implemented in full.
OH.29	All discharges to and through the surface water collection and disposal system to groundwater and thence to surface water shall not be of environmental significance
OH.30	All mitigation measures identified in the EIAR are implemented in full.
OH.31	Piling activities adjacent to watercourses will begin with a ramp-up or ‘soft-start ' procedure to mitigate the impact of any noise more fully on the movement of fish species through the works area.
OH.32	There will be no permitted discharges to surface water resources of contaminated water or surface water run-off from the development.
OH.33	Servicing including refuelling of plant and equipment will only be undertaken on impermeable hard standing areas.
OH.34	All plant and equipment used within the subject site will carry spill clean-up kits and not be used or operated if there is evidence of leakage or damaged oil seals.

OH.35	There will be no discharge during the construction period of cementitious materials or residues thereof to the surface water or drainage network.
OH.36	When cast-in-place concrete is required. all works will be undertaken in the dry and effectively isolated from entering any receiving surface or foul sewers for a period sufficient to cure the concrete.
OH.37	Concrete delivery vehicles will be precluded from washing out at locations that could result in a discharge to the surface or foul sewers.
OH.41	Any silt curtains to be deployed will comply with the relevant European Standard CE 37- CPR-0613/29.
OH.42	All staff working in the vicinity of watercourses will be made aware of procedures to prevent silt or other pollutants from reaching watercourses
OH.43	Sufficient materials to aid in diversion/containment of any such spillage will be readily available and stored at close distance.
OH.44	Contact details for local IFI staff will be supplied to the contractor once appointed to be added to the Emergency Response Plan.
OH.45	The timing for any instream works will be confined to July to September in any one year.
OH.51	The Terms and Conditions of the Bat Derogation Licence (DER-BAT-2019-128) are to be adhered to as follows: Condition 4: The mitigation measures outlined in the application report (2019 NPWS Derogation Licence Application, Dr Tina Aughney, Bat Eco Services, 4. Bat Mitigation Measures), together with any changes or clarification agreed in correspondence between NPWS and the agent or applicant, are to be fully and strictly carried out. Strict adherence must be paid to all the proposed measures in the application. Condition 5: All sites must be surveyed immediately prior to demolition. Condition 6: Demolition works should happen outside the main summer season, avoiding May to August and cold winter months (December and

	January). Condition 7: The works will be supervised by a licenced bat specialist agent.

1.7. Interactions and Cumulative effects

Chapter 17 of the EIAR describes and assess interactions between individual topics and also cumulative effects between the likely effects of the PRD and other developments and plans.

The applicant describes a process of iterative assessment and mitigation design involving workshops between various specialists where strong relationships exist between environmental topics for example between designers, biodiversity, hydrology and hydrogeology and also between designers, landscape and biodiversity specialists.

1.7.1. **Matrix table 17.1** shows the key interrelationships between the EIAR environmental topics and biodiversity interacts in some way with most environmental topics (17.3.1).

1.7.2. The interactions between biodiversity, hydrogeology and hydrology are most significant with the maintenance of existing hydrogeological conditions with ground water dependant habitats such as fens a significant consideration as well as the protection of water quality. Mitigation measures designed for the protection of water quality at local watercourses are integrated across the biodiversity chapter and the hydrology chapter. Biodiversity measures have also been integrated where stream diversions are required.

1.7.3. The integration of biodiversity mitigation measures which include additional landscape planting and connectivity to severed treelines and or hedgerows, and the inclusion of Barn Owl landscaping mitigation will have a positive effect on landscape, material assets and non-agricultural lands and provide additional benefit of additional screening for local residents.

1.7.4. Noise and vibration impacts as a result of the construction and operation of the proposed road development have potential to impact on Biodiversity, causing disturbance to species.

1.7.5. Interactions between Air Quality and Climate and Biodiversity have the potential to be significant. Concentrations of pollutants in air and deposition of particles can damage vegetation directly or affect plant health and productivity. Deposition of pollutants to the ground and vegetation can alter the characteristics of the soil, affecting the pH and nitrogen availability that can then affect plant health, productivity and species composition. Increased greenhouse gas emissions on a global scale can affect the climate, such that the ability of existing species to tolerate local conditions can change.

1.7.6. A detailed assessment is presented in Chapter 13 Air Quality and Climate estimating pollutant concentrations (i.e., Oxides of Nitrogen (NOx)) at European sites. Only European sites within 200m of affected roads were determined to require quantitative air quality assessment (UK DMRB guidance and TII Air quality Guidance) namely Lower River Shannon SAC and River Shannon & River Fergus Estuaries SPA. The assessment demonstrated an increase in NOx and NO2 dry deposition from the operation of the RPD at the location of the River Maigue bridge crossing within Lower River Shannon SAC at Ardshanbally does not represent a significant increase over the background levels at a distance of >20m from the roads centre line (for NOx, marginally above the limit value for the protection of vegetation of 30 µg/m3 at 0 and 20m) and would not give rise to any adverse effects on site integrity. This conclusion was reached based on the very marginal increase of ambient NOx within a narrow band and that the habitats present are not considered sensitive to a marginal increased loading in Nitrates taking the conservation objectives of the site into account. Similarly, the River Shannon and River Fergus Estuary SPA and Lower River Shannon SAC at Robertstown will not be significantly affected. The PRD will cause a decrease in NOx and NO2 dry deposition rates at this location when assessed against the ‘do nothing’ scenario.

1.7.7. Mitigation measures proposed for the construction phase of the proposed development will also ensure that airborne dust generation is minimised through the implementation of a Dust Management Plan (Appendix 13.3 Volume 4A) and no significant effects on sensitive habitats and vegetation are predicted.

1.7.8. Cumulative effects were assessed by consulting planning and land use data bases (17.2.2). Possible cumulative effects were assessed by the applicant by examining developments within the last ten years and current developments for which planning

has been received within 10km of the PRD. The plans and projects are set out in Chapter 17, in Supplementary Information submitted to An Bord Pleanála at the oral hearing on Monday 15th February 2021 and also in Section 12.20 (Cumulative Impacts and Interactions) of the Inspectors assessment.

1.7.9. Of these plans and projects, the future Cork to Limerick M20 road development project is assessed for cumulative effects with biodiversity and hydrology in particular. The M20 which falls predominately within the River Blackwater SAC Catchment but also includes a river crossing of the River Maigue has been assessed with the PRD and the applicant finds that as both schemes will not result in any significant residual effects, there will be no additive or cumulative effect that could be considered significant in the construction or operational phase of the schemes with regard to the Lower River Shannon SAC.

1.7.10. It is likely that the construction of the M20 scheme will result in the severance of commuting routes for wildlife and mammal territories including breeding grounds and foraging habitat. However, extensive mitigation measures have been provided as part of the PRD to reduce impacts and to re-establish connectivity within the landscape. Once best practice measures are undertaken in the design of the M20 scheme, the applicant considers that there will not be significant cumulative impacts for mammal movements.

1.7.11. In the assessment of interactions between the individual environmental disciplines, the applicant has concluded that once relevant mitigation measures are implemented, no residual likely significant effects will exist as a result of the construction or operation of the proposed road development.

1.7.12. In the assessment of cumulative impacts, the applicant concludes that the scale of the works and implementation of effective environmental control measures will avoid all likely significant effects on environmental parameters. There is no potential for significant cumulative impacts arising in combination with any other plans or projects and therefore no potential for significant in-combination effects on biodiversity parameters.

1.8. Assessment

This assessment and analysis of the impact of the PRD on biodiversity addresses issues raised in written and oral submissions in addition to biodiversity issues that I consider of particular relevance. The Inspector and Board should also note that the briefs of evidence presented at the oral hearing by expert witnesses, Paul Murphy, Dr Tina Aughney and John Brophy responded to written submissions made by the public and by statutory bodies on the application and on further information submitted. My assessment is structured around the following headings (CIEEM 2019[5]):

- Scope of the biodiversity/ ecological impact assessment
- Surveys, sites, species and habitats
- Impacts and effects
- Mitigation
- Conclusions

Scope of the biodiversity/ ecological impact assessment

1.8.1. Section 1.4 of this report details my assessment of the competence and technical content of the biodiversity component of the EIAR, all associated surveys and appended reports. I am satisfied that the scope, structure and content of the biodiversity/ ecological impact assessment is in accordance with published good practice. There is evidence that pre-application advice from the National Parks and Wildlife Service and Inland Fisheries Ireland was received and accounted for in the biodiversity assessment and also further information submitted (in relation to IFI).

1.8.2. A number of written submissions asserted that the EIAR was incomplete in terms of the information presented. Having reviewed and evaluated the information submitted I do not find this to be the case for the biodiversity impact assessment submitted by the applicant. The industry specific guidance developed by TII has been followed faithfully by the applicant and scope and content is in accordance with EPA (2017) Guidance on EIAR (2017).

1.8.3. The ecological issues of importance were determined through a standard iterative process from the constraints study phase to route selection to emerging preferred

[5] Chartered Institute of Ecology and Environmental Management (CIEEM) 2019. Ecological Impact Assessment (EcIA) Checklist: https://cieem.net/wp-content/uploads/2019/11/EcIA-Checklist.pdf

route. Desk studies were undertaken and all sources of data are clearly described. Initial multidisciplinary ecological surveys informed the requirements for more detailed habitat and species-specific studies and an innovative and evidence-based approach was taken with regard to Barn Owl on this scheme.

1.8.4. Surveys, sites, species and habitats

Surveys

1.8.5. A number of written and oral submissions made reference to the timing and adequacy of ecological surveys. The level of survey effort and species-specific survey required to inform an ecological impact assessment must be carefully considered as it is not feasible nor necessary to survey all animal or plant groups. The CIEEM guidance followed by the applicant states that when scoping the ecological/ biodiversity assessment it should be proportionate to potential effects on ecological features: Professional ecologists need to use their knowledge and experience to judge the resources required to complete an adequate and effective EcIA (ecological impact assessment). Emphasis in EcIA is on 'significant effects' rather than all ecological effects.

1.8.6. Similarly, the TII guidelines Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes state that survey effort is dependant of the target species or group and the complexities of the habitats concerned.

1.8.7. Having reviewed the survey methodology and timing of surveys undertaken, I am satisfied that they are in line with the stated best practice guidance followed and have been undertaken at the correct time of year / over multiple seasons.

1.8.8. In a written submission on Further Information (FI-4) and in an oral submission at the oral hearing, Mr. Ian Gilvarry raised concerns regarding the lack of specific (instream) surveys for a number of qualifying interest species of Lower River Shannon SAC, including Sea lamprey, River lamprey and Brook lamprey, white clawed crayfish, Atlantic Salmon and Eel, questioning how an impact assessment can be undertaken in the absence of detailed information on these species. Mr. Murphy responded by assuring the participants at the oral hearing and the Board that the level of survey undertaken has met with all requirements, applying accepted

and standard methodologies. A comprehensive suite of surveys was undertaken which have established the ecological baseline. He outlined that the requirement for invasive fish survey, which would involve electrofishing, to inform the results, is not standard or applicable for an approach and design where all major watercourse crossing are clear span structures. He maintained that the level of assessment was more than adequate to determine the ecological value of the watercourses in question and to identify the range of possible impacts. He stated that the overall approach is aimed at avoiding impacts in the first instance.

1.8.9. I accept Mr. Murphy's defence of his approach as it is based on the standard Industry guidance Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes and for the benefit of the Inspector and the Board, I include excerpts from these guidelines which support Mr. Murphy's position and overall approach of the proposed development as described in the EIAR. The guidance is clear that fish surveys should only be considered in those situations where significant impacts are anticipated for example, where the principal likely effect would be disturbance of spawning habitat or the creation of barriers to migration and that impact assessments should, wherever possible be based on existing information, adopting a precautionary approach.

Fish Surveys

> *Prior to undertaking fish surveys, it is also important to consider the scale of impacts that the activities associated with road construction and operation will have on the river. It will only be appropriate to undertake detailed surveys where significant impacts are anticipated on potentially valuable assemblages of fish, or important populations of a particular species. It is often possible to avoid significant impacts on rivers and aquatic habitats that have been identified as being of value to fish species through sensitive design. This can include features such as clear-span bridges, which avoid the need to affect the river channel. Throughout construction, it will be particularly important to minimise the impacts of construction activities on watercourses. In particular, sediment released during construction can impact spawning gravels, choke fish and smother larvae or young fish*.

Lamprey species and Atlantic Salmon:

Where conditions are considered suitable to support lamprey, it will be necessary to review the need to undertake more detailed surveys, following the principles and methodologies described under 'Survey techniques' in the GSGN for Fish Surveys should only be considered in those situations where significant impacts on lamprey are anticipated. In addition, the choice of survey technique should be informed by the characteristics of any potential impacts. For example, where the principal likely effect would be the creation of barriers to migration, it may be appropriate to confirm the use of the river by adults upstream of the potential barrier, by employing fish traps or counters, or direct observations of spawning adults. Where the works in question could affect potentially important nursery areas, ammocoete surveys would be more appropriate… However, in each case, the need for invasive sampling should be reviewed in consultation with the NPWS, the appropriate Regional Fisheries Board, and other relevant consultees; wherever possible, impact assessments should be based on existing information, adopting a precautionary approach.

The potential for rivers to support Atlantic salmon should initially be assessed through an appraisal of the habitat suitability within the river channel during the multi-disciplinary walkover survey, supported by the results of the desk study and consultation (particularly with the EPA and appropriate Regional Fisheries Board). This should include consideration of water quality, river or stream morphology, substrate type and speed of flow. Where conditions are considered suitable to support the species, it will be necessary to consider the need to undertake specific surveys to investigate the use of the watercourse by salmon. This will depend upon the type and extent of potential impacts and whether sufficient information already exists…

…In all cases, the need for specific surveys should be reviewed with the relevant Regional Fisheries Board, the NPWS, EPA and other relevant consultees. As with other important fish species, impact assessments should, wherever possible be based on existing information, adopting a precautionary approach.

1.8.10. The presence of sea lamprey in the reaches of the River Maigue impacted by the RPD was confirmed by Inland Fisheries Ireland in their written submission on the PRD and they requested that an impact assessment be included for this species in the NIS specifically. IFI did not request any further survey for Sea Lamprey, River or Brook lamprey or an any other fish species and did not query the applicant approach to impact assessment. The applicant had indicated in the EIAR that Sea Lamprey may be present in the River Maigue at the affected location/ zone of influence, and in response to the further information request, included a detailed assessment of impacts on this species in view of the site-specific conservation objectives as an addendum to the NIS (See Appropriate Assessment for complete, precise, and definitive findings in respect to this and other species).

Sites of importance for nature conservation and biodiversity

1.8.11. I am satisfied that all sites designated for nature conservation likely to be significantly affected are clearly and correctly identified. Informed by the NIS, the AA examines impacts on qualifying interest features and their conservation objectives on European Sites in more specific detail as required under Article 6(3) of the Habitats Directive.

1.8.12. All protected species and habitats likely to be significantly affected are clearly and correctly identified and adequate surveys have been undertaken to inform the baseline including relevé surveys at the River Maigue crossing.

1.8.13. Key ecological sites are identified and evaluated in line with best practice using the TII guidelines. Individual habitats contributing to the ecological value of each site are described and it is the overall mosaic of habitats that contributes to the importance of the site for biodiversity. (Assigning an ecological value to individual habitats can underestimate the overall biodiversity significance of a particular area).

1.8.14. The 20 watercourses identified and evaluated in the biodiversity assessment are significant biodiversity receptors. The evaluation of these sites takes into account water quality status, riparian habitats, instream habitat and substrate, likely importance for fisheries, otter, kingfisher and other riparian species and I am satisfied that this allows for an assessment of likely effects.

Species

1.8.15. In a written submission on the PRD, Simon White and others (ENV-31) questioned if the applicant had correctly identified all species that could be impacted by the scheme at the River Deel in particular. He claimed that surveys undertaken by a University of Limerick student in 2003 found records of Freshwater Pearl mussel. The same submission refers to white clawed crayfish and smooth newt which were acknowledged to be addressed in the EIAR.

1.8.16. As outlined in my assessment for survey effort, it can be a challenge to determine when to draw the line on what surveys to undertake, particularly on such a large road scheme and in the end, it comes down to the potential risk to the ecological receptors. Any possible risk to Freshwater Pearl Mussel is excluded as Mr. Murphy clarified that the water chemistry of the River Deel and other rivers in the vicinity of the proposed development is not suitable for this species, reflecting the underlying limestone geology with pH values in the alkaline spectrum. Therefore, Freshwater Pearl Mussel would have been scoped out of the biodiversity assessment at an early stage. The likely explanation is that the 'mussel' reported to be found was that a Duck Mussel (*Anodonta anatina*), which to the untrained eye resembles the Annex II Pearl Mussel.

Lack of information on Invasive alien plant species including Japanese knotweed.

1.8.17. The absence of records of Japanese knotweed was questioned in a submission by Mr. Conor Enright (Ref FI-2) which is reasonable given its widespread occurrence along roadsides. Mr Murphy outlined that while J. knotweed is indeed commonly found along roadsides in the area, the occurrence of this invasive species is not common in the rural countryside away from road verges such as in agricultural fields. As much of the PRD traverses land in agricultural use, there were no stands of this invasive species recorded. Other invasive species including Giant Hogweed, Himalayan Balsam and floating fairy fern were documented at river crossings including the River Maigue. The applicant is very clear in the approach taken for the management and prevention of the spread of invasive species- see Section 9. EOP.

1.8.18. Overall, I am satisfied that invasive and non-native plant species have been clearly and correctly identified and that the EOP Section 9 deals adequately with the management of these species during construction.

Fauna (excluding fish species)

1.8.19. I am satisfied that the faunal species or groups most likely to be affected by the PRD have been correctly identified and surveyed to inform the baseline for impact assessment. In line with the requirements of the EIA Directive and TII guidance, there is a focus on protected species including those listed on Annex II and IV of the EU Habitats Directive, Annex I of the EU Birds Directive, The Wildlife Act 1976, and Wildlife (Amendment) Act 2000. The suite of species that form the key consideration of 'at risk of significant effects' species includes the following:

- Bats: All 9 species of Bat were recorded within the area surveyed. Static survey showed that Lesser Horseshoe occurs throughout the area in low numbers and this species is a key consideration in the biodiversity assessment.
- Birds: Barn Owl is considered the most significant possible avian receptor at risk from the PRD. Existing baseline data and survey (Whooper Swan) scoped out need for further examination of risks on wintering birds. No attempt at quantifying impacts on common breeding farmland birds (due to hedgerow loss)
- Otter: with a confirmed presence along many watercourses and likely widespread distribution
- Badger: 5 sets recorded along entire route. For a scheme of this magnitude this appears to be a low number of setts potentially affected.
- Desmoulins snail (*Vertigo moulinsiana*) new records of this species at three Fen habitats

I am satisfied that protected species and habitats likely to be significantly affected are clearly and correctly identified and adequate surveys have been undertaken to inform the EIAR and the EIA to be conducted by the Board.

1.8.20. Impacts and effects

1.8.21. The construction and operation of a road scheme of the magnitude proposed cannot reasonably be facilitated without impacts on biodiversity. Overall, I am satisfied that the applicant has identified and evaluated the impacts in a manner in line with EIA requirements and current best practice guidance and that where potentially significant effects have been identified, mitigation measures have been proposed to reduce impacts to a non-significant level (where significant would mean an impact which, by its character, its magnitude, duration or intensity alters a sensitive aspect of the environment: EPA,2017). Submissions related to potentially significant effects on protected sites and species and effects on wider biodiversity are assessed in this section.

European Sites

1.8.22. (A recommended determination on) Appropriate Assessment of the PRD based on scientific information provided by the applicant in the form of the NIS, has ascertained that the proposed development, individually or in combination with other plans or projects would not adversely affect the integrity of the Lower River Shannon SAC or the River Shannon and River Fergus Estuaries SPA in view of the conservation objectives of those sites. The potential for any adverse effects was also excluded for Curraghchase Woods SAC and Askeaton Fen Complex SAC. No reasonable scientific doubt remains as to the absence of such effects. General concerns relating to protected sites as relevant to the EIA are detailed below.

Lower River Shannon SAC

1.8.23. The submission by Inland Fisheries Ireland on the inclusion and integration of Sea Lamprey in the EIA and NIS has been addressed by the applicant as part of the further Information supplied and the applicant has agreed to all IFI requests regarding the application of mitigation measures and pre-construction survey. At the oral hearing IFI stated that they were satisfied with the applicant's response and approach and will be ready to engage on specific measures regarding the CEMP and EOP if the scheme is approved. I am satisfied that all issues and concerns raised by IFI have been addressed and assessed adequately.

Impacts on Lower River Shannon SAC- location of road bridge on River Maigue

1.8.24. In both written and oral submissions on the application and further information, Mr. Simon White and others, raise concerns regarding the decision to locate the major bridge crossing of the River Maigue within the Lower River Shannon SAC at the proposed location North of Adare at Islandea. The contention is that a more suitable location and feasible alternative is available that would not impact directly on the SAC (if the scheme was a more modest bypass of Adare as opposed to the combined Limerick Foynes proposal). The location of a bridge crossing south of Adare, as in a previous application for the Adare by-pass, is suggested as a more suitable location.

1.8.25. As part of his brief of evidence, Mr Murphy described how the route option which followed the route of the 2010 proposal for the Adare bypass was discounted due to technical and cost issues including an increased length of over 2.5km compared to final design, increased construction costs, longer journey times and higher carbon emissions. While a crossing south of Adare would avoid direct impacts on the SAC, a bridge crossing within the freshwater reaches of the River Maigue would still pose significant risks for conservation interests species including spawning Salmon, Lamprey species and otter. Mr Murphy reiterated that the proposal before the Board is based on suitable design aimed at avoiding adverse effects, including the provision of a clear span over the river and retention of riverbank habitats and mammal passage along the riverbank.

1.8.26. The technical justification for the final route design has been provided in Chapter 3 Alternatives Considered, Chapter 4 Description of the PRD and the need and type of road selected along each of Section A, B, C and D has been considered in the inspector's assessment. As described by Mr. Murphy, any crossing of the River Maigue would have potentially significant implications for the habitats and species present whether within the SAC boundary or not. The design of the proposed river crossing is based on avoidance of impacts on qualifying habitats and species and ensuring the continued ecological integrity of the site at this location. The provisions of the Habitats Directive do not exclude development from occurring within sites designated SAC or SPA, rather the legal test is to determine that adverse effects on

site integrity can be excluded before permission can be granted and the Appropriate Assessment confirms this to be the case.

River Fergus and River Shannon Estuaries SPA

1.8.27. There were no specific submissions made in relation to the SPA or its SCI bird species. Based on my review and evaluation of the information provided in the EIAR, I am satisfied that direct impacts are avoided by the PRD and that all potential indirect impacts in terms of disturbance of wintering water birds both within and outside the SPA (ex-situ) have been carefully and appropriately considered. I am satisfied that the potential for indirect effects on bird habitats such as estuarine mud flats will be avoided through the application of watercourse protection mitigation and that no significant effects will occur either during construction or operation of the PRD.

Key Ecological Receptors, habitats and species

1.8.28. Habitat loss and fragmentation, the effects of loss of trees and hedgerows on wildlife and the barrier effect of the PRD on biodiversity are issues raised in all submissions/objections that relate to biodiversity. Roads can cause a barrier effect to animal movement and dispersal by presenting a physical obstacle, by causing animal-vehicle collisions or through disturbance where animals display avoidance behaviour due to the presence of the road/traffic. In all cases, this barrier effect reduces the exchange of individuals between roadside populations, with possible negative consequences for local populations.

1.8.29. The ecological impact assessment of EIAR Chapter 7 Biodiversity, identifies, describes and assess these impacts for both construction and operation of the PRD. Habitat fragmentation/ site dissection is identified as an impact at 11 of the KERs. Construction will result in habitat loss and fragmentation with potential consequences for associated fauna which, without mitigation, could be isolated by the barrier effect of the road. There will be some level of habitat loss at all KERS with the exception of KER 1 Churchfield and KER 7 Ballyellinan and disturbance to species associated with those habitats. There is no quantification of the actual amount of habitat loss (in ha), rather, a qualitative evaluation of the impact is presented. These impacts have been evaluated as permanent moderate negative effects for 16 of these sites and slight negative at four sites (in the absence of mitigation). I note that in the residual

impacts the applicant refers to permanent moderate negative effects for 17 sites and minor negative at 3 sites however, my examination of section EIAR 7.4.5 and EIAR table 7.10 shows permanent slight negative for 4 KERs.

1.8.30. The total lengths of hedgerows and treelines to be impacted by the proposed road development include 23.3km of hedgerows and 15.8kmm of treelines. Where watercourses require culverts or channel realignments, there will be permanent habitat loss.

1.8.31. The operational impacts of the PRD are also identified, described and assessed by the applicant. The potential for significant effects on certain species was identified (in the absence of mitigation) including Otter, bats and Barn owl.

1.8.32. Overall, I am left in no doubt that the applicant has addressed the issues of habitat loss and fragmentation, and the barrier effect of the PRD. The evaluation of these impacts is based on best practice guidance, and I consider that the evaluation is appropriate and does not underestimate the likely effects.

1.8.33. Mitigation measures have been designed with the landscape specialists to reduce impacts to non-significant levels over time through the extensive replacement planting of trees and shrubs and the realignment of wildlife corridors where possible (Figs 7.25-7.47 Vol 3 EIAR). At the oral hearing Mr. Murphy confirmed that a total of 45.18km of hedgerow and treeline will be planted, providing a net increase of over 6km of linear habitat from that to be removed. In addition, 181ha will be planted (as detailed on Drawings 11.1 to 11.24 of the EIAR) which will comprise screen planting (37.2 ha) and specific landscape measures (85.4 ha) to re-connect severed habitats, provide compensatory habitat including woodland around attenuation ponds (21.1 ha) and as part of the specific mitigation planting for Barn Owls (37.3 ha).

1.8.34. The locations of underpasses which allow permeability between both side of the road have been selected based on existing mammal trails, locations close to badger setts or where foraging activity has been recorded which ties in with existing landscape features. Underpass culverts which have been designed to facilitate movements of lesser Horseshoe Bats throughout the landscape will also accommodate badger and other small mammals. In addition, the applicant points to other agricultural underpasses and railway overbridges which will allow for movement of wildlife. The extent of provision of these measures is detailed in Table 7.12 of the EIAR.

1.8.35. Looking at the proposed mammal passage, taking Section A as an example, (Foynes to Ballyclogh Junction) ch 1+100 to ch 7+400 there is provision at 13 locations for mammal/ bat passage. Section D (Rathkeale to Attyflin- N21 replacement) of the PRD from ch 50+000 to 65+400 has a denser provision of permeability across the scheme with 23 locations for mammal and bat passage. In addition, the design of the PRD has ensured maintenance of riparian habitats along watercourses to ensure the continued unimpeded movements of terrestrial fauna along these ecological corridors where-ever possible.

1.8.36. Based on the extensive consideration and application of key actions to facilitate wildlife movements, concerns that sufficient wildlife permeability has not been designed from the start are unjustified.

1.8.37. The proposed landscaping planting including biodiversity specific measures for Barn Owl and bat species and the planting of hedgerow and treelines will result in an overall net gain of such habitats and I agree that in time these measures will reduce the impacts on biodiversity to non-significant levels. However, I also acknowledge that replacement planting will not fully replicate the complex structural and botanical composition of mature hedgerows and treelines lost to the PRD and residual adverse effects will persist in the short to medium term in a local context for species associated with these habitats including breeding countryside birds.

Mammals and bats

1.8.38. The key risks for local mammal populations including badger and bats during the operation of the proposed road are collisions with vehicles, and effective habitat loss due to disturbance from noise and lighting along the proposed road, with the construction stage effects of habitat clearance having a permanent loss of foraging habitat and reduced access to habitat.

1.8.39. Concerns of adverse effects on Badgers were raised in a written submission by Eileen Madden (Sch-30). The approach to assessing impacts on badgers and any significant effects on their local population was led by the TII publications including *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (TII, 2006). The predicted impact on badgers is slight negative of temporary- short term duration. A total of five badger setts were recorded within the footprint/ along the CPO line, none of which are classified as main setts. A further

six setts are located within 50 to 150m of the CPO boundary and would only be subject to mitigation measures if pile driving or blasting is proposed within 150m of the sett location. There is always the possibility that given the terrain or areas of inaccessible habitat that setts could be overlooked however, pre- construction survey is an important element to cover this eventuality (EIAR 7.5.4.1). In addition, given the likely passage of time between survey and construction commencing, it is standard practice to undertake confirmatory surveys for ground living mammals including badger and otter.

1.8.40. Mitigation measures are set out in line with standard industry practice including monitoring during site clearance, protection of setts close to the CPO and evacuation of setts adjacent to the CPO where required. The measures outlined above in relation to ensuring permeability for biodiversity across the PRD applies directly to badgers with significant levels of mammal underpass provided throughout the scheme. Mammal resistant fencing will be installed at mammal passage facilities to guide badgers and other mammals to the underpass/culvert and to prevent animals crossing the new roadway.

1.8.41. I am satisfied that impacts on badger population in the area has been adequately and accurately assessed and that with the application of mitigation measures concur with the overall impact assessment of the applicant that there will be no significant adverse effect on the badger population. Badger movements will be facilitated by the installation of mammal underpasses and monitoring has been proposed to ensure the effective use of these measures.

1.8.42. The potential for significant effects on bats has been clearly examined and assessed. Areas of importance for bats along the PRD have been identified and a pre-construction survey is proposed in advance of the removal of any structures and trees with potential to act as bat roost and vegetation clearance will be supervised by an ecologist and in line with TII guidance. Three of ten structures scheduled for demolition had evidence of bats present/roosting. Two satellite roots and 2 no. night roosts for soprano and common pipistrelle bats were identified and another building has potential for roosting bats. A bat derogation license has been attained to ensure the safe and legally sound method of excluding bats from these buildings (see below). Lighting of the proposed road and junctions and bridges has been considered for the operational phase to ensure minimal disturbance of nocturnal

species. The replanting of native hedgerow species with the inclusion of mature specimens of 3.5-4m will, overtime compensate for the high levels of hedgerow removal. The height at planting was clarified at the oral hearing after I sought clarification of this issue. From Chapter 11, 11.5 page 29:

> At 32 no. locations along the proposed road development, specific landscape planting measures are proposed for the mitigation of impacts on Bats (see Chapter 7 Biodiversity for further details). The planting is proposed where hedgerows / scrub / treelines will be removed or bisected as a result of the construction of the proposed road development. The purpose of the planting is to provide alternative flight paths or reinstate such features for commuting bats. This planting will comprise of a mix of native species, of the same species removed wherever possible. Such planting should be of a size directed by the project ecologist in order to ensure continuity of cover. Nominal size expected for such planting is 3.5-4m in height for trees and 1.5-2m for hedgerow / shrub plants.

1.8.43. The provision of alternative roosts has also been incorporated into the mitigation measures. This includes the recommendation of 19 no. summer bat boxes (to be erected on mature trees) and 6no. double -chamber rocket boxes installed in suitable areas within the CPO as identified in table 7.12a. Alternative roosts will also be provided to compensate the loss of satellite and night roosts including double-chamber rocket bat boxes and bat tubes will also be installed in new culvert and bridges.

1.8.44. At the oral hearing Dr Tina Aughney of Bat Eco Services provided a comprehensive summary of the potential impacts on Lesser Horseshoe bats and other bat species and reaffirmed that all mitigation measures proposed are proven and effective with examples of successful bat mitigation measures presented. She addressed a written submission regarding mitigation measures for Lesser Horseshoe Bats in particular, clarifying that bat mitigation has been incorporated into the overall design of the scheme. Mitigation measures including the incorporation of underpasses that will accommodate brown long-eared bats and Myotis species insofar as possible which are also suitable for lesser Horseshoe bats. She stated that Bat mitigation is proposed at 35 locations along the PRD with structures designed to provide safe

passage for bats under the PRD with linear habitat planting in the vicinity of these structures to act as guiding corridors, ensuring connectivity between flight corridors.

1.8.45. At the oral hearing, it was confirmed that a derogation license (DER-BAT-2019-128) has been obtained from the Minister under Regulation 54 of the European Communities (Birds and Natural Habitat Regulations 2011). This grants the applicant license in respect of roost disturbance or damage or destruction of breeding sites or resting places) of common pipistrelle and soprano pipistrelle (both at favourable conservation status) under supervision by Dr Tina Aughney or another suitably qualified agent. At the oral hearing I asked Dr Aughney if any monitoring conditions were attached to the license. Dr Aughney responded to this question with a short note (11th February 2021). In the application for the derogation licence, Section 4.3 states that "implementation of the mitigation measures will be monitored by a competent, qualified and experienced ecologist at intervals during the initial years of operation of the development to ensure successful implementation". The **Derogation Licence (DER-BAT-2019-128),** dated 18/11/2019, Condition 4 states that "… Strict adherence must be paid to all the proposed measures in the application" and specifies conditions in relation to surveying, timing of works and supervision, based on the information provided in the application. The terms and conditions of the derogation license will be included in the Schedule of Commitments for the PRD.

1.8.46. I am satisfied that based on the application mitigation measures proposed, there will be no significant residual effects on bat populations in the area. The PRD will not alter the favourable conservation status of most bat species or delay the attainment of favourable status for Lesser Horseshoe Bat (inadequate) by ensuring their continued use of the area and maintaining connections throughout the wider landscape. The risks of roost disturbance and or damage or destruction of breeding or resting places has been clearly identified for two common bat species and in line with the provisions of Article 16 of the Habitats Directive a derogation license has been obtained from the Minister under Regulation 54 of the Habitats Regulations.

Birds

1.8.47. **Barn owl** is considered to be the most sensitive and at-risk avian receptor along the PRD. Based on the information and analysis presented on potential impacts on Barn Owl, prepared by an expert in the field (John Lusby, BirdWatch Ireland) and author

of new guidance for TII (Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects PE-ENV-07005 April 2021), I am satisfied that with the application of mitigation measures, no significant adverse effects will occur for the local population this red list species (BOCCI).

1.8.48. The mitigation recommendations are based on best scientific information as detailed in the TII Technical publication (April 2021) *The Interactions between Barn Owls and Major Roads: Informing Management and Mitigation* prepared by BirdWatch Ireland. Mitigation measures are designed to discourage Barn Owls from flying and/or foraging in close proximity to the road carriageway and to divert the flight height of birds above the height of traffic, as shown in EIAR Plate 7.15. These measures will be applied across the extent of the PRD and are fully integrated into the general landscape treatments. The total area of Barn Owl mitigation is 37.3ha. The Barn Owl mitigation and other biodiversity related landscaping mitigation proposed is extensive along the scheme as evidenced in Figures 11.1-23 of the EIAR Vol. 3 and in the figure (14131-SK-11001 - Landscape & Ecological Mitigation) submitted at the hearing which is a composite of all the landscaping mitigation for biodiversity.

1.8.49. Post construction monitoring of the Barn Owl mitigation measures is not set out in the EIAR. At the oral hearing, Seamus Mac Gearailt confirmed that post construction monitoring of *landscape measures* that form the Barn Owl mitigation is proposed as part of standard TII general post construction commitments, part of a 5-year maintenance contract which includes the functioning of mitigation measures. He did not reference monitoring of any possible Barn Owl mortality rates. The TII *Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects*[6] published in 2021 does have a requirement for post construction monitoring where Barn Owl mitigation measures are applied in the landscape treatment. Therefore, in order to bring the measures fully in line with the TII mitigation standards, I recommend that in the event that the PRD is approved by the Board a condition of post-construction monitoring would include a road casualty survey to assess Barn Owl mortality rates and locations on the scheme in addition to those related to the monitoring of landscape measures

[6] https://www.tiipublications.ie/library/PE-ENV-07005-01.pdf

themselves. Given the fact that this scheme is pioneering such extensive Barn Owl mitigation, evidence of effectiveness of the measures is required and adaptive management applied in the unforeseen event where any previously unknown Owl hot spots arise along the PRD. A monitoring programme will be developed by the applicant in line with the methods for designing and undertaking the road casualty survey specified in TII publication (2021) *The interactions between Barn Owls and major roads: informing management and mitigation*[7].

Loss of wetland habitats and impacts on watercourses

1.8.50. Three wetland habitats comprising the Annex I habitat Alkaline fens (7230) which support Annex II listed Desmoulin's snail (*Vertigo moulinsiana*) are impacted by the PRD. These sites include KER 7 Ballyellinan, KER 11 Lismakeery and KER 21 Blossomhill.

1.8.51. Desmoulin's snail is listed under Annex II of the Habitats Directive and is a Qualifying Interest in eight Special Areas of Conservation (SACs) around Ireland. The closest SAC with *V. moulinsiana* as a Qualifying Interest is the Curraghchase Woods SAC (000174), which is located approximately 7km from Blossomhill, 9km from Lismakeery and 10km from Ballyellinan. Assessment of local hydrogeology (EIAR chapter 9) has shown that these sites are not connected to the Askeaton Fen complex SAC.

1.8.52. The PRD does not impact directly on the fen habitat host to Desmoulin's whorl snail at KER 7 Ballyellinan or KER 21 Blossomhill, so there will be no direct negative effect on the populations at these sites. Mitigation measures to prevent change to the groundwater flows at these sites are set out in EIAR Chapter 9 Hydrogeology, Table 9.19. These measures will prevent significant indirect effects from changes to the groundwater regime and any associated changes to the fen habitat.

1.8.53. At Lismakeery, the PRD impacts directly on fen habitat and will result in a loss of 0.51ha of suitable Desmoulin's snail habitat along the northern end of the site. The whorl snail will continue to be present within the remaining suitable habitat to the south of the road. Hydrological management of the groundwater flows and road drainage will ensure that the hydrology of the unimpacted section of the study area

[7] https://www.tiipublications.ie/library/RE-ENV-07004-01.pdf

remains unaltered (See EIAR Chapter 9 Hydrogeology, Table 9.19), thus preventing indirect effects via changes to the groundwater regime. The area of fen habitat that will be lost due to the proposed road development amounts to 20% of the overall fen habitat. Direct loss of the Desmoulins snail (V. moulinsiana) habitat at Lismakeery has been assessed as a permanent moderate negative impact.

1.8.54. Following the implementation of engineering measures to ensure a drainage neutral design (EIAR Chapter 19, p. 45 and Mr. Keohane's assessment), the residual impact of the proposed road development on the hydrology of the fens at Lismakeery, Ballyellinan and Blossomhill will be imperceptible.

1.8.55. While the loss of the 0.51ha of *V. moulinsiana* habitat under the footprint of the road cannot be avoided, it is proposed that the remaining fen habitat and associated wet grassland (approximately 4.4ha) at Lismakeery will be acquired through CPO to protect the remaining Desmoulin's snail population from other threats and pressures into the future (Appendix I, Figure A4). At the oral hearing Mr John Brophy of BEC Consultants Ltd explained that this would require minimal or no intervention, with the main benefit being that the site could be protected from future reclamation or more intensive grazing, both of which would impact negatively on Desmoulin's snail. There is no proposal for monitoring of this site.

1.8.56. I am satisfied that the measures proposed for Ballyellinan and Blossom Hill which avoid alterations to the hydrological regime will ensure that the PRD will not result in significant effects at these sites - a residual, permanent slight negative impact is predicted. In addition, the acquisition of additional lands at Lismakeery will ensure the continued presence of Desmoulin's snail at this site with a permanent moderate negative effect predicted, which may lessen overtime as the acquired habitat improves due to removal of grazing and other pressures.

1.8.57. Concerns regarding impacts at the wetland areas of Blossom Hill and Doohyle Lough resulting from route selection in the area of Amogan Beg were raised in written and oral submissions by Mr. Paul Madden (Sch-89). Mr Murphy considered this in this brief of evidence. A report prepared on behalf of Mr. Madden (included in his submission) by independent ecologist, Donnacha O'Cathain on three possible route options at this location concluded that the blue option is preferable (for biodiversity), followed by the green with the pink option least preferable. This

conforms to the result of the assessment by Mr Murphy and EirEco Environmental Consultants in relation to the three route options considered at this location under the criteria of Ecology. However, the route selection process takes account of numerous criteria, and the blue route was found to be the least favourable when taking these other criteria into account. I am satisfied that the occurrence of the fen habitat and hydrological connections between the various wetland habitats at this location has been given adequate examination and assessment.

1.8.58. General concerns relating to water pollution of local streams and rivers including the River Deel, Lismakeery stream and the river Maigue were raised in submissions. I am satisfied that with the application of the standard environmental control measures for working near watercourses including control of invasive alien species, mitigation measures described in Chapter 7 and 8 and in the EOP, no significant residual effects are predicted for the riparian habitats, aquatic species or water quality at these locations.

1.8.59. I am satisfied that the ecological impact assessment for biodiversity is based on a clearly defined development proposals along with relevant drawing and plans and that the applicant has described and assessed all likely significant ecological effects clearly stating the geographical scale of significance. Mitigation measures have been designed and applied to ensure that no residual significant effects remain once the PRD is constructed and operational.

1.8.60. I am satisfied that that the applicant has adequately addressed submissions and observations related to Biodiversity and that I have taken account of these issues in my overall examination, analysis and assessment of significant effects on Biodiversity.

1.8.61. Mitigation and monitoring

1.8.62. Submissions and observations on Biodiversity raised general concerns regarding adequateness of mitigation measures and proposals for monitoring.

1.8.63. I am satisfied that the mitigation hierarchy has been clearly followed with a focus on the avoidance of impacts in the first instance through route planning and design. The EIAR clearly identifies proposed mitigation measures and explains how these will address all likely significant adverse effects. Mitigation measures for biodiversity also have interrelationships with hydrology, hydrogeology and landscape and this

interdependence is captured in the EIAR. I have summarised the relevant sections in the EIAR that detail measures related to biodiversity in Table 9 below for ease of reference for the Inspector and the Board.

1.8.64. Mitigation measures are based on existing and emerging best practice (e.g. for Barn Owl) and are incorporated into a full chapter on mitigation (chapter 19), an environmental operating plan (EOP) and a revised schedule of commitments as presented in the oral hearing (see section 1.6.20 above).

1.8.65. Having reviewed, evaluated and assessed the proposed mitigation measures I am satisfied that the measures are based on best practice, are effective, capable of being implemented through conditions and where any residual effects remain, these have been identified.

1.8.66. The best practice measures of relevance to biodiversity which will be followed and set out in the EOP have been informed by the relevant TII guidelines, including but not limited to the following:

- Guidelines for the Treatment of Badgers prior to the Construction of a National Road Schemes;
- Guidelines for the Treatment of Bats during the Construction of National Road Schemes;
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes;
- Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post-Construction of National Road Schemes;
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes;
- Guidelines on the Management of Noxious Weeds on National Roads;
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes;
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes;

- Guidelines for the Management of Waste from National Road Construction Projects; and
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan

Table 9: A summary of the provisions for mitigation measures from the EIAR and associated documents (of relevance for biodiversity)

EIAR	**Measures of relevance to biodiversity**	**Updated information (from RFI/ oral hearing)**
Chapter 7 Biodiversity (also, Natura Impact Statement)	7.5.1Mitigation for designated areas 7.5.2 Mitigation for Terrestrial sites 7.5.3 Mitigation for Aquatic Sites 7.5.4 Mitigation for Fauna Table 7.12a-d Biodiversity Mitigation measures	12 months of water sampling to establish water quality baseline Soft start/ ramp up for any piling activities at the River Maigue bridge crossing point during construction Consultation with IFI in relation to EOP/ final CEMP with appointed contractor
Figures 7.25-7.47 Volume 3		
Appendix 7.1, Volume 4A: Four Season Bat Report	As above Also: Table 22 of Appendix 7.1, Section 7.1 General Bat Mitigation Measures	Bat Derogation license secured (DER-BAT-2019-128) which authorises 9a) roost disturbance (b) damage or destruction of breeding sites or resting places for common pipistrelle and soprano pipistrelle in line with terms and conditions set out by the Minister.

Chapter 9 Hydrogeology	9.5.1.1 General mitigation measures for hydrogeology 9.5.1.2 Site Specific Mitigation Required for Hydrogeology	
Chapter 10 Hydrology	10.5.2 Construction Stage Mitigation for Hydrology 10.5.3 General Operational Stage Mitigation for Hydrology 10.5.3.1 Water Quality Impact Mitigation 10.5.3.2 Storm Runoff Mitigation 10.5.3.3 Culverts and Bridges 10.5.3.4 Watercourse Diversions	
Chapter 11 Landscape	11.5.1 General mitigation and monitoring measures 11.5.2 Specific mitigation measures 11.5.3 summary of mitigation measures	
Figures 11.1-11.24 Volume 3		
Chapter 19 Mitigation and Monitoring measures	19.5 Mitigation and Monitoring Measures for Biodiversity	
Environmental operating plan	Chapter 4 schedule of commitments	Schedule of commitments updated at oral hearing

	Chapter 6 Water quality protection Chapter 7 construction and demolition waste management Chapter 8 incident response Chapter 9 Construction phase invasive species and biosecurity management Appendix A Erosion and sediment measures	

1.8.67. Monitoring of mitigation measures

Monitoring of construction works and the implementation of mitigation measures is described in the EIAR and associated EOP. A site Environmental Manager will be appointed by the eventual contractor to implement the EOP and an Ecological Clerk of Works (ECoW) will also be appointed.

The principal functions of the ECoW will be:

- To provide ecological supervision of the construction of the proposed road development and thereby ensure the full and proper implementation of the mitigation prescribed in this NIS and in Chapter 7 (Biodiversity) of the EIAR;
- To regularly review the outcome of the specialist hydroacoustic monitoring and, on that basis, make any necessary adjustments to the mitigation; and,
- To carry out weekly inspections and reporting on the implementation of the Contractor's Biosecurity Protocol.

Post construction monitoring

1.8.68. At the oral hearing I raised a question regarding the operational phase of the PRD and if monitoring of long-term mitigation measures would be undertaken to provide

feedback on mitigation effectiveness such as use of underpasses by mammals, use of bat boxes, and effectiveness of proposed Barn Owl mitigation. In response, Mr. Seamus MacGearailt (ROD) confirmed that the eventual contractors who will run the operation of the PRD will carry out monitoring of measures as part of standard maintenance obligations.

1.8.69. The success of the mitigation measures for Badgers will be monitored for a period after construction, and measures taken to enhance use of underpasses implemented where required. Monitoring will be carried out to determine the success of the measures employed within one year after construction ceases, in accordance with the TII Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (2005).

1.8.70. As pointed out in my assessment of impact on Barn Owl, there is a requirement for post construction monitoring of Barn Owl mitigation to bring the full implementation of the measures in line with the TII Survey and Mitigation Standards for Barn Owls to inform the Planning, Construction and Operation of National Road Projects. This can be achieved by way of condition where the applicant will be required to develop a monitoring programme in line with the methods specified in TII publication (2021) *The interactions between Barn Owls and major roads: informing management and mitigation.*

1.8.71. For the avoidance of doubt, I do not consider that mitigation effectiveness is dependent on monitoring or that by specifying the need for monitoring that there is any uncertainty in relation to predicted impacts. Monitoring of mitigation measures provides important feedback on the successful implementation or otherwise of measures and where in unforeseen circumstances, measures need to be amended in some way this can be picked up and acted upon in a timely manner.

1.9. Concluding Comments-Biodiversity Mitigation and Residual Effects

1.9.1. I am satisfied that provided the mitigation measures prescribed in the EIAR, including EOP and schedule of commitment are implemented in full, with comprehensive management of all measures by the appointed contractor with high levels of ecological supervision, no significant negative/adverse impacts are expected for biodiversity in terms of the terrestrial, riparian or estuarine habitats within the footprint of the proposed development, or the wider environment.

1.9.2. Residual impacts on biodiversity will remain (non-significant level) even after the application of mitigation measures due to habitat loss and fragmentation, however, I am satisfied that no impact greater than **moderate negative** will occur (at 8 no. KER sites).

1.9.3. I am satisfied that with the full implementation of the mitigation measures prescribed in the EIAR with comprehensive management of all measures by the appointed contractor with high levels of ecological supervision, no significant adverse impacts are predicted for fish species and other protected aquatic species, protected flora, and no significant residual impacts are predicted for birds or mammals, including bats during construction or operation of the proposed Road scheme.

In summary:

- The technical content of the biodiversity and ecological information is sound and includes adequate and up-to-date data, ecological methods have been clearly described and are in accordance with good practice.
- The ecological features likely to be affected have been identified and all potential direct and indirect impacts are described adequately.
- The magnitude of effects has been evaluated and where these are significant are capable of being mitigated.
- It has been adequately demonstrated that the proposal will deliver stated outcomes, with regard to likely effectiveness and certainty over deliverability of mitigation and monitoring measures.
- The mitigation measures are capable of being secured through planning conditions.

1.9.4. Significant adverse effects on biodiversity will be averted. This will be achieved through the application of the mitigation hierarchy with a focus on the avoidance of impacts in the first instance through route planning and design, the application of conditioned mitigation measures that will prevent negative effects on water quality and ground water dependant habitats. Where impacts cannot be avoided the application of measures to off-set losses wherever possible has been applied including compensatory landscape planting, the provision of Barn Owl landscape measures, and the provision of terrestrial mammal and bat passage.

Maeve Flynn, BSc, PhD, MCIEEM

Inspectorate Ecologist

10/02/2022

Foynes to Limerick Road (including the Adare Bypass)

Appropriate Assessment

Prepared by: Maeve Flynn BSc PhD MCIEEM

Inspectorate Ecologist, An Bord, Pleanála

1.0 Introduction

1.1. Limerick City and County Council is seeking approval from An Bord Pleanála for the proposed Foynes to Limerick Road (including the Adare bypass). The proposed road development (PRD) would comprise a new road between the towns of Foynes, Askeaton, Rathkeale and Adare to link to Limerick City via the existing M20 motorway. The PRD would be located for the most part in a rural landscape of West County Limerick and is within proximity to a number of European Sites designated Special Area of Conservation (SAC) and Special Protection Areas (SPA), part of the European Network of Natura 2000 sites.

1.2. A Natura Impact Statement (NIS) prepared by Ecologists from EirEco in conjunction with ROD-AECOM Alliance on behalf of the applicant was submitted as part of the overall application to inform Appropriate Assessment (AA) of the proposed road development. In screening the need for AA, the applicant determined that in the absence of mitigation measures, the proposed development could give rise to significant effects on four European sites and therefore a NIS was required to inform AA. The NIS comprises a focused scientific examination of the potential adverse effects of the proposed road development alone and in combination with other plans and projects on the conservation objectives of the following European Sites:

1. Lower River Shannon SAC (002165)
2. River Shannon and River Fergus Estuaries SPA (004077)
3. Curraghchase Woods SAC (000174)
4. Askeaton Fen Complex SAC (002279).

The potential for the proposed road development to significantly affect other European sites was excluded by the applicant in the AA Screening Report.

Following a request for further information the applicant submitted additional updated scientific information and assessment on the potential for effects on Sea Lamprey and the extension of pre- construction monitoring, and together with submissions and information gathered at the oral hearing, this suite of scientific information is considered in the AA.

1.3. This report and assessment has been prepared by Dr Maeve Flynn MCIEEM Inspectorate Ecologist, providing expert support to the Inspector and to inform the AA process for the Board. The assessment comprises an expert examination and evaluation of the information supplied by the applicant to inform the AA of the PRD and been prepared in line with the requirements of Sections 177U and 177V of part XAB of the Planning and Development Act 2000 (as amended) and relevant guidance including:

- DEHLG (2010). *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, National Parks and Wildlife Service. Dublin
- EC (2002) *Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EC*
- EC (2018) *Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC*
- EC (2021) Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (update of EC, 2002 above)

1.4. As part of the assessment, I undertook a site visit on 7th and 8th of September 2020. I was also in attendance for both module 1 Section 51 Application and module 2 (Section 49 Application) of the Oral hearing that was conducted remotely in February 2021.

1.5. This report details a full examination, evaluation and assessment to inform the overall decision making by the Boards Inspector and the Board in by providing a **recommended determination** for:

- Screening for appropriate assessment of the proposed development: an examination carried out in view of the best scientific knowledge to determine if the project individually or in combination with other plans or projects is likely to have a significant effect on European sites.
- Appropriate assessment: comprising a compete assessment of all aspects of the proposed development that could affect the conservation objectives of European sites with clear, precise and definitive conclusions as to the implications for the overall integrity of those sites.

2.0 **Proposed Development**

2.1. The proposed road development (PRD) is described in detail in the Natura Impact Statement, in EIAR Chapter 4 and summarised in the Inspectors Report. In order to avoid repetition, I summarise the aspects of the development that are of relevance to the AA in this section.

2.2. The PRD is 35km comprising 15.6km of Type 2 Dual Carriageway from Foynes to Rathkeale, 1.9km of single carriageway link road from Ballyclogh towards Askeaton, 17.5km of dual carriageway M21 Motorway from Rathkeale to Attyflin, of which 14km is new build (and the remainder of which is improvement of existing N21 to Motorway standard). The PRD also includes a new clear span bridge over the River Maigue at Adare. The final route design of November 2018 was informed by constraints study, route selection and design refinement in line with the TII Guidance Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA,2008). Construction compounds and haul routes have been identified and assessed as part of the overall PRD. The main construction compound will be immediately west of the proposed Rathkeale Junction, remote from the European sites. Other works associated with the PRD include the provision of drainage system, surface water treatment and attenuation treatment facilities, alterations of some existing services and utilities, earthworks, construction of farm access tracks, landscaping and other ancillary works. The PRD also includes a terminal service area for HGVs near Shannon Foynes Port, accommodation of a section of the Great Southern Train

Greenway at Rathkeale and the acquisition of nine dwelling houses (including two that are not occupied).

2.3. Construction time is estimated at potentially lasting 30-36 months. An Environmental Operating Plan (EOP) has been developed for the proposed road development in accordance with the TII *Guidelines for the Creation and Maintenance of an Environmental Operating Plan* and informed by relevant TII guidelines which will be finalised in the event that the PRD is given planning approval. The EOP includes all environmental commitments and mitigation measures detailed in the EIAR and the NIS and will include any further measures that may arise as conditions. The EOP details the approach to construction, erosion and sediment control, construction and demolition waste management, incident response and invasive species management.

2.4. The proposed alignment intersects directly with a European site at one location only. This is at the proposed bridge crossing of the River Maigue, part of the Lower River Shannon SAC at a location north of Adare Village. All watercourses impacted by the PRD are within the catchment of this SAC and the River Shannon and River Fergus Estuaries SPA is also within the zone of influence of the PRD. In addition to the bridge crossing of the River Maigue, there are four other major river bridges proposed over the Robertstown, Deel and Greanagh (two crossings) Rivers and a further 16 river/ stream bridges including crossings of the Ahacronane and Clonshire Rivers.

2.5. In developing the road alignment through the constraints and route selection process, European sites between Limerick and Foynes were taken into consideration with **avoidance of direct impacts** on the extensive Askeaton Fen Complex SAC, Curraghchase woods SAC and Barrigone SAC.

2.6. The application was accompanied by the following documents:

Natura Impact Statement (NIS) December 2019,

- Volume 1: Main text (including appendices A-G)
- Volume 2 Figures

Environmental Impact Assessment Report (EIAR) comprising:

Volume 1: EIAR Non-Technical Summary

- Volume 2: Main Text
- Volume 3: Figures
- Volume 4A and Volume 4B: Appendices
- Volume 5A and Volume 5B: Photomontages
- Mitigation Measures Report[8]

2.7. Following a request for further information from the Board, an NIS addendum was submitted which includes a detailed assessment of potential effects on the qualifying Interest species Sea Lamprey and revisions to the proposed pre-construction water sampling schedule in line with Inland Fisheries Ireland recommendations.

2.8. At the Oral hearing, clarifications and further opportunity to address submissions were considered and discussed by the applicant. Briefs of evidence relevant to Biodiversity and the NIS were presented by expert witnesses, Paul Murphy, Dr Tina Aughney and John Brophy and included responses to written submissions made by the public and by statutory bodies on the application and on further information submitted.

3.0 Submissions and Observations

3.1. Prescribed Bodies

Inland Fisheries Ireland (IFI) made a detailed submission (14.02.2020) including outlining the requirements and obligations under the Water Framework Directive whereby all necessary measures to prevent the degradation of the status of all surface waters must be considered in the approval of the road scheme. The submission emphasised the need for the protection of the fishery resource and all associated riparian habitats with particular reference to the Lower River Shannon SAC and the importance of the River Maigue for protected aquatic species including salmonids, lamprey species, European Eel and White Clawed Crayfish. IFI confirmed the presence of suitable (fish) spawning and nursery habitat within the development footprint. The submission also included confirmation of records of **sea lamprey** (a qualifying interest species of the SAC) in the River Maigue as far

[8] On 16th February 2021 (at the oral hearing), the applicant provided a document – 'Additions to the Schedule of Commitments submitted to An Bord Pleanála on Tuesday 16th February 2021'.

upstream as Adare and requested that the applicant include this species in the detailed assessment as part of the NIS.

Recommendations on appropriate mitigation measures were provided including the adherence to standard IFI Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016) and Biosecurity protocol for field survey work (IFI, 2010). The submission included a request that pre-works water quality monitoring be undertaken over a period 12 months and not six as detailed by the Applicant.

IFI Submission on Further Information (Dec 2020)

IFI acknowledged the Applicants response in relation the presence of Sea Lamprey within the River Maigue system and the revised surface water quality monitoring programme. IFI stated that they were satisfied by the response and had no further comment on the application as submitted.

IFI were represented at the oral hearing and made reference to the parameters of the water risk analysis tool used by the applicant (HWARAT) and requested that a soft start/ ramp up procedure be employed during any piling activities at the River Maigue bridge crossing to allow fish to move out of direct area of works. Both issues were addressed by the applicant. IFI confirmed that they would be available to work with the applicant and contractor once appointed to secure best outcome for fisheries in the area.

National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage:

No submission was made by the NPWS through the Development Application Unit as part of the Boards consultation process on the application. However, I draw the Inspector and the Boards attention to the point that the applicant provided evidence of significant engagement with NPWS in the course of the development of the preferred route, the planning of ecological survey and in the application for derogation licenses etc. I also note that a representative from the NPWS (Divisional Ecologist, Southern Region, Dr Jervis Good) attended the oral hearing virtually. No additional submissions or observations were made at the hearing by the NPWS.

An Taisce made a detailed submission as part of the consultation phase and made a further detailed submission at the Oral Hearing. General reference was made to biodiversity loss and the need for a robust assessment under the provisions of the Habitat Directive, but no specific issues related to the NIS were raised.

3.2. Observations (public)

There were a number of written submissions and observations from the public that referenced issues related to the Habitats Directive, Appropriate Assessment, protected habitats and species. Further observations/submissions were made in this regard during the oral hearing. Submissions and observations of relevance to the AA have been taken into account in my overall assessment and include the following:

- Impacts on hydrology of Askeaton Fen complex;
- Impacts on Lesser horseshoe bat population;
- Impacts on Lower River Shannon SAC- location of road bridge on River Maigue;
- Impacts on qualifying interest species of Lower River Shannon SAC, including Sea lamprey, River lamprey and Brook lamprey, Atlantic Salmon and Otter;
- Adequacy of survey for protected aquatic species.

4.0 Appropriate Assessment: Stage 1 Screening and Stage 2 AA

The section details the following:

- Compliance with Article 6(3) of the EU Habitats Directive
- Stage 1: Screening the need for appropriate assessment
- The Natura Impact Statement (NIS) and associated documents
- Stage 2: Appropriate assessment of implications of the proposed development on the integrity of each European Site.

4.1. Compliance with Article 6(3) of the EU Habitats Directive

Article 6(3) of the Habitats Directive requires that 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. The competent authority must be satisfied that the proposal will not adversely affect the integrity of the European site before consent can be given.

As a major infrastructure project, the PRD is not connected with or necessary for the management of any European site and therefore is subject to an assessment of the potentially significant effects on European Sites that form part of the Natura 2000 Network.

4.2. Screening the need for Appropriate Assessment

The Applicant provided a Screening Report for AA (NIS Appendix A) the conclusions of which informed the direction of the NIS. Notwithstanding the Applicants screening conclusion, the Board is obliged to undertake screening for AA and come to a formal screening determination as part of the Appropriate Assessment process. The Applicants Screening report informs this determination.

Overview of the applicants screening report

4.2.1. A **Screening Report for AA** is included as Appendix A of the NIS and is effectively repeated in Section 3 of the NIS (European Sites likely to be significantly affected). The applicant followed DEHLG (2010) guidance in selecting European Sites for consideration in AA. All European Sites within or immediately adjacent to the project area were considered and a likely zone of impact determined using Geographical information Systems (GIS) within an indicative buffer area of 15km. Consideration was also given to the potential for effects to other sites beyond this distance through hydrological connectivity or the occurrence of critical ex-situ habitats.

Given the scale and extent of this major infrastructure project, I am satisfied that the zone of influence is appropriate and incorporates all sites that require consideration**.**

4.2.2. Seven European Sites were identified within or adjacent to the likely zone of impact. These sites are presented in Table 3.1 NIS Appendix I Screening Report and in Section 3 of the NIS and summarised in **Table 1** of this report for ease of reference. The established source-pathway-receptor model of impact prediction was employed. Potential impact pathways from various aspects of the PRD to these sites were considered and only those sites where pathways were identified were taken forward for further consideration.

4.2.3. Pathways considered included physical proximity, air, water and ecological interactions. Sources of risk (direct and indirect) considered by the Applicant included loss and/or fragmentation of habitats, direct mortality of species, disturbance caused by noise, vibration and lighting, pollution and mobilisation of sediment which could alter ecological conditions and functions of the sites.

4.2.4. The full catalogue of qualifying interest features of the SAC sites and special conservation interest of the SPA sites and associated conservation objectives, attributes and targets have been taken into account and are listed in the screening report and NIS (Table 3.3).

4.2.5. The applicant ruled out the possibility of any effects of the project alone on the following European Sites based on (a) absence of ecological pathways linking those sites to any impact that may arise from the proposed road development, (b) distance from those sites and (c) lack of suitable ex- situ habitat for mobile species including dispersing Hen Harrier.

- Barrigone SAC
- Tory Hill SAC
- Stacks to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA

4.2.6. The PRD intersects directly with the Lower River Shannon SAC at the River Maigue Bridge crossing, downstream of Adare. This is the only location along the scheme where the infrastructure will have a direct impact on a European Site, and it is evident that significant effects are likely to arise in the absence of mitigation measures. There are numerous other ecological connections with this SAC across the extent of the proposed road scheme as all river and streams crossed by the

proposed road scheme are within the wider catchment of the Lower River Shannon and all discharge into the SAC.

4.2.7. The River Shannon and Fergus SPA overlaps to a large extent with the boundaries of the Lower River Shannon SAC and the proposed road development is in close proximity to the SPA at its most western extent (Robertstown/ Churchfield Creek) and there are numerous pathways for potential impacts on this site. I note some discrepancies between the distance quoted between the AA Screening report (400m) and Section 3 of the NIS (150m and also 400m) prepared by the applicant. My estimate from examination of the mapping provided is that the SPA boundary is within 200m of the edge of the land take required for the PRD at the closest point at Churchfield/Robertstown.

4.2.8. Further possible ecological connections are identified for Curraghchase Woods SAC in relation to the Lesser Horseshoe Bat population which is a qualifying interest (QI) of this site. Bat surveys throughout the study area of the PRD identified the presence of Lesser Horseshoe bats (outside of the SAC). Further assessment and analysis required to determine if any possible disruption of flight paths and or habitat fragmentation caused by the PRD could affect this population and/or the wider LHB population outside of the SAC. Due to distance from the SAC, no impacts could occur to known roost sites within the SAC, linear habitats within 2.5km of the SAC or the habitats for which this site is designated.

4.2.9. The possibility of hydrological connections between land impacted by the proposed road scheme and the extensive Askeaton Fen Complex SAC could not be excluded on preliminary examination. Any alteration or disruption of hydrological pathways could result in significant effects on the ecological functioning of the Fen Complex and further detailed assessment and analysis is required to rule out adverse effects.

Table 1: Summary of screening table for European Sites considered within a possible zone of influence

European Site (code)	Full list of Qualifying interest /Special conservation Interest	Distance from proposed development (Km)	Connections (source, pathway receptor)	Considered further in screening Y/N
Lower River Shannon SAC [002165]	Sandbanks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide *Coastal lagoons Large shallow inlets and bays Reefs Perennial vegetation of stony banks Vegetated sea cliffs of the Atlantic and Baltic coasts Salicornia and other annuals colonising mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*) Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion,Alnion incanae, Salicion albae*) Freshwater Pearl Mussel (*Margaritifera margaritifera*)	0 km at River Maigue Intersects/ crosses the SAC at River Maigue	River Maigue bridge crossing is within the SAC and there are hydrological/ecological connections with all watercourses crossed by the proposed road eventually discharging into the Estuary	Y

	Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*) River Lamprey (*Lampetra fluviatilis*) Atlantic Salmon (*Salmo salar)* Bottle-nosed Dolphin (*Tursiops truncatus*) European Otter (*Lutra lutra*)			
River Shannon and River Fergus Estuaries SPA [004077]	Cormorant (*Phalacrocorax carbo*) Whooper Swan (*Cygnus cygnus*) Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Wigeon (*Anas penelope*) Teal (*Anas crecca*) Pintail (*Anas acuta*) Shoveler (*Anas clypeata*) Scaup (*Aythya marila*) Ringed Plover (*Charadrius hiaticula*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Lapwing (*Vanellus vanellus*) Knot (*Calidris canutus*) Dunlin (*Calidris alpina*) Black-tailed Godwit (*Limosa limosa*) Bar-tailed Godwit (*Limosa lapponica*) Curlew (*Numenius arquata*) Redshank (*Tringa totanus*)	Within 0.2km at closest point	Within close proximity at western extent of scheme and hydrological connections throughout the wider area. Possible ex-situ sites for SCI species Whooper Swan in proximity to the PRD.	Y

	Greenshank (*Tringa nebularia*) Black-headed Gull (*Chroicocephalus ridibundus*) Wetlands and Waterbirds			
Curraghchase Woods SAC [000174]	*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *Taxus baccata woods of the British Isles Lesser Horseshoe Bat (Rhinolophus hipposideros)	3 km	Possible habitat connections with linear habitats affected by the proposed road- (Lesser Horseshoe bat)- disruption of flight corridors	Y
Askeaton Fens Complex SAC [002279]	*Calcareous fens with *Cladium mariscus* and species of the *Caricio davallianae* Alkaline fens	0.5 km	Possible hydrological/ hydrogeological connections	Y
Barrigone SAC [000432]	*Juniperus communis* formations on heaths or calcareous grasslands Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) Limestone pavements Marsh Fritillary (E*uphydryas aurinia*)	0.5 km	No connections identified by applicant See section 4.3.4-4.3.5 of this report- consideration of haul route	N (Applicant) Y (Inspectorate Ecologist)
Tory Hill SAC [000439]	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Alkaline fens	6 km	No ecological connections identified	N
Stacks to Mullaghareirk Mountains, West Limerick Hills	Hen Harrier (*Circus cyaneus*) (Breeding)	9.5 km	No ecological connections identified	N

and Mount Eagle SPA [004161]				

4.2.10. For those European Sites identified as having some ecological connection to the zone of influence of the proposed road development, the AA Screening report (replicated in Section 3 of the NIS) further details those sites and examines the potential risks to individual qualifying interests, their extent and character, conservation objectives, targets and attributes for each European Sites (Tables 4.1-4.4). The Inspector and the Board will note that the qualifying interest (QI) species Sea lamprey was subsequently included in the NIS (screened in) for the Lower River Shannon SAC following a request by IFI. In addition, I note that the QI feature *Mudflats and sandflats not covered by seawater at low tide* [1140] is included in Section 3 of the NIS as a habitat identified at risk of significant effects but not in the original screening conclusion for this site. I refer the Inspector and the Board to **Tables 3.3-3.6 of the NIS** for a full list of qualifying interest features for these sites.

4.2.11. Considering the possible direct and indirect impacts arising from the project alone, the applicant found potential for significant effects to occur, or such effects could not be excluded for certain QI features of these four European sites. Therefore, further assessment through the preparation of a NIS was required to establish whether adverse effects on the integrity of these European Sites could be excluded. As the PRD could have significant effects alone, i.e., the trigger for AA, the consideration of in-combination effects was addressed by the applicant in the NIS and not in the screening stage for those sites.

4.2.12. Applicants Screening determination for AA

The applicant came to the following screening determination:

Having considered the nature, scale and location of the proposed road development and the Conservation Objectives of the European Sites within the likely zone of impact, and having applied the Precautionary Principle, it was determined that the proposed road development has the potential to result in likely significant effects on certain Qualifying Interests in four European Sites as summarised below

European Site	Qualifying Interest(s) *priority habitat
Lower River Shannon SAC [002165]	**Mudflats and sandflats not covered by seawater at low tide [1140]** Water courses of plain to montane levels with the *Ranunculion* *fluitantis* and *Callitricho-Batrachion* vegetation [3260] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] Sea Lamprey (*Petromyzon marinus*) [1095] **River Lamprey (*Lampetra fluviatilis*) [1099]** Atlantic Salmon (*Salmo salar*) [1106] European Otter (*Lutra lutra*) [1355]
River Shannon and River Fergus Estuaries SPA [004077]	Whooper Swan (*Cygnus cygnus*) [A038] Wetlands and Waterbirds [A999]
Curraghchase Woods SAC[000174]	Lesser Horseshoe Bat (*Rhinolophus hipposideros*) [1303]
Askeaton Fens Complex SAC [002279]	*Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]

(QI features **in bold** are those included by the applicant post initial screening report)

As significant effects on these European Sites and their respective Qualifying Interests, as listed in Table above, cannot be ruled at this stage, the AA process must continue to Stage 2 in order to undertake a full assessment of the implications of the proposed road development for these European Sites, in view of their Conservation Objectives.

4.3. Screening Determination (recommendation)

4.3.1. Overall, I consider that the scientific information (in terms of general approach and information on European Sites) presented in the screening report and NIS is robust and in line with current guidance and the requirement for best available scientific knowledge. The information provided is adequate to undertake Screening for AA and to come to an AA Screening determination in line with the provisions of S177U.

4.3.2. In determining the possibility of significant effects of the PRD on European sites in view of their conservation objectives, the applicant considered the likely impacts of such infrastructure including direct and indirect impacts on habitats, disturbance to species from noise, vibration, lighting etc, pollution and sedimentation of watercourses and receiving habitats. This approach is in line with the preliminary nature of the screening test, with more detailed examination of impacts presented in the NIS for AA.

4.3.3. Taking into account the location, size, scale and likely impacts of the proposed scheme, I would agree that the possibility of significant effects can be excluded for Tory Hill SAC and the Stacks to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA based on the objective information and scientific justification provided by the applicant.

4.3.4. In relation to Barrigone SAC, I consider that the screening report could have expanded further on the possible impacts on this site before coming to a conclusion of no potential for direct or indirect effects. Calcareous grassland habitats in particular are sensitive to Nitrogen deposition which may arise from NOx emissions associated with major roads. EIAR *Chapter 13 Air Quality and Climate*, details the scope for consideration of such effects on sensitive ecological sites. European sites within 200m of affected roads were determined to require quantitative air quality assessment (UK DMRB guidance and TII Air quality Guidance). The southernmost boundary of Barrigone SAC is, at 500m, outside the area at risk from the effects nitrogen deposition arising from the construction and operation of the proposed road development. However, I have also considered proposed haul routes for construction traffic in this context, an issue not referenced in the AA Screening Report. The existing N69 will be used as a haul route for HGVs during the construction phase. Barrigone SAC extends along the southern boundary of the N69 for approximately 1.4km. A significant increase in heavy goods vehicles (HGVs) during the construction period could have the potential to affect the critical level of NOx and NO2 dry deposition at that site. The UK DMRB guidance (UK Highways Agency, 2007), on which the TII guidance is based, states that road links (which would include haul routes) meeting certain criteria can be defined as ‘affected’ and require assessment if, among other criteria, HGV flows change by 200 vehicles per day or more.

4.3.5. While not referred to in the screening report, Chapter 13 of the EIAR section *13.3.1 Construction stage* considered these criteria in accordance with 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (TII, 2011) and concluded that the construction stage traffic does not meet the criteria to be included in the local air quality assessment and was scoped out from further assessment. A predicted 82 additional HGV (AADT HGV) vehicles will utilise the N69 East of Askeaton during construction (see Table 12.8 EIAR of Chapter 13 (Air Quality and Climate) of the EIAR), significantly below the number of 200 that would classify a haul route as 'affected'. Therefore, based on objective information relating to air quality during the construction stage presented in Chapter 13 of the EIAR, I am satisfied that the risk of significant effects can be excluded for Barrigone SAC in addition to those aspects considered in the screening report.

Screening stage and exclusion of certain QI features from further assessment

4.3.6. It is obvious, based on preliminary examination of the proposed road scheme, that aspects development alone may result in significant effects on the Lower River Shannon SAC and River Fergus and River Shannon Estuaries SPA in relation to a number conservation objectives and that the proposed development must be *screened in* for AA. (In addition, the Inspector and the Board will note that proposed development includes detailed mitigation measures which cannot be taken into account during screening and must be considered as part of AA). I also concur with the Applicants inclusion of Curraghchase Wood SAC and Askeaton Fen complex in the AA due to uncertainty regarding possible ecological connections/ interactions of certain QI features within the area affected by the development. Therefore, I agree with the applicant's determination regarding the European Sites that required AA and that have been included in the NIS.

4.3.7. As noted, the applicant further refined screening stage to determine the individual qualifying interest features of those sites that they considered required detailed assessment in the NIS and any subsequent AA. This approach can be helpful, streamlining the elements required detailed assessment. However, I consider that a number of features may have been excluded prematurely in the screening stage in relation to the Lower River Shannon SAC in particular. The QI features of Estuaries

[1130] and Atlantic salt meadows (*Glauco Puccinellietalia maritimae*) [1330] are, by my examination, also potentially within the zone of influence of the proposed road development as these habitats are at the receiving end of (affected) watercourses that discharge into the SAC. The conservation objectives document (NPWS 2012) for the Lower Shannon SAC shows that Atlantic salt meadow habitat occurs within the Churchfield Estuary. The Ahacronane River, and three further watercourses crossed/affected by the proposed road scheme discharge into this estuary at its western extent. In the absence of mitigation measures, construction related impacts such as surface water pollution and sedimentation as well as operational related water pollution may affect the ecological functioning of these habitats.

4.3.8. The River Shannon and River Fergus Estuaries SPA is *screened in* by the applicant for inclusion in the AA of the PRD for two SCI features: the possibility of ex-situ disturbance of Whooper Swan and risk of disturbance and pollution to the feature Wetlands and Waterbirds. The applicant expanded on this in Table 3.4 of the NIS for the individual SCI bird species. The conservation objectives for the QI feature of *Wetland and Waterbirds* relates to habitat area only and not the waterbird population *per se*. As significant numbers of wintering water birds use the Chruchfield Estuary and construction works in the vicinity of this area may pose of risk of disturbance to wintering waterbirds, comprised of numerous species, I will consider these further in the AA, as the applicant has in section 3 of the NIS.

4.3.9. These considerations do not change the overall screening determination in terms of the European sites that require further detailed assessment as part of AA (note that the Screening test is for likely significant effects on *European Sites***)** and can be dealt with in my assessment as part of the AA based on the scientific information provided by the applicant and available to the Board.

4.3.10. Based on my examination of the applicants screening report and NIS, supporting information included the EIAR, information available on the NPWS website and my own site visit and overall assessment, I concur with the applicants determination and conclude that the proposed development alone may result in significant effects (or such effects cannot be ruled out at this stage) on four European sites and therefore, appropriate assessment is required to determine if adverse effects on site integrity can be ruled out for those sites. In combination effects are considered in detail in the AA and include the project and plans identified by the applicant.

4.3.11. The possibility of significant effects on a further three European Sites can be excluded with confidence as it has been demonstrated that no ecological pathways exist or that those connections are weak and pose no significant risk alone and there is no additive effect that could combine with other plans and projects to give rise to significant in combination effects in view of the conservation objectives of those sites. The European Sites excluded from the appropriate assessment of the road scheme are Tory Hill SAC, Barrigone SAC and Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA.

4.3.12. While the design of the overall scheme was influenced by environmental constraints, including European Sites, no measures intended to avoid or prevent effects of the final design road alignment on European Sites were considered in the Screening report or in my assessment.

Recommended screening determination

In screening the Foynes to Limerick Road Scheme including the Adare bypass for appropriate assessment, it has been determined the development alone is likely to result in significant effects on the Lower River Shannon SAC and The River Shannon and River Fergus Estuaries SPA in view of a number of the conservation objectives of those sites and there is uncertainty regarding the possible significant impacts on two further sites namely, Curraghchase Woods SAC and Askeaton Fen Complex SAC, therefore appropriate assessment is required.

The possibility of significant effects has been excluded for other European sites on the basis of objective information including distance from the sites and a lack of meaningful ecological connections. European sites excluded from further assessment include Barrigone SAC, Tory Hill SAC and Stacks to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA.

4.4. The Natura Impact Statement (NIS)- overview

4.4.1. The NIS submitted with the application (December 2019) examines and assesses in detail the potential impacts identified at the screening stage and details mitigation measures required to exclude adverse effects on the integrity of the following European Sites:

- River Shannon SAC and The River Shannon and River Fergus Estuaries SPA in view of a number of the conservation objectives of these sites.
- Curraghchase Woods SAC and Askeaton Fen Complex SAC in view of uncertainty regarding the possible significant impacts on a number of the conservation objectives of these sites.

4.4.2. The NIS was prepared by competent experts with demonstrated expertise and experience in large scale infrastructure projects such as the proposed road scheme. Experts in certain animal groups and species (including Lesser Horseshoe bat) were also involved in the field surveys undertaken and in the assessment of impacts.

4.4.3. The NIS was prepared in-line with standard best practice guidance and informed by the following studies, surveys and consultations (sections 1.3 and 1.4 of the NIS):

- Desktop and literature study.
- Multi-disciplinary ecological surveys undertaken in line with TII/NRA Guidance for road schemes including habitat/botanical, mammals (including otter), bat (including Lesser horseshoe bat) and bird surveys.
- Wintering bird surveys for Whooper Swan
- Consultations with the National Parks and Wildlife Service, Inland Fisheries Ireland,
- Consultations with relevant NGOs including Bat Conservation Ireland, the Vincent Wildlife Trust and BirdWatch Ireland.

4.4.4. In line with best practice guidance, a detailed description of the PRD is provided in the NIS as a standalone document. This includes a description of the main construction works, duration (2.5-3years), environmental operating plan, incident response plan and invasive species management.

4.4.5. A full assessment of potential significant effects on the conservation objectives, targets and attributes of qualifying interest features for each site screened in for detailed assessment is presented in Section 4 of the NIS. This assessment is based around the main impacts related to changes / deterioration of water quality, changes to hydrological /hydrogeological regime, degradation of habitats, disturbance of QI

species, disturbance of protected plant species and effects on Lesser horseshoe bat habitat in the wider area.

4.4.6. Mitigation measures have been designed around the mitigation hierarchy and detailed for each qualifying interest feature considered at risk of adverse effects. There is a strong focus on water quality protection during construction phase and during the operational phase and measures to protect and prevent significant disturbance of aquatic species. The maintenance and reconnection of ecological features (outside of European sites) including watercourses and hedgerows through design and biodiversity planting are designed to ensure the continued free movement of species in the wider landscape.

4.4.7. The assessment presented in the NIS demonstrates interaction with other specialists and environmental topics in the avoidance and reduction of impacts on hydrology and hydrogeology

4.4.8. The effectiveness of mitigation measures is considered through the examination of any residual effects and in-combination effects with plans and projects are assessed.

4.4.9. The NIS concluded that, subject to the implementation of the recommended mitigation measures, the proposed road development would not by itself or in combination with other plans and projects adversely effect the site integrity of the Lower River Shannon SAC, the River Shannon and River Fergus Estuaries SPA, the Curraghchase Woods SAC and the Askeaton Fen Complex SAC, in view of their Conservation Objectives.

4.4.10. In a written response to the request from further information (September 2020) Limerick City and County Council provided clarification on all issues raised in the Board's request for further information.

4.4.11. Further information received included assessment Sea Lamprey (*Petormyzon marinus*) in an addendum to the NIS as part of the assessment of conservation objectives for the Lower River Shannon SAC. These inclusions are added to Table 3.3 and 3.7, Section 3. 4 and Sections 4 and 5 of the NIS.

On request from Inland Fisheries Ireland, the applicant has agreed to a 12-month period of monthly water quality sampling, pre-construction, to establish baseline conditions. This extended timeframe from 6 to 12 months is to account for seasonal variation in water quality parameters.

4.4.12. Having reviewed the NIS, response documents, all supporting documentation and submissions, I am satisfied that together these documents provide accurate and up to date information in respect of the baseline conditions and uses the best scientific information available on European sites, and clearly identifies potential adverse impacts. Details of mitigation measures, how and when they will be implemented, are detailed in Section 5 of the NIS. Ecological monitoring of mitigation measures by an Ecological Clerk of works (ECow) is included in line with best practice. Mitigation and monitoring will be manged by the appointed contractor and an Environmental Operating Plan has been drafted which incorporates all mitigation measures detailed in the EIAR and NIS. An additional mitigation document was supplied at the oral hearing further detailing a Schule of Commitments.

4.4.13. I am satisfied that the information is sufficient to allow for a complete assessment of the proposed development (see examination and analysis below) in view of the requirements of the Habitats Directive and Section 177V of PDA and that precise and definitive findings can be reached with regard to the implications of the project on European Sites.

4.5. Appropriate Assessment and Integrity Test

The following is an assessment of the implications of the project on the relevant conservation objectives of the European sites using the best scientific knowledge available. This includes the NIS, further information received, evidence presented at the oral hearing and consideration of submissions related to Article 6(3) of the Habitats Directive. All aspects of the project which could result in significant effects are assessed and mitigation measures designed to avoid or reduce any adverse effects are examined and assessed.

4.5.1. **Tables 2-5** at the end of this report summarise the findings of the appropriate assessment and site integrity test. The Inspector and the Board should note that this is based on the scientific information provided in the NIS and full detail is not repeated. Potential adverse effects on conservation objectives, targets and attributes, are examined and assessed in relation to the aspects of the project (alone and in combination with other plans and projects). Mitigation measures are included, and clear, precise and definitive conclusions reached in terms of adverse effects on the integrity of European sites.

4.5.2. Supplemental to the summary tables, key issues that arose through my examination and assessment of the NIS, further information request and during the course of the OH are expanded upon in the text below.

4.5.3. Lower Shannon SAC

4.5.4. Table 2 details the key issues and potential adverse effects on conservation objectives of habitats and species identified as being within the zone of influence of the PRD. The assessment of the potential adverse effects of the project is confined to the following Annex I habitats:

- Mudflats and sandflats not covered by seawater at low tide
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
- *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion,Alnion incanae, Salicion albae*)
- Estuaries
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

As part of my assessment, I included Estuaries and Atlantic salt meadows as along with Mudflats and sandflats not covered by seawater at low tide, these Annex I habitats comprise the wetland habitat at Churchfield Estuary as detailed in the maps included in the NPWS conservation objectives for the site. Indirect effects due to construction/ operational water pollution of connected water courses including Ahacronane River and Robertstown Stream could pose a risk to the ecological functioning of these habitats. I am satisfied that the mitigation measures proposed to prevent construction or operational related water pollution and any possible subsequent degradation of these habitats will be avoided and adverse effects can be excluded.

4.5.5. The possible effects of air pollution on European sites were not specifically referenced in the NIS but are considered in chapter 7 (Biodiversity) of the EIAR and chapter 13 (Air Quality and Climate). European sites within 200m of the PRD were determined to require quantitative air quality assessment (UK DMRB guidance and

TII Air quality Guidance) namely Lower River Shannon SAC and River Shannon & River Fergus Estuaries SPA. The assessment demonstrated an increase in NOx and NO_2 dry deposition from the operation of the RPD at the location of the River Maigue bridge crossing within Lower River Shannon SAC at Ardshanbally does not represent a significant increase over the background levels at a distance of >20m from the roads centre line (for NO_x, marginally above the limit value for the protection of vegetation of 30 µg/m^3 at 0 and 20m) and would not give rise to any significant effects and therefore adverse effects on site integrity could be excluded. This conclusion was reached based on the very marginal increase of ambient NO_x within a narrow band and that the habitats present are not considered sensitive to a marginal increased loading in Nitrates taking the conservation objectives of the site into account. Similarly, the River Shannon and River Fergus Estuary SPA and Lower River Shannon SAC at Churchfield Estuary/Robertstown will not be significantly affected. The PRD will cause a decrease in NO_x and NO_2 dry deposition rates at this location when assessed against the 'do nothing' scenario.

4.5.6. The following Annex II species are considered in the NIS with the inclusion of Sea Lamprey in further information following on from the IFI submission:

- Sea Lamprey (*Petromyzon marinus*)
- River Lamprey (*Lampetra fluviatilis*)
- Atlantic Salmon (*Salmo salar*)
- European Otter (*Lutra lutra*)

4.5.7. I am satisfied that a complete and accurate assessment of these species has been undertaken that no other Annex II species for which the site is designated could be affected by the PRD.

4.5.8. As also detailed in the biodiversity assessment, observations by Mr. Ian Gilvarry (FI-4) raised concerns regarding the lack of specific (instream) surveys for a number of qualifying interest species of Lower River Shannon SAC, including Sea lamprey, River lamprey, Brook lamprey and Atlantic Salmon questioning how an impact assessment can be undertaken in the absence of detailed information on these species. Mr. Murphy responded by assuring the participants at the oral hearing and the Board that the level of survey undertaken has met with all requirements, applying

accepted and standard methodologies. A comprehensive suite of surveys was undertaken which have established the ecological baseline. He outlined that the requirement for invasive instream fish survey, which would involve electrofishing, to inform the results, is not standard or applicable for an approach and design where all major watercourse crossing are clear span structures and disturbance of spawning habitat is avoided. He maintained that the level of assessment was more than adequate to determine the ecological value of the watercourses in question and to identify the range of possible impacts. He stated that the overall approach is aimed at avoiding impacts in the first instance.

4.5.9. I accept Mr. Murphy's defence of his approach as it is based on the standard Industry guidance Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The guidance is clear that fish surveys should only be considered in those situations where significant impacts are anticipated for example, where the principal likely effect would be disturbance of spawning habitat or the creation of barriers to migration and that impact assessments should, wherever possible be based on existing information, adopting a precautionary approach.

4.5.10. In both written and oral submissions on the application and further information, Mr. Simon White (Env-31) and others, raise concerns regarding the decision to locate the major bridge crossing of the River Maigue within the Lower River Shannon SAC at the proposed location North of Adare at Islandea. The contention is that a more suitable location and feasible alternative is available that would not impact directly on the SAC (if the scheme was a more modest bypass of Adare as opposed to the combined with the Limerick Foynes road proposal). The location of a bridge crossing south of Adare, as in a previous application for the Adare by-pass, is suggested as a more suitable location.

4.5.11. As part of his brief of evidence, Mr Murphy described how the route option which followed the route of the 2010 proposal for the Adare bypass was discounted due to technical, cost and environmental issues including an increased length of over 2.5km compared to final design, increased construction costs, longer journey times and higher carbon emissions. While a crossing south of Adare would avoid direct impacts on the SAC, a bridge crossing within the freshwater reaches of the River Maigue would still pose significant risks for conservation interests species including

spawning Salmon, Lamprey species and otter. Mr Murphy reiterated that the proposal before the Board is based on suitable design aimed at avoiding adverse effects, including the provision of a clear span over the river and retention of riverbank habitats and mammal passage along the riverbank.

4.5.12. The technical justification for the final route design has been provided in Chapter 3 Alternatives Considered, Chapter 4 Description of the PRD and the need and type of road selected along each of Section A, B, C and D has been considered in the inspector's assessment. As described by Mr. Murphy, any crossing of the River Maigue would have potentially significant implications for the habitats and species present whether within the SAC boundary or not. The design of the proposed river crossing is based on avoidance of impacts on qualifying habitats and species and ensuring the continued ecological integrity of the site at this location.

4.5.13. I am satisfied that the mitigation measures designed into the scheme and aimed at avoiding in the first instance and preventing adverse effects on the Lower River Shannon SAC have been fully described in the NIS (and the EIAR) and are feasible. They clearly target the impacts identified and will be effective in reducing impacts below a level of significance as demonstrated in the assessment of residual effects. The measures are best practice and are informed by industry specific (TII) guidelines. There is a comprehensive plan (the Environmental Operating Plan) including a schedule of commitments on how to implement and monitor the mitigation measures.

4.5.14. Summary (from Table 2)

- The design of the PRD has ensured that there will be no direct impacts on Annex I habitats or priority habitats and that hydrological regimes will be maintained.
- The pollution prevention measures and monitoring plan will ensure that the favourable conservation condition of Annex I habitats will not be undermined by the PRD, and that habitats in unfavourable condition including priority habitats Alluvial forests will not be adversely affected or delayed in reaching their conservation objectives.
- Design of the scheme including clear span bridges over the major water courses avoids adverse effects on instream habitats and spawning habitat for

fish species and allows for the free movement Annex II species including Lamprey species, Atlantic salmon and Otter.

- The pollution prevention measures and monitoring plan will ensure that the favourable conservation condition of Annex II species will not be undermined by the PRD, and that species in unfavourable condition including Atlantic Salmon and Otter will not be adversely affected or delayed in reaching their conservation objectives

4.5.15. River Shannon and River Fergus Estuaries SPA

4.5.16. Table 3 details the key issues and potential adverse effects on the special conservation interests of the SPA. The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland and the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl. Twenty-one bird species are listed as special conservation interest (SCI) for the SPA and the wetland habitat upon which they depend is also an SCI for this site.

4.5.17. Factors than can adversely affect the achievement of conservation objectives include, disturbance that could result in the displacement of one or more listed waterbird species, habitat modification and activities that could modify discrete areas within the SPA causing displacement from feeding or roosting areas.

4.5.18. The potential for the proposed development to cause direct effects of disturbance and displacement on the SCI bird species at the Churchfield Estuary/ Robertstown area at the western extent of the PRD is considered in Table 3.4 of the NIS. Significant populations of wintering waterbirds use the Churchfield Estuary for foraging. The NIS relied upon survey results from the EIAR prepared for the development of Shannon-Foynes Port (Capacity Extension at Shannon Foynes EIAR: Chapter 7 – Biodiversity) which showed that wintering bird numbers peak in the Churchfield Estuary in December and January (from 2016 and 2017 data) of with a maximum of 2,150 birds recorded. The most abundant species were Golden Plover, Dunlin, Lapwing, Wigeon, Teal and Black-headed Gull.

4.5.19. The potential for adverse disturbance effects on SCI species at this location is ruled out by the applicant. At 150m distant from the PRD at the closest point, visual

screening of construction activity will be provided by interviewing hedgerows, and the likelihood of direct disturbance events are low. Noise generated from construction activity may result in temporary localised disturbance if occurring during the winter period when numbers of birds are at their highest, but it would not lead to any significant decrease in range, timing or intensity of use of the waterbirds. This conclusion is backed up by the scientific evidence referenced in the NIS related to work done by Cutts *et al* 2009[9] (the Institute of Estuarine & Coastal Studies -IECS). Table 12.7 of EIAR Chapter 7 Noise shows the various levels of construction noise at increasing distances. At 150m, which is the closest point between the PRD and the SPA boundary, noise levels are modelled at 70dB L_{Aeq} for the most intrusive works (including rock breaking) to 52dB L_{Aeq} for site compound activity and landscaping works. In updated research by Cutts and the ICES, I note that the Waterbird Disturbance & Mitigation Toolkit (ICES, Cutts *et al* 2013[10]) references Acceptable 'dose' levels of up to 70dB(A) which are unlikely to have any effect while levels of 71-73 70dB(A)) might occasionally induce a low-level behavioural response in waterbirds.

4.5.20. The potential for disturbance/ displacement of Whooper Swans from ex-situ foraging or roosting sites, if occurring close to PRD was also examined. Dedicated survey showed that PRD will not impact on birds flyway paths, foraging areas or distribution and therefore no adverse effects on range timing or intensity of use of whooper swan areas within or outside the SPA is predicted.

4.5.21. Potential water quality risks from the PRD including hydrocarbons or other pollutants which could infiltrate the estuary and result in direct effects on birds' health or indirect effects on prey availability will be prevented by the application of detailed pollution prevention measures including hydrocarbon interceptors at this location and monitoring plan will ensure that the favourable conservation condition of the wetlands and waterbirds SCI will not be undermined by the PRD.

4.5.22. Summary (from Table 3)

[9] Cutts, N.D., Phelps, A., & Burdon, D., 2009. Construction and waterfowl: Defining sensitivity, response, impacts and guidance. Report to Humber INCA. Institute of Estuarine & Coastal Studies, University of Hull.

[10] https://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/

- There will be no significant decrease in the range, timing of use of Churchfield Estuary by foraging wintering birds and the favourable conservation condition of the SCI wintering waterbird species will not be undermined by the PRD.
- The PRD will not impact on ex-situ sites used by Whooper Swan.
- The pollution prevention measures and monitoring plan will ensure that the favourable conservation condition of the wetlands and waterbirds SCI will not be undermined by the PRD.

4.5.23. Curraghchase Woods SAC

4.5.24. Table 4 details the key issues related to this SAC and to the wider population of Annex II and IV Lesser Horseshoe Bat (LHB) and include:

- Barrier effect of the PRD: indirect effects on movements and foraging of Lesser Horseshoe Bat outside of the SAC through loss /fragmentation of linear landscape features used as commuting corridors within the footprint of the PRD
- Possible adverse effects on SAC LHB population and LHB in wider landscape due to potential genetic isolation if habitat connections between populations are fragmented.

4.5.25. The PRD is outside of the defined site-specific foraging range as defined in the conservation objectives (2.5km from roost) located over 4km from known roost sites within the SAC at closest point and within 3 km of SAC boundary at the closest point. While research shows that the species normally forage within 2.5kms of their roosts, they are capable of undertaking longer movements therefore there is the possibility of indirect impacts both at construction and operation of the PRD on commuting bats linked to the SAC population. In addition, the specialists appointed by applicant stress that maintaining connectivity between the SAC population and LHB in the wider area is important to maintain the population in County Limerick. This is illustrated by a map prepared by the Vincent Wildlife Trust of potentially important flightpaths for LHBs in the Limerick landscape, linking the Curraghchase SAC to the south of the county (Plate 5.2 NIS). LHB was recorded in low numbers throughout the PRD study area covered by the bat surveys. The loss and fragmentation of

linear features such as hedgerows and treelines from the footprint area of PRD may affect commuting of bats in wider area and affect wider supporting populations of LHB and genetic exchange between populations.

4.5.26. The focus of mitigation measures to exclude possible adverse effects on the LHB population is the provision of mammal passage designed to allow unimpeded movement of LHB, combined with landscaping measures to reconnect linear habitats acting as flight corridors and to direct LHB to crossing points (15 specific to LHB with a further 19 suitable for all bats). In addition, lighting along river crossings and proposed bat passage areas will be limited to junctions and roundabouts, facilitating the movement or foraging behaviour of LHB and other bat species. There will therefore be no significant increase in artificial light intensity along commuting routes.

4.5.27. At the oral hearing Dr Tina Aughney of Bat Eco Services provided a comprehensive summary of the potential impacts on Lesser Horseshoe bats and other bat species and reaffirmed that all mitigation measures proposed are proven and effective with examples of successful bat mitigation measures presented. She addressed a written submission regarding mitigation measures for Lesser Horseshoe Bats in particular, clarifying that bat mitigation has been incorporated into the overall design of the scheme. Dr Aughney was satisfied that with the correct implementation of mitigation measures, any residual effect on the LHB populations would be slight and non-significant in view of the conservation objectives, reducing further over time with maturing landscape features.

4.5.28. I bring the Inspector and the Boards attention to the fact that the site-specific conservation objectives for Lesser Horseshoe Bat in Curraghchase Woods SAC does not make reference to wider population exchange and targets set for maintaining extent of foraging habitat and linear features within 2.5km of qualifying roosts will not be affected. However, given the stated concerns related to the relative isolation of the County Limerick LHB population, described by the Vincent Wildlife Trust as the 'Limerick Gap'[11]it is clear that maintaining linear habitat connectivity is of importance in supporting the population targets set for both winter

[11] The Vincent Wildlife Trust (VWT) (McAney et al., 2013) reported that a gap of over 45km has opened up between the roosts at Rathkeale in Co. Limerick and those at Castleisland and Tralee in north Co. Kerry. A distance of over 70km was measured between roosts that are used by more than 25 bats.

and summer roost populations at Curraghchase and smaller disparate roosts in the wider area. In addition, while the overall LHB population for the county is only several hundred and is confined to a small number of sites, Co. Limerick is key to ensuring connectivity between populations in the north and south.

4.5.29. Based on the assessment provided in the NIS, the four-season Bat report and the expert contributions of Dr. Aughney, I am satisfied that the mitigation measures proposed will reduce possible impacts on the LHB population of the SAC to non-significant levels by ensuring the unimpeded movement of this species across the landscape and maintaining flight corridors between the Curraghchase SAC and other LHB roosts throughout this area of County Limerick. Site specific conservation objectives for LHB will not be adversely affected and the PRD will not delay the overall objective of restoring the favourable conservation condition of LHB in Curraghchase Woods SAC.

4.5.30. Askeaton Fen Complex SAC

4.5.31. The potential for adverse effects on the Askeaton Fen Complex SAC is confined to indirect impacts on the hydrological regime that sustains the ecosystem functions of the Annex I habitats Alkaline Fen and the priority habitat Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (Table 5).

4.5.32. The NIS and appropriate assessment rely upon the detailed hydrological assessment presented in the EIAR and at the oral hearing and the independent assessment by Mr. Jer Keohane which shows that the proposed Road Sections A, B and D would have no hydraulic connection with the Askeaton Fens complex. In Section C, the road would be at grade or on slight embankments where it is in closest proximity to the Fen Complex (within 500m). The water balance calculations indicate that the PRD would be sited down gradient of the fen complex. Outflow streams from the Fen would cross the road, but there is expected to be a neutral impact on these surface water features. No potential Impact on the Askeaton Fen SAC is predicted by the applicant to arise during either the construction or operational phase, a finding supported by Mr Keohane in his assessment.

While avoidance of impacts on the Fen complex is the primary mitigation, a number of incorporated design measures have also been prescribed to further protected groundwater including the following:

- Sealed drainage system at areas of extreme and high aquifer vulnerability and where rock is close to surface.
- Drainage system to incorporate filter drains, sealed systems and vegetated sediment bays for attenuation ponds.
- Protection of ground water quality during construction through pollution prevention measures including treatment of site run-off before discharge.
- All measures are fully detailed in EOP including monitoring.

4.5.33. Summary: Ecological function will be maintained and the favourable conservation condition of the two Fen habitats will not be undermined by the PRD.

4.5.34. **In combination effects**

4.5.35. The requirement to undertake an examination and assessment of possible in-combination effects of the PRD on European sites with other plans and projects is addressed in the NIS section 7.3 and also in supplementary Information submitted to An Bord Pleanála on Monday 15th February 2021 at the oral hearing (updated list of plans and projects submitted after the finalisation of the EIAR and NIS).

4.5.36. Possible In-combination effects were determined by examining all proposed and existing large-scale plans and projects within 10 km of the proposed road development.

4.5.37. For the benefit of the Inspector and the Board, I have summarised the projects and plans considered in both assessments (NIS and supplementary information).

4.5.38. In an assessment of residual effects (NIS Section 6) the applicant concludes that with the full and proper implementation of mitigation prescribed in the NIS, no residual effects of likely significance will occur and there will be no adverse effects on the four European Sites in view of their conservation objectives. Therefore, there are no residual effects of significance arising from the PRD that could act in an

additive manner to combine with other plans and projects in relation to the conservation objectives of these sites. Nonetheless, there are other in-combination effects that could arise beyond purely additive impacts and these are also considered in the in-combination assessment.

4.5.39. The development of the PRD is intrinsically linked to the planned expansion and further development of the capabilities of the Shannon-Foynes Port Company as defined the Masterplan – Vision 2041 and this has been examined adequately for in-combination effects.

Table 6: projects and plans considered for in-combination effects with the PRD in relation to the Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, Curraghchase Woods SAC and Askeaton Fens Complex SAC

Projects		
Project	**Brief description**	**In combination effects**
Shannon-Foynes Port expansion	An area of 0.51 ha for quay/jetty development 33.95 ha undeveloped land at Durnish to the east for port related storage and ancillary activities EIAR and NIS	No adverse effects on site integrity of Lower River Shannon SAC or SPA from low levels of noise/visual disturbance and habitat loss. Mitigation for water quality, habitat deterioration and noise. No habitat loss of estuarine habitat predicted from PRD. No adverse in-combination effects will arise

N/M20 Cork to Limerick Road Improvement Scheme	Proposed Motorway scheme between N20 Blarney Cork with N21 west of Attyflin, Limerick- Scheme is still in development- Final route not selected -	Potential for in-combination effects if Lower River Shannon SAC affected. No EIA or NIS yet prepared, therefore assessment is not feasible. The possibility of adverse in-combination effects will have to be ruled out by the NIS and AA of the N/M20 scheme.
Bord na Móna	smokeless and biomass-based solid fuel manufacturing and packaging facility within industrial lands at Shannon-Foynes port. NIS prepared	Mitigation measures prescribed to avoid potential adverse effects arising from both the construction and operation of the project on the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. No precited residual effects such as could act in combination with the PRD to give rise to adverse effects
Nestlé – Wyeth Nutritionals Ireland Ltd	Number of permissions granted for construction and demolitions at this site. All emissions from	No precited residual effects such as could act in combination with the PRD to give rise to adverse effects

	plant within IPC license limit values	
Great Southern Railway extension	3km section from Rathkeale to Ballingarrane- intersects with PRD – underpass to be provided	Nature and scale of project along disused railway line will not give rise to any effects
Adare Manor Hotel and Golf Resort	Refurbishment works EIS and NIS – potential for impacts on bats including LHB	Due to the distance of the proposed road development from the Adare Manor Hotel, and the suite of mitigation measures proposed as part of the proposed road development, there will be no in-combination effects on Lesser Horseshoe Bat as a result of the two developments.
Irish Cement	10-year permission for replacement of fossil fuels and alternative use of raw materials	No precited residual effects such as could act in combination with the PRD to give rise to adverse effects
Greenstar Environmental Services Ltd.	Granted planning to increase waste accepted EIS	No precited residual effects such as could act in combination with the PRD to give rise to adverse effects
CPL fuels	Granted permission in 2015 for works including the alterations and	No precited residual effects such as could act in combination with the

	extension to the existing industrial building, erection of new buildings and hard-core area for processing and storage of solid fuel briquettes and to use the property for the import and export of products through Shannon-Foynes Port	PRD to give rise to adverse effects
Aughinish Alumina Ltd.	ten-year permission for development on site of c. 7 hectares located adjoining the existing Aughinish Alumina Ltd. plant for the provision of a Borrow Pit with an extraction area of c. 4.5 hectares; In planning process- decision awaiting EIAR and NIS	Incorporated mitigation measures NIS to avoid impacting on water quality within the SAC. Timing of works to avoid disturbance of wintering birds Subject to successful implementation of mitigation measures (if granted) – no adverse cumulative effects
Infill of land (Ref 20954)	2.27 ha 3km SE of PRD	No pathways for effects
Limerick City and County Council (Ref 201128)	1.7 km road Mungret	Likely significant effects screened out- no possible in combination effects
IDA Ireland (Ref 201128)	Office building IDA business park, Raheen	Likely significant effects screened out- no possible in combination effects
Housing developments (summary):		No impact is expected on the hydrological and

Mixed use Graigue Adare Affordable housing - Deerpark and Rathkeale Road Adare Rockspring developments (99 units Raheen Co, Limerick) Housing developments in Mungret : 96 units (Ref 2011140 and Ref 201115) 66 units (Ref 201195)		hydrogeological regime in the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA, or on any other European site and there is no potential for any in-combination effect with the proposed road development
Plans		
Shannon-Foynes Port Company Masterplan – Vision 2041 (2013)	High level vision on growth potential of port. Includes provision for reinstatement of the Foynes to limerick railway line and the implementation of the PRD SEA carried out	No potential for adverse effects on any European Sites arising from the combination of Vision 2041 and the proposed road development.
Limerick County Development Plan 2010-2016 (as varied) (as extended)	Transport and development objectives, includes provision for the PRD Subject to SEA and AA	No potential for adverse effects on any European Site arising from in-combination effects of the plan and the PRD
Southern Regional Assembly Regional	Subject to AA	No in-combination effects on the integrity of any European site arising as a

Spatial and Economic Strategy (RSES)		result of the interaction of the proposed road development with the RSES.

Summary: I am satisfied that a comprehensive assessment of possible in-combination effects of the PRD with other plans and projects has been undertaken for the European sites included in the AA and that no adverse in-combination effects will arise that could affect site integrity.

5.0 Appropriate Assessment Conclusion /Recommendation

5.1. Conclusion and Appropriate Assessment Determination in relation to Site Integrity

5.1.1. I am satisfied that the proposed development has been considered in light of the requirements of Sections 177U and 177V of the Planning and Development Act 2000 as amended. I consider that the Board can be confident that the information and assessment before them is complete, precise and definitive for the purpose of Appropriate Assessment.

5.1.2. Having carried out screening for Appropriate Assessment of the proposed development, it was concluded that it would be likely to have a significant effect on the following European sites part of the Natura 2000 network:

- Lower River Shannon SAC
- The River Shannon and River Fergus Estuaries SPA

In addition, effects were considered uncertain for the following European Sites:

- Curraghchase Woods SAC
- Askeaton Fen Complex SAC,

Consequently, an Appropriate Assessment was required of the implications of the project on the qualifying features of those sites in light of their conservation objectives.

5.1.3. Following Appropriate Assessment informed by a Natura Impact Statement, supplementary reports, information gathered at the oral hearing, submissions and observations and including the full application of mitigation measures, it has been determined that the Foynes to Limerick Road (including Adare Bypass) development, individually or in combination with other plans or projects would not adversely affect the integrity of Lower River Shannon SAC, The River Shannon and River Fergus Estuaries SPA, Curraghchase Woods SAC or Askeaton Fen Complex SAC the in view of the Conservation Objective of those sites.

5.1.4. This conclusion is based on a complete assessment of all aspects of the proposed road development including consideration of the following in view of the conservation objectives of those sites:

- It has been proven through detailed survey and analysis that there will be no loss or deterioration of Annex I or priority habitats where the proposed road scheme intersects directly with the Lower River Shannon SAC at the River Maigue bridge crossing due to the design of the scheme and no loss of supporting habitats or species required to maintain the functioning of these habitats that form the qualifying interests of that site or other European Sites.
- Following the implementation of mitigation measures to prevent any deterioration in water quality during construction or operation, the proposed development will not adversely affect the integrity of Annex I habitats and similarly, adverse effects on Annex II aquatic species including Sea Lamprey, River Lamprey, Atlantic Salmon and Otter will be prevented.
- The Foynes to Limerick Road (including Adare Bypass) will not pose an impediment to Otter movements within or outside the Lower River Shannon SAC and mitigation measures including the installation of mammal ledges, culverts and mammal resistant fencing will reduce habitat fragmentation and ensure permeability within the footprint of the road scheme. Mammal resistant fencing will prevent access onto the carriageway at crossing locations.
- Survey and analysis of wintering waterbirds including whooper swan has demonstrated that no significant levels of disturbance will arise that could

undermine the conservation objectives of the bird assemblages of the SPA. Following the implementation of mitigation measures to prevent any deterioration in water quality during construction or operation, the proposed development will not adversely affect the integrity of The River Shannon and River Fergus Estuaries SPA in view of the conservation objectives for wintering waterbird species and wetlands and waterbirds and no reasonable doubt remains as to the absence of such effects.

- Following the implementation of mitigation including dedicated passage facilities and landscaping measures to maintain habitat connectivity for Lesser Horseshoe Bats along the footprint of the PRD, the construction and operation of this proposed development will not adversely affect the integrity of Curraghchase Woods SAC in relation to conservation objectives for Lesser Horseshoe Bats and no reasonable doubt remains as to the absence of such effects.
- Following detailed hydrological assessment, it has been demonstrated that the PRD will not alter the hydrological regime that supports the functioning of the Fen Complex. With the implementation of integrated design measures and water quality mitigation, the construction and operation of this proposed development will not adversely affect the integrity of Askeaton Fen Complex and no reasonable doubt remains as to the absence of such effects.
- The Foynes to Limerick Road (including Adare Bypass) will, through the design and application of mitigation measures, ensure the preservation of the favourable conservation status of habitats characterised as being in favourable status and ensure that habitat characterised as being in unfavourable status will not be further harmed or rendered difficult to restore to favourable status.
- The Foynes to Limerick Road (including Adare Bypass) will, through the design and application of mitigation measures, ensure the preservation of the favourable conservation status of Annex II species characterised as being in favourable status and ensure that species characterised as being in

unfavourable status will not be further harmed or rendered difficult to restore to favourable status.

- The Foynes to Limerick Road (including Adare Bypass) development will, through the design and application of mitigation measures as detailed and conditioned ensure the lasting preservation of the essential components and characteristics of European Sites.
- The mitigation measures which follow the mitigation hierarchy of avoidance, design and direct measures to reduce impacts have been assessed as effective and fully implementable and are included in the recommended conditions of planning.

Therefore, the appropriate assessment has demonstrated beyond reasonable doubt that there will be no adverse effects on the integrity of any European Site.

6.0 Recommended Conditions

6.1. I recommend the inclusion of the following conditions to ensure the protection and maintenance of the conservation objectives of European sites affected by the Foynes to Limerick road (including Adare bypass):

(a) The developer shall ensure the appointment of an **Site Environmental Manager for the construction phase of the development**. The Site Environmental Manager shall be an experienced and responsible person and shall oversee that the environmental commitments and the Environmental Operating Plan are fully executed for the duration of works, and to monitor whether the construction phase mitigation measures employed are effective in addressing the environmental impact(s) that they were prescribed for. The Site Environmental Manager shall provide independently verifiable audit reports that shall be made available for inspection or audit by Limerick City and County Council, the National Parks and Wildlife Service and Inland Fisheries Ireland staff, as appropriate. All inspections, monitoring and results shall be recorded on standard forms.

(b) The developer shall ensure the appointment of an independent **Ecological Clerk of Works (ECoW).** The principal functions of the ECoW shall be as follows:

1. To provide ecological supervision of the construction of the proposed road development and thereby ensure the full and proper implementation of the mitigation prescribed in the submitted Natura Impact Statement and in Chapter 7 of the Environmental Impact Assessment Report (Biodiversity);
2. To regularly review the outcome of the specialist hydroacoustic monitoring and, on that basis, make any necessary adjustments to the mitigation;
3. To carry out weekly inspections and reporting on the implementation of the Contractor's Biosecurity Protocol.

In exercising his or her functions, the Ecological Clerk of Works will be required to keep a monitoring file and this will be made available for inspection or audit by Limerick City and County Council, the National Parks and Wildlife Service and Inland Fisheries Ireland, as appropriate, at any time.

Dr Maeve Flynn
Inspectorate Ecologist
10/02/2022

Appropriate Assessment Summary Tables 2-5

Table 2: Summary of Appropriate Assessment for Lower River Shannon SAC

Lower River Shannon SAC (002165)

Summary of Key issues that could give rise to adverse effects:

- **Direct impacts on QI habitats through habitat loss/degradation at proposed bridge crossing (construction and operation)**
- **Direct disturbance of QI species at proposed bridge crossing (construction and operation)**
- **Direct effects on SAC via decrease in water quality (construction and operation)**
- **Indirect effects on QI habitats and species via decreased in water quality in tributaries and other rivers and streams discharging into the SAC (construction and operation)**
- **Spreading of invasive species**
- **Timing of works**

Conservation Objectives: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf

		Summary of Appropriate Assessment			
Qualifying Interest feature	**Conservation Objectives** **Targets and attributes (summary- see Table 3.3 for full list)**	**Potential adverse effects**	**Mitigation measures** **(NIS, EIAR Chapter 19, EOP and Schedule of commitments)**	**In-combination effects**	**Can adverse effects on integrity be excluded?**

Mudflats and sandflats not covered by seawater at low tide (also sub type of Estuaries) Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community	To maintain favourable conservation condition Habitat area Community distribution:	At river Maigue crossing: bridge design avoids direct impacts- piers will be set into flood embankments Sheet piling defining works zone will avoid intertidal zone Deterioration of Water quality in construction and operation may affect habitat. Risks to vegetation structure and composition from invasive species	Detailed measures set out for pollution prevention for river Maigue including: Construction method statement and erosion and sediment control measures- see EOP Earth bunds to contain surface water and silt trap to treat water- will not exceed 25mg/l upon release to river. Surface water attenuation and hydrocarbon interceptors. Incident response plan established for any pollution incidents on site	None expected	Yes The design of the PRD has ensured that there will be no direct impacts on Annex I habitats or priority habitats and that hydrological regimes will be maintained. The pollution prevention measures and monitoring plan will ensure that the favourable conservation condition of Annex I habitats will not be undermined by the PRD, and that habitats in unfavourable condition including
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	To maintain favourable conservation condition Habitat area and distribution Hydrological regime	No impacts on habitat area or distribution. Hydrological regime will be maintained Sheet piling defining works zone will avoid	Run off: spill containment and Hydrocarbon interceptors (operation) Sustainable drainage system to be installed (operation)		

Sub types: 1. *Groenlandia densa* (Opposite-leaved Pondweed) 2. *Schoenoplectus triqueter* (Triangular Club-rush)	Water quality Vegetation structure and composition,	intertidal zone which is the habitat for the Triangular Club-rush :no effect on the habitat distribution or area for the species. No direct effects on distribution of opposite-leaved pondweed. Water quality - construction: sedimentation from surface water, cementitious materials, hydrocarbons: effects on vegetation structure and function Operational impacts- pollutants from run-off Risks to vegetation structure and composition from invasive species	Biosecurity protocol developed and included in EOP Monitoring and supervision by Ecological Clerk of works		priority habitats Alluvial forests will not be adversely affected or delayed in reaching their conservation objectives. Design of the scheme including clear span bridges over the major water courses avoids adverse effects on the free movement Annex II species including Lamprey species, Atlantic salmon and Otter. The pollution prevention measures and monitoring plan will ensure that the favourable conservation

*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion,Alnion incanae, Salicion albae*)	Restore favourable conservation condition Habitat area Habitat distribution Woodland size and structure Hydrological regime Vegetation composition	Habitat is outside of footprint of the PRD: no reduction in habitat area or distribution along river Maigue or Ahacronane River Water quality risk and spread of invasive species may affect vegetation composition			condition of Annex II species will not be undermined by the PRD, and that species in unfavourable condition including Atlantic Salmon and Otter will not be adversely affected or delayed in reaching their conservation objectives
Additional QI habitats included in the AA					
Estuaries	To maintain favourable conservation condition Habitat area Community distribution	Water quality and impacts on ecological functioning :Indirect effects due to construction/ operational water pollution of connected water courses including Ahacronane River and Robertstown Stream	As above		
Atlantic salt meadows (*Glauco-*	Restore favourable conservation condition	Water quality and impacts on ecological functioning and	As above		

Puccinellietalia maritimae)	Habitat area Community distribution Physical structure Vegetation structure	vegetation composition :Indirect effects due to construction/ operational water pollution of connected water courses including Ahacronane River and Robertstown Stream			
Sea Lamprey (*Petromyzon marinus*) And River Lamprey (*Lampetra fluviatilis*)	Maintain favourable conservation condition of lamprey species Distribution: extent of anadromy- extent of barriers Population structure of juveniles Juvenile density in fine sediment Extent and distribution of spawning habitat Availably of juvenile habitat	No physical or water flow impediment to movement of these species upstream or downstream migration patterns Noise and piling operations: physical damage to fish species, disturbance and displacement from area Nocturnal migration patterns will not be affected	Soft start procedure for any piling activities at River Maigue No temporary lighting along watercourses during construction. No artificial lighting on proposed River Maigue, River Deel bridges Detailed measures as set out for pollution prevention for Lower River Shannon SAC		

		Reduction in water quality may reduce prey availably Spawning habitat for salmonids or lamprey species could be affected by siltation arsing during construction on other watercourses. (No suitable spawning at River Maigue crossing point).			
Atlantic Salmon (*Salmo salar)*	Restore favourable conservation condition distribution extent of anadromy- extent of barriers adult spawning fish salmon fry abundance out-migrating smolt abundance	As above	As above		

	number and distribution of reds water quality				
European Otter (*Lutra lutra)*	Restore favourable conservation condition Distribution, habitats and breeding and resting places; Barriers to connectivity; Disturbance; Prey availability	No otter holts or couches recorded at proposed crossing points Interruption to movements along watercourses Mortality leading to local extinctions Temporary disturbance during construction deterioration in water quality during construction affecting fish biomass available to otters as food	Pre-construction surveys (where 36 months elapse from most recent survey) Clear span bridges on larger watercourses: allow unimpeded access Mammal culverts / mammal ledges on smaller watercourses- reduce fragmentation Mammal resistant fencing Limitations on timing of pile driving and use of lighting Detailed measures set out for pollution prevention for watercourses and Lower River Shannon SAC		

Overall conclusion: Integrity test

Following the implementation of mitigation measures including supervised monitoring, the construction and operation of the PRD will not adversely affect the integrity of the Lower River Shannon SAC in view of the conservation objectives of the site and no reasonable doubt remains as to the absence of such effects

Table 3: Summary of Appropriate Assessment for River Shannon and River Fergus Estuaries SPA

River Shannon and River Fergus Estuaries SPA [004077] **Summary of Key issues that could give rise to adverse effects:** • **Disturbance of Special Conservation Interest bird species (construction and operation)** • **Decreased in water quality and effects on water dependant habitats and associated food sources for wintering birds (construction and operation)** • **Ex-situ disturbance of SCI species: Whooper Swan (construction and operation)** • **Timing of works** **Conservation Objectives:** https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf					
		Summary of Appropriate Assessment			
Qualifying Interest feature	**Conservation Objectives** **Targets and attributes**	**Potential adverse effects**	**Mitigation measures** **(NIS, EIAR Chapter 19, EOP and Schedule of commitments)**	**In-combination effects**	**Can adverse effects on integrity be excluded?**
Wintering waterbirds including: Cormorant, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey	Maintain favourable conservation condition: Population trend and distribution There should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest, other	Temporary disturbance of foraging birds during construction (noise, and visual disturbance) possible localised displacement of foraging birds at Churchfield Estuary: Distance: within 150m at closest point at western end of PRD and	None required	None expected	Yes There will be no significant decrease in the range, timing of use of Churchfield Estuary by foraging wintering birds and the favourable conservation condition of the SCI

Plover, Lapwing, Knot, Dunlin, Black-tailed, Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Black-headed Gull	than that occurring from natural patterns of variation.	screened by interviewing hedgerows Temporary localised disturbance- no significant decrease in range, timing or intensity of use of the waterbirds Water quality: see below Wetlands			wintering waterbird species will not be undermined by the PRD. The pollution prevention measures and monitoring plan will ensure that the favourable conservation condition of the wetlands and waterbirds SCI will not be undermined by the PRD.
Whooper Swan	Maintain favourable conservation condition Population trend and distribution There should be no significant decrease in the range, timing or intensity of use of areas by whooper Swan other than that occurring from natural patterns of variation	Potential for disturbance/ displacement from ex-situ foraging or roosting sites if occurring close to PRD. Dedicated survey showed that PRD will not impact on birds flyway paths, foraging areas or distribution- no adverse effects on range timing or intensity of use of areas within or outside the SPA.	None required		
Wetlands and Waterbirds	Maintain favourable conservation condition:	No impacts on habitat area and distribution.	Detailed measures set out for pollution		

	Habitat area and distribution Water quality	Hydrocarbons or other pollutants which could infiltrate the estuary and result in direct effects on birds' health or indirect effects on prey availability. Temporary during construction, ongoing during operation. No significant effects arising from changes to air quality (N deposition)	prevention for Ahacronane River and Robertstown Stream including: Construction method statement and erosion and sediment control measures- see EOP Surface water attenuation and hydrocarbon interceptors. Suspended solids in any run off will not exceed 25mg/l upon release to any watercourse. Incident response plan established for any pollution incidents on site Run off: spill containment and Hydrocarbon interceptors (operation)		

			Sustainable drainage system to be installed (operation)		

Overall conclusion: Integrity test

Survey and analysis of wintering waterbirds including whooper swan has demonstrated that no significant levels of disturbance will arise that could undermine the conservation objectives of the bird assemblages of the SPA. Following the implementation of mitigation measures to prevent any deterioration in water quality during construction or operation, the proposed development will not adversely affect the integrity of this European site in view of the conservation objectives for wintering waterbird species and wetlands and waterbirds and no reasonable doubt remains as to the absence of such effects.

Table 4: Summary of Appropriate Assessment for Curraghchase Woods SAC

Curraghchase Woods SAC [000174] **Summary of Key issues that could give rise to adverse effects:** • **Indirect effects on movements and foraging of Lesser Horseshoe Bat outside of the SAC through loss /fragmentation of linear landscape features within the footprint of the PRD** • **Possible adverse effects on LHB population in wider landscape and potential genetic isolation** **Conservation Objectives:** https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000174.pdf Supporting document: https://www.npws.ie/sites/default/files/publications/pdf/Lesser_horseshoe_bat_supporting_document_Jan_2018_V1.pdf					
		Summary of Appropriate Assessment			
Qualifying Interest feature	**Conservation Objectives** **Targets and attributes**	**Potential adverse effects**	**Mitigation measures** **(NIS, EIAR Chapter 19, EOP and Schedule of commitments)**	**In-combination effects**	**Can adverse effects on integrity be excluded?**
Lesser Horseshoe Bat (*Rhinolophus hipposideros)*	**Restore** favourable conservation condition Extent of potential hectares of foraging habitat- no significant decline within 2.5km of qualifying roosts Linear features- kms no significant loss within 2.5km of qualifying roosts	**No direct impacts** on any CO Attribute or target PRD is outside of site specific foraging range- >4km from known roost sites at closest point, within 3 km of SAC boundary	Provision of mammal passage designed to facilitate LHB movements and flight paths Landscaping measures to reconnect linear habitats outside of SAC and to direct LHB to crossing points	None expected	Yes Habitat connectivity and movements of LHB through the wider landscape (outside of the 2.5km range from SAC roost) will be maintained through application of

	(2.5 km foraging range based on known roost sites) Light pollution- no significant increase in artificial light intensity adjacent to roosts/ along community routes within 2.5kms	Loss of linear features from the footprint area of PRD may affect commuting of bats in wider area (outside of SAC) creating a barrier to movements in wider Co. Limerick area and affect wider supporting populations of LHB Disturbance -Light pollution	(15 LHB specific and 19 general bat locations) Lighting design: Very limited artificial lighting- remote from bat roosts and flightpaths		mitigation measures. The PRD will not delay or otherwise affect the objective to restore favourable conservation condition for LHB

Overall conclusion: Integrity test

Following the implementation of mitigation including dedicated passage facilities and landscaping measures to maintain habitat connectivity for Lesser Horseshoe Bats in the wider landscape of the PRD, the construction and operation of this proposed development will not adversely affect the integrity of this European site in relation to conservation objectives for Lesser Horseshoe Bats and no reasonable doubt remains as to the absence of such effects.

Table 5: Summary of Appropriate Assessment for Askeaton Fens Complex SAC

Askeaton Fens Complex SAC [002279]

Summary of Key issues that could give rise to adverse effects

Sections of 'cut' could disrupt the groundwater regime leading to:

- **Indirect effects on water dependant habitats and ecosystem function through disruption of hydrological and hydrogeological connections (construction and operation)**
- **Indirect effects through water quality via infiltration of construction or operational pollutants**
- **Indirect effects on habitat and species composition**

Conservation Objectives: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002279.pdf

		Summary of Appropriate Assessment			
Qualifying Interest feature	**Conservation Objectives** **Targets and attributes (as relevant)**	**Potential adverse effects**	**Mitigation measures** **(NIS, EIAR Chapter 19, EOP and Schedule of commitments)**	**In-combination effects**	**Can adverse effects on integrity be excluded?**
*Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Alkaline fens	**Maintain favourable conservation condition** Ecosystem function: **hydrology** Maintain appropriate natural hydrological regimes necessary to support the	No impacts on habitat area and distribution No direct impacts on vegetation composition Detailed hydrological assessment shows the PRD will not change groundwater	Avoidance of Fen complex Incorporated design measures: Sealed drainage system at areas of extreme and high aquifer vulnerability and where rock is close to surface Drainage system to incorporate filter drains,	None expected	Yes Ecological function will be maintained and the favourable conservation condition of the two Fen habitats will not be undermined by the PRD

	natural structure and functioning of the habitat Ecosystem function: **peat formation** Maintain active peat formation, where appropriate Ecosystem function: **water quality** Maintain appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitat	or surface water balance to or within the SAC: natural regimes will be maintained and ecosystem function unaffected. Water quality: given the sensitivity of groundwater in the area, surface and groundwater pollution could alter nutrient levels if infiltration of groundwater occurred.	sealed systems and vegetated sediment bays for attenuation ponds. Water quality- construction: pollution prevention measures, treatment of site run-off before discharge. Measures fully detailed in EOP including monitoring.		

Overall conclusion: Integrity test

Following detailed hydrological assessment, it has been demonstrated that the PRD will not alter the hydrological regime that supports the functioning of the Fen Complex. With the implementation of integrated design measures and water quality mitigation, the construction and operation of this proposed development will not adversely affect the integrity of this European site and no reasonable doubt remains as to the absence of such effects.