Chapter 7 Biodiversity

7.1 Introduction

This chapter assesses the biodiversity of the receiving environment within and surrounding the study corridor of the proposed N5 Ballaghaderreen to Scramoge road development and describes the likely impacts of the proposed road development thereon. It also describes the design, best practice and mitigation that will be employed to avoid, reduce or remedy any such impacts.

The following paragraphs provide an overview of the assessment process and provide definitions of the key terms utilised in this chapter.

The surveys undertaken were concentrated within a 300m wide corridor centred on the centreline of the proposed road development (hereinafter referred to as the study corridor); being the receiving environment for the activities associated with the proposed development and the biophysical changes that are likely to result. There were amendments to the exact location of the centreline of the proposed road development during the iterative road design process. Where required, further assessment was undertaken to ensure that the entire study corridor was the subject of a multidisciplinary walkover assessment.

Following desk studies and multidisciplinary walkover surveys, Zones of Influence (ZOI) for individual ecological receptors were assigned. Where necessary, surveys were undertaken outside the study corridor to adequately assess the potential impacts on individual receptors based on their individual identified ZOIs. The area surveyed to comprehensively assess the impacts on any receptor is hereafter referred to as the 'study area' and is based on the individual requirement for assessment of each ecological receptor based on the identified ZOI. In some cases, the ZOI for a particular receptor expanded or contracted during the course of the assessment, based on the findings of the surveys undertaken. The study areas are mapped within the EIAR as they relate to the individual receptors.

Habitats were assessed within the study corridor, and where considered appropriate, over a wider area. A habitat is the environment in which an animal or plant lives and is generally defined in terms of vegetation and physical structures. Habitats and species of ecological significance occurring/likely to occur within the zone of influence (ZOI) were classified as Key Ecological Receptors (KERs). A KER is defined as a site, habitat, ecological feature, assemblage, species or individual that occurs within the vicinity of a proposed road development upon which impacts are likely and where further survey effort is required to assess the anticipated impacts. This chapter quantifies the potential impacts relating to KERs and identifies the measures required to avoid, reduce and mitigate likely significant impacts. Identification of impacts and prescribed mitigation has been derived following a collaborative approach working with a multi-disciplinary team including project engineers, hydrologists and hydrogeologists. The results of ecological surveys have been utilised to inform the design of the proposed road development, thereby avoiding or minimising potential impacts on sensitive habitats and species of conservation interest.

The assessment began with a desk study of available published data on sites designated for nature conservation, other ecologically sensitive sites, habitats and species of interest in the vicinity of the proposed road development. A review of OSI mapping, online environmental web-mappers and orthophotography was also

undertaken. The baseline information obtained from the desk study was the first stage in defining a zone of influence of the proposed road development.

Following the desk studies, multi-disciplinary ecological walkover surveys (As per Section 4.2 of *Ecological Survey Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*' (TII/NRA, 2009)) were conducted along the study corridor. A multi-disciplinary survey aims to undertake habitat assessment through classification, mapping and compilation of flora species lists and habitat suitability assessments for faunal species. The multi-disciplinary surveys provided vital baseline information regarding the existing ecology of the study corridor. It also identified KERs (floral and faunal) and informed the need for further specialist survey work in specific various locations. Following the multi-disciplinary ecological walkover surveys, the initial alignment was adjusted and amended, where possible, to avoid KERs and to avoid and minimise potential impacts.

The principal objectives of this study are to:

- Complete a desk study and all necessary field surveys to obtain relevant terrestrial and aquatic ecological data for the ZOI of the proposed works.
- Identify and describe sites of known or potential ecological interest.
- Assess the significance of the likely significant impacts of the proposed road development on each of these environmental aspects.

The ZOI differs for different habitats and species. The ZOI for many of the terrestrial habitats is confined to the study area, whereas for certain other taxa and aquatic habitats, the ZOI is much wider and thus the studies undertaken have been scoped accordingly. The individual ZOIs were derived, reviewed and amended as the project evolved through consultation with ecological specialists, project engineers, geologists, hydrologists, hydrogeologists and landscape architects. They were derived on the basis of analysis of the possible interaction with those Environmental Resources and Receptors that are likely to be affected by any biophysical changes caused by the proposed road development. These included interactions between the development and the Qualifying Interests and Special Conservation Interests of European Sites (Natura 2000), as appropriate, taking their sensitivities, ecological functions and processes that support them into account. The ZOIs were also informed by extensive hydrological/hydrogeological monitoring and modelling thereby including all water-dependent receptors that could be affected by the development. As regards surface water, the ZOI includes the full extent of surface water catchments to their coastal outfalls. Habitats and foraging routes remote from the development particularly for mammal species and birds were all considered in the establishment of their respective ZOIs. The ZOI includes a number of European Sites (cSACs and SPAs) with potential connection to the project, connected River Catchments, and areas of sensitivity for protected flora and fauna.

Throughout 2014, 2015 & 2016, a range of specialist ecological survey work has been undertaken to provide comprehensive information on all ecological aspects of the study area. These surveys include detailed analysis of potential protected habitats and species, Watercourse assessment, Bat surveys, Ornithological surveys, Marsh Fritillary Butterfly surveys and Mammal surveys including Otter and Badger. The studies and survey work undertaken provide a comprehensive inventory of the flora and fauna likely to be effected by the proposed road.

Using the comprehensive assessment of the existing environment (baseline conditions), it has been possible to accurately predict the likely impacts of the

proposed road development on the KERs and correctly assign an ecological significance to them.

Where potential detrimental impacts have been identified, detailed and specific mitigations have been developed in accordance with the hierarchy of options suggested in the research for the European Commission publication; '*Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, 2000'*. The adopted approach was - Avoid at source, reduce at source, abate on site, and finally abate at receptor. These measures have been incorporated into the proposed road development as part of the avoidance and environmental protection strategy.

The information provided in this EIAR chapter, accurately and comprehensively describes the baseline ecological environment; provides an accurate prediction of the likely ecological impacts of the proposed road development; prescribes mitigation as necessary. It also describes the residual ecological impacts. The specialist studies, analyses and reporting have been undertaken in accordance with the appropriate guidelines as fully described in the methodology section below.

7.2 Methodology

This section describes the methodologies followed in the compilation of this EIAR chapter. Recognised guidelines were followed in relation to every aspect of the scoping, survey and assessment. Reference to "Chainage" (Ch.) (a measured distance along the centreline of the proposed road development) is made throughout the Chapter and is used to give an indication of the location of a specific survey, habitat or species.

7.2.1 Guidelines on Environmental Impact Assessment

The assessment methodology is based primarily upon the National Road Authority (TII/NRA)'s Guidelines for Assessment of Ecological Impacts of National Road Schemes Rev 2 (TII/NRA, 2009) (referred to hereafter as the TII/NRA Ecological Impact Assessment Guidelines), and the survey methodology is based on the TII/NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (TII/NRA, 2009).

In addition, regard was paid to the guidelines listed below in the preparation of this document to provide the scope, structure and content of the assessment. They are among the recognised guidance in Environmental Impact Assessment and National Road Scheme assessments.

- *Guidelines for Ecological Impact Assessment* i*n the UK and Ireland. Terrestrial, Freshwater and Coastal* (CIEEM, 2016).
- *Advice Notes on Current Practice (in preparation of Environmental Impact Statements)* (Environmental Protection Agency (EPA), 2003).
- *Guidelines on the information to be contained in Environmental Impact Statements* (EPA, 2002).
- *Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (Draft May 2017).Environmental Impact Assessment of National Road Schemes – A Practical Guide* (TII/NRA, 2009).
- *Guidelines for assessment of Ecological Impacts of National Road Schemes*, (TII/NRA, 2009).
- *National Roads Project Management Guidelines*, (TII/NRA, 2010).

7.2.2 Desk Study

The desk study undertaken for this assessment included a thorough review of the available ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), Teagasc, EPA, Water Framework Directive (WFD), Geological Survey of Ireland (GSI), Inland Fisheries Ireland (IFI) & Irish Wetland Bird Survey I-WeBS.
- Review of Bird Atlases: (Sharrock, 1976; Lack, 1986; Gibbons *et al*., 1993; Balmer *et al*., 2013).
- Review of Birds of Conservation Concern (BoCCI) in Ireland 2014-2019 (Colhoun & Cummins, 2013)
- Review of the Bat Conservation Ireland (BCI) Private Database
- Review of the publically available National Biodiversity Data Centre (NBDC) web-mapper
- Inland Fisheries Ireland (IFI) Reports
- Review of specially requested records from the NPWS Rare and Protected Species Database for the hectads which overlap with the study area.

7.2.3 Specific Ecological Methodologies

Multi-disciplinary Walkover Surveys (as per TII/NRA, 2009)

The ecology of the study area was first assessed in a desk study of pertinent ecological information. This was followed by a multi-disciplinary ecological walkover survey of the study corridor which incorporated habitat survey, mapping and evaluation. The walkover surveys were undertaken on the 14th & 28th July 2014 and 31st October 2014. The walkover surveys were undertaken by Pat Roberts B.Sc. (Env.) MCIEEM and John Hynes B.Sc. (Env.) GradCIEEM with assistance from Laoise Kelly B.Sc. (Env.). All three surveyors have relevant academic qualifications and significant experience in undertaking habitat and ecological assessments to this level.

Habitats were identified in accordance with the Heritage Council's *'Guide to Habitats in Ireland'* (Fossitt, 2000). Habitat mapping was undertaken with regard to guidance set out in '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al*., 2011). Plant nomenclature for vascular plants follows '*New Flora of the British Isles*' (Stace, 2010), while mosses and liverworts nomenclature follows '*Mosses and Liverworts of Britain and Ireland - a field guide'* (British Bryological Society, 2010).

The walkover surveys were designed to detect the presence, or likely presence, of a range of protected species. The surveys included identification of Badger setts and areas of suitable habitat, potential Bat roosts and linear features likely to be of significance to Bats, potential wetlands likely to be of significance to wintering and breeding waterfowl and additional habitat features for the full range of other protected species that are likely to occur in the vicinity of the study corridor (e.g. Otter, Marsh Fritillary etc.).

Habitats considered to be of ecological significance and in particular having the potential to correspond to those listed in Annex I of the EU Habitats Directive 92/43/EEC were identified as such during the walkover survey.

The multi-disciplinary walkover survey comprehensively covered the entire length of the proposed road development and based on the survey findings, further more

detailed targeted surveys were carried out for habitats, features and locations of ecological significance. These surveys were carried out in accordance with TII/NRA *Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna* on National Road Schemes (TII/NRA, 2009).

The desk study and initial walkover surveys identified the areas of highest ecological sensitivity (for both flora and fauna) in the study area. The identified areas were classified as KERs and were subject to detailed and specialist assessment. Sections of the study corridor that were identified as being of limited ecological sensitivity (as per the desk study and walkover surveys) were not subject to further survey work.

The following sections outline methodologies followed when undertaking various specialist surveys.

Habitats

Following the initial walkover surveys, a number of areas of habitat were identified as requiring further assessment in order to establish their ecological importance in the context of the proposed road development. In these cases specialised surveys were undertaken and the methodologies followed for these are provided below. Field surveys were conducted within the recognised optimum period for vegetation surveys/habitat mapping, *i.e*. April to September (Smith *et al.,* 2011).

Detailed surveys were undertaken where habitats listed on Annex I of the EU Habitats Directive were potentially present within the study corridor or were not within the study corridor but considered to have the potential to be indirectly impacted by the proposed road development in the absence of mitigation. Habitats that were the subject of specialised ecological survey included potential Annex I Habitats: *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (6410); Degraded Raised bog (7120); Alkaline Fen (7230); and, Turloughs (3180). Where broadleaved woodlands were encountered, they were subject to detailed assessment and classified according to '*National Survey of Native Woodlands 2003- 2008'* (Perrin *et al.,* 2008b). The woodlands were also analysed in relation to potential links with Annex I woodland habitats as per Perrin *et al*. (2008a).

Larger watercourses within the study area, such as the Scramoge River, are of ecological significance as they provide a potential habitat for a range of sensitive protected species, for example, species listed on Annex II of the EU Habitats Directive such as Otter, White Clawed Crayfish and Atlantic Salmon and species listed on Annex I of the EU Birds Directive such as Kingfisher. In addition, watercourses often support a wide range of aquatic and riparian species that are of high conservation value. Watercourses also have the potential to act as conduits for pollution to sensitive habitats potentially located downstream of the proposed road development. The nine larger watercourses traversed by the proposed road development have been subject to detailed assessment. The watercourses identified for detailed assessment were established on the basis of information gathered during the multidisciplinary walkover survey. Inland Fisheries Ireland (IFI), the state agency responsible for the protection, management and conservation of Ireland's inland fisheries and sea angling resources, was also consulted in this regard.

None of the other habitats located along the proposed road development were assessed to have had links to habitats listed on Annex I of the EU Habitats Directive or required further assessment.

Summaries of Dedicated Habitat Surveys are Provided Below

Survey of Habitat Identified as Potential 'Molinia meadows on calcareous, peaty or clayey-silt laden soils (6410)

Site visits were undertaken on the 29th - 31st of July and the 5th of August 2015 by Mr. Barry O'Loughlin (B.Sc, M.Sc, MCIEEM), John Hynes and Dr. Pamela Boyle (B.Sc, M.Sc. PhD.). The multi-disciplinary walkover surveys identified areas within the ZOI of the proposed road development in the townlands of Leggatinty and Turlaghnamaddy that may potentially support the Annex I habitat '*Molinia* meadows on calcareous, peaty or clayey-silt laden soils (6410)'.

Assessment of this Annex I habitat type followed the methodology provided in '*The Irish Semi-natural Grasslands Survey. 2007 – 2012'* (O'Neill *et al*., 2013). Standardised quadrats measuring 2m x 2m were utilised during field survey work to assess plant species composition and abundance. Plant species cover and abundance was recorded using the Domin scale. Details of these surveys and assessments are provided as Appendix 7.1.

Survey of Habitat Identified as Degraded Raised Bog (7120) (Potential Annex I Peatland Habitat)

A review of ortho-base maps (Bing aerial photography May 2012) identified the presence of potential raised bogs within the ZOI of the proposed road development. This was verified during the multidisciplinary walkover survey. Further site visits were undertaken on the 29th - 31st of July and the 5th of August 2015 by Mr. Barry O'Loughlin and Dr. Pamela Boyle. The proposed road development was designed to avoid these areas where possible but detailed surveys were required to inform the design of the road. Active and Degraded Raised Bog are divided into five different ecotopes characterised by vegetation communities: Face-bank, marginal, sub-marginal, sub-central and central. Ecotope community complexes were determined as per the '*Raised Bog Monitoring and Assessment Project, 2013'* (Fernandez *et al*., 2014). A community (in vegetation studies) is a well-defined assemblage of plants and/or animals that is clearly distinguishable from other such assemblages.

Quadrat and ecotope surveys undertaken on areas of raised bog (high bog) followed the methodology developed by Fernandez *et al.* (2014). A 4m x 4m grid/quadrat is utilised for habitat assessment for both Active and Degraded Raised Bog. Photographic records for each quadrat surveyed were taken and physical characteristics noted. Plant species cover and abundance was recorded using the Domin scale. Details of these surveys and assessments are provided as Appendix 7.1.

Survey of Alkaline Fen Habitats

A site visit was undertaken on the 18th of May 2015 by Mr. Barry O'Loughlin and Mr. John Hynes to identify and assess a small area of Rich fen and flush (PF1) considered to have potential links with Annex I habitat 'Alkaline Fens (7230)'. This habitat was recorded in the townlands of Tullyloyd and Tullycartron, Co. Roscommon. Survey methods followed '*Guidelines for a National Fen Survey of Ireland Survey Manual'* (Foss & Crushell, 2008). Plant species data were recorded on Relevé Cards similar to those described in the aforementioned manual.

The cover of plant species present within quadrats was estimated according to the Domin scale. A relevé measuring 2m x 2m was devised at each sampling location to estimate cover abundance of plant species present within each quadrat. A minimum of two relevés were recorded at the site as per guidelines outlined by Foss & Crushell

(2008). Surveys were also undertaken of the Fen area to the south of the proposed road development in this area. Details of these surveys and assessments are provided as Appendix 7.2.

Survey of Turlough Habitat

A seasonal karstic lake (Turlough) located to the south of the proposed road development in the townlands of Cregga and Cuilrevagh was identified as having the potential to correspond the Annex I Priority habitat Turloughs (3180). Priority Annex I habitats are those habitats within Member States that are in danger of disappearance within the European Union and for which the Member State has particular responsibility. The site was surveyed on the 24th of June 2015 by Roger Goodwillie of Roger Goodwillie & Associates. The site visit was conducted during the recognised optimum period for vegetation surveys/habitat mapping i.e. May to September (Smith *et al*., 2011).

The site was systematically walked, noting key botanical features and the extent of identified vegetation communities. The limits of the identified vegetation communities were sketched onto field maps and later digitised using OSI vector mapping and the GIS software programme MapInfo 10.5. The dominant species from each identified vegetation community were identified in the field and the vegetation community later classified in accordance with the best scientific guidance in relation to Turlough habitats, notably Chapter 7 of Waldren (2015), Ed. *Turlough Hydrology, Ecology and Conservation, Unpublished Report, NPWS.* The Turlough Assessment Report is provided as Appendix 7.3.

Survey of Watercourses

The watercourse assessments were undertaken by Pat Roberts and John Hynes with assistance from Laoise Kelly. The watercourses were assessed during the multidisciplinary walkover surveys that were undertaken on the 14th and 28th of July 2014 and the 31st of October 2014. Further detailed assessments were conducted on the 13th of February, 27th of March, 6th of October and the 23rd of November 2015.

Discussions were held with IFI in October 2015 in relation to the proposed road development and their comments were incorporated into the surveys undertaken and the subsequent reporting.

Notes on the, morphology, physical characteristics and potential of the river habitat to support protected flora and fauna including (Otter, Kingfisher, fisheries etc.) were recorded. Information regarding riparian habitats, aquatic macrophytes present and any other ecological information was recorded. These watercourses were also studied as part of Otter surveys that were undertaken.

The descriptive terms *right bank* and *left bank*, as used in this document, are relative to an observer looking downstream in which the right bank is to the observer's right (Standard Convention).

Survey of Woodlands

The woodland assessment surveys described in this report have been undertaken with reference to the following guidelines:

- National Roads Authority (2009) *Guidelines for assessment of ecological impacts of national road schemes (Revision 2, June 2009),* Dublin, Ireland.

- Perrin, P.M, Martin, J.R., Barron, S.J., O'Neill, F.H., McNutt, K.E. & Delaney, A.M. (2008a) National Survey of Native Woodlands 2003-2008: Volume I: Main report. Report submitted to National Parks & Wildlife Service, Dublin.
- Perrin, P.M, Martin, J.R., Barron, S.J., O'Neill, F.H., McNutt, K.E. & Delaney, A.M. (2008b) National Survey of Native Woodlands 2003-2008: Volume II: Woodland classification. Report submitted to National Parks & Wildlife Service, Dublin.

The identified woodlands were classified in accordance with *Fossitt* (2000) during the multidisciplinary walkover survey conducted on the 14th & 28th of July 2014 and on the 31st of October 2014. Woodland stands were selected for further assessment based on their size, naturalness or connectivity with larger or more sensitive areas. Detailed assessments of the woodlands were conducted on 30th of September and 6th of October 2015. Specific field sheets were used for recording the survey data. Homogeneous representative 20m x 20m relevés were assessed at each woodland site and the woodland areas were thoroughly walked and assessed. For each site surveyed the following data were recorded as per Perrin *et al*. (2008b): Site species list, Site situation, Area, Internal features, Surface cover, Vegetation community and Additional attributes.

Faunal Surveys

Prior to conducting field surveys, a desk study of all literature pertinent to the potential faunal assemblage within the ZOI was undertaken. This included a review of available atlases and databases. OSI mapping and orthophotography was reviewed to determine the range of habitats with potential to support protected fauna within the study area including ecological connecting features in the landscape (e.g. hedgerows/treelines, woodland edge habitat and watercourses).

The NPWS were consulted regarding records of rare and protected species from the hectads which overlap with the proposed road development.

A review of all designated sites in the ZOI, with reference species of conservation interest, was undertaken as part of the desktop process. This included a review of all Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs).

Following the desk studies, multi-disciplinary ecological walkover surveys were conducted along the study corridor on the 14th & 28th of July 2014 and on the 31st of October 2014. These provided vital baseline information regarding the ecology of the study corridor and it was from these initial surveys that the KERs along the study corridor were identified and the requirement for further survey work in various disciplines and in various locations was highlighted.

Summary details of the methodologies utilised in the various detailed faunal surveys undertaken are presented below.

Terrestrial Mammals

Otter Survey

Following on from the multi-disciplinary walkover surveys undertaken on the 14th & 28th July 2014 and 31st October 2014; areas identified as providing potential habitat for Otter were subject to specialist targeted survey. The Otter survey of watercourses was conducted on the 13th of February 2015 and 27th of March 2015. The survey work was completed by John Hynes and Pat Roberts. Incidental

observations of Otter signs were also noted during the initial walkover surveys and during all additional survey works undertaken for the project.

The Otter survey was conducted as per TII/NRA (2009) guidelines (*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*). This involved a search for all Otter signs e.g. spraints, scat, prints, slides, trails, couches and holts within the 150m derogation limit, plus a precautionary 100m buffer, upstream and downstream of proposed crossing points. In addition to the width of the rivers, a 10m riparian buffer (both banks) was considered to comprise part of the Otter habitat (NPWS 2009*. Threat Response Plan: Otter* (2009-2011).

The dedicated Otter survey also followed the guidance as set out in TII/NRA (2008) '*Guidelines for the Treatment of Otters Prior to the Construction of National Roads Schemes*'.

Bat Survey

Following on from the multi-disciplinary walkover surveys undertaken on the 14th & 28th July 2014 and 31st October 2014; areas identified as providing potential habitat for Bats were subject to specialist targeted survey. Dedicated surveys were conducted during the recommended survey periods outlined in TII/NRA (2005) *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* & *'Bat Survey Good Practice Guidelines' 2012* (Hundt, 2012) Bat Conservation Trust Guidelines 2nd Edition). The overall aims of surveys were to identify and assess the potential impacts on local populations of Bat species present up to 1km either side of the proposed road development as per recommendations set out in (TII/NRA, 2006).

Reference to the following best practice guidelines also informed Bat surveys and the interpretation of results:

- Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd Edition). Bat Conservation Trust (BCT). Published after field survey work undertaken however informed the assessment.
- National Roads Authority (2006) *Guidelines for the treatment of bats during the construction of national road schemes.* National Roads Authority, Dublin, Ireland; and,
- Roche, N., Langton, S. & Aughney T. (2012) *Car-based bat monitoring in Ireland 2003-2011.* Irish Wildlife Manuals, No. 60. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.

Night Time Detection Surveys, Fixed Point Detector Surveys & Potential Roosts Surveys were conducted during the 2015 surveys. The Night Time Detection Surveys were conducted over four nights (i.e. dusk and dawn) and the ZOI was divided and systematically surveyed by two survey teams. In addition to walked transects, car transects were utilised as part of the survey in accordance with Roche *et al*. (2012).

Areas identified as providing good Bat habitat or located in close proximity to potential roost sites were subject to Fixed Point Detector Surveys.

Nine buildings were subject to internal and external surveys and five were subject to emergence/ swarming surveys at dawn/dusk. These buildings were identified during the multi-disciplinary walkover surveys as having potential to support Bat roosts.

Buildings to be demolished or located immediately adjacent to the proposed road development were also subject to assessment.

During the desk study and multi-disciplinary walkover surveys the study corridor was assessed and the areas with trees and treelines that are most likely to offer opportunities for Bats were identified from aerial photography and ground inspection (As per Section 5.3 (TII/NRA 2006)). These areas were targeted in further Bat detector surveys. Where individual trees were identified as having multiple highly suitable features capable of supporting Bat roosts, these were visually assessed using recognised criteria (Hundt, 2012). Close-focusing binoculars were used to inspect trees from the ground to the canopy for potential Bat roosts. Features indicative of Bat roosts (as per Table 8.3 – (Hundt, 2012)) include natural holes, cracks/splints in major limbs, loose bark, hollows/cavities, dense epicormic growth and Bat boxes.

Table 7.1 below summarises survey effort in relation to the Bat assessment of the proposed road development.

Table 7.1 Survey Effort Summary

Survey Date	Survey Type	Surveyor(s)
14th and 28th July 2014 & 31st October 2014	Preliminary walkover and bat habitat assessment survey. Included identification of landscape features (i.e. Mature treelines and hedgerows) likely to be of significance to bats and potential roost sites (i.e. buildings and trees).	Pat Roberts, John Hynes, Laoise Kelly
26th/27th March 2015	Dawn and Dusk Detector Survey incorporating Building Emergence Survey.	Pat Roberts
08th/09th June 2015	Dawn and Dusk Detector Survey Incorporating Building Emergence Survey.	Team 01 (West) Pat Roberts, Barry O'Loughlin, Team 02(East) John Hynes, Laoise Kelly
08th-13thJune 2015	Fixed Point Detector Surveys (2 locations)	Set up by Pat Roberts & John Hynes
23rd/ 24th July 2015	Dawn and Dusk Detector Survey Incorporating Potential Building and Tree Roost Emergence Survey	Team 01 (West) Pat Roberts Team 02 (East) John Hynes
14th – 31st August 2015	Fixed Point Detector Surveys (2 locations)	Set up by Pat Roberts
3rd/4th September 2015	Dawn and Dusk Detector Survey, Incorporating Building Emergence Survey.	Team 01 (West) Pat Roberts Team 02 (East) John Hynes, Pamela Boyle
29th October 2015, 11th November 2015, 27th January 2016	External and Internal Building Surveys	John Curtin
23rd November 2015	External and Internal Building surveys	John Hynes

Badger Survey

Following on from the multi-disciplinary walkover surveys undertaken on the 14th & 28th July 2014 and 31st October 2014; areas identified as providing potential habitat for Badger were subject to specialist targeted survey. Dedicated Badger surveys were conducted on the 26th of February 2015 and on the 13th of March 2015, consistent with optimal survey periods for this species (Harris, 1989, TII/NRA, 2006a). In addition, targeted surveys were conducted during woodland assessments undertaken on the 30th of September and 6th of October 2015. The survey work was completed by John Hynes and Pat Roberts.

Surveys to identify setts, locations of latrines and field signs can be undertaken at any time of the year, but are most effective between November and April when vegetation cover is reduced (TII/NRA 2009). The Badger survey was conducted in accordance with best practice guidance (TII/NRA, 2009) and was cognisant of '*Guidelines for the Treatment of Badger Prior to the Construction of National Roads Schemes'* (TII/NRA, 2006a) in order to determine the presence of mammal signs along and adjacent to the proposed road development. This involved a search for all potential Badger signs as per TII/NRA (2009) (latrines, badger paths and setts). Setts were classified as per the convention set out in TII/NRA (2009) (i.e. Main, Annexe, Subsidiary, Outlier). Additional Badger signs recorded during subsequent site visits in 2015 were also incorporated into the assessment.

Additional Mammals

During the multi-disciplinary ecological walkover surveys the potential for the study corridor to support additional protected mammals such as Irish Hare, Pine Marten, Red Squirrel, Pygmy Shrew, Irish Stoat, Hedgehog etc. was assessed. While the study corridor has the potential to support these species; no evidence of their presence was recorded and no additional species specific surveys were required.

Birds

Wintering Birds

As per TII/NRA (2009):

"*The decision as to whether further bird surveys need to be carried out (and if so the type of survey methodologies that may be required), should be based on a combination of a comprehensive desk study, the habitat assessment undertaken as part of a multi-disciplinary walkover survey, supplemented by discussions with the relevant consultees. Further surveys should only be undertaken in those situations where significant impacts are likely on important assemblages or populations of birds*".

Following a detailed desk study of records pertinent to the ZOI and consultation with the relevant consultees (i.e. BirdWatch Ireland and NPWS); wetland habitats identified during the multi-disciplinary walkover surveys (i.e. conducted on the 14th & 28th of July 2014 and on the 31st of October 2014) as having potential to support significant wintering bird populations (target sites (i.e. Cregga Turlough, Clooncullaan Lough and Bellanagare Bog) were subject to further survey as part of the assessment. The methodologies employed were as recommended in (TII/NRA, 2009) (i.e. British Trust for Ornithology's Wetland Bird Survey (WeBS) methodology). Given the potential significance of the identified target sites, further detailed bespoke assessment including Vantage Point (VP) Surveys, Point Counts, Flight Line Mapping and identification of foraging areas were conducted drawing on the methodologies outlined in '*Recommended bird survey methods to inform impact assessment of onshore wind farms* (SNH, 2014). Bi-weekly bird surveys were

carried out during the winters of 2014-2015 and 2015-2016. The surveys were conducted by appropriately skilled and experienced observers (John Hynes & John Curtin B.Sc.).

The VP survey comprehensively identified the use of the target sites by sensitive bird species. In addition, walkover surveys of potential Whooper Swan foraging areas within the study corridor were undertaken and Point Count data was recorded for wetlands in the wider area including Annaghmore Lough.

Breeding Birds

Breeding bird surveys were conducted on the 27th March, 18th of May, 9th of June, 24th of June, 24th and 29th of July 2015. Transect surveys were conducted throughout the entire extent of the 33.4km study corridor.

The surveys focused on potential habitat for sensitive breeding bird species listed on Annex I of the EU Birds Directive and Birds listed on the Birds of Conservation Concern in Ireland (BoCCI) Red and Amber list (Colhoun & Cummins, 2013). Annex I of the EU Birds Directive aims to protect bird species and subspecies that are considered to be particularly threatened within EU Member States. Protection is provided through the designation of Special Protection Areas (SPA) for the survival of target species and all migratory bird species. In addition, common species listed on the BoCCI Green list were also recorded in order to determine the breeding bird assemblages within the study corridor which would in turn aid in determining the significance of the study area to all bird species. Best practice guidance (TII/NRA, 2009) recommends "*Three survey visits during the breeding season (April to June) starting one hour after first light and finishing wherever possible before 9am (and certainly by midday)"*

In accordance with TII/NRA guidance a 'scaled-down' survey protocol, based upon the specifications of the Common Bird Census (CBC) methodology was utilised to fulfill the survey objectives.

In addition to the dawn breeding bird survey effort, targeted surveys of areas deemed likely to support waders and waterfowl (including Kingfisher), as identified during the multi-disciplinary walkover survey, were conducted on the 27th of March, 18th of May and the 29th of July. Areas subject to targeted survey included Cregga Turlough, Clooncullane Loughs, peatlands including Bellanagare Bog and wet grassland located adjacent to the larger watercourses along the study corridor. These targeted surveys aimed to supplement the data gathered during the dawn breeding bird surveys, particularly in relation of waterfowl and waders. In relation to Kingfisher, the surveyors noted whether or not the waterways within the study corridor were suitable for Kingfisher (i.e. slow-flowing, with perches available for fishing) and whether suitable Kingfisher nesting banks (tall vertical banks with soft material into which they can dig their burrows) were present (Cummins *et al*., 2010).

Ecologists carrying out Bat surveys at night were trained in the identification of signs/calls of crepuscular and nocturnal species such as Woodcock and Owl species that are typically active at this time. Nocturnal bird surveys undertaken as part of Bat survey work during the breeding bird season were conducted on the 9th of June 2015 and on the 24th of July 2015. In addition, buildings/outbuildings which were subject to internal and external Bat roost surveys were also surveyed in relation to Barn Owl.

Table 7.2 below summarises the Breeding Bird survey effort during the 2015 breeding season.

Table 7.2 Breeding Bird Survey Summary

Date	Survey Period	Weather Conditions	Location	Survey Conducted
27/03/2015	9:00-17:00	Mild, minimal cloud cover, no breeze, no precipitation	Clooncullaan Lough and adjacent habitats, Cregga Turlough, selected wet grasslands the larger watercourses and adjacent habitats	Targeted survey for breeding Water fowl and Waders (Curlew, redshank, lapwing, snipe etc.)
18/05/2015	9:00-17:00	Mild, occasional showers, good visibility, no breeze	Clooncullaan Lough and adjacent habitats, Cregga Turlough	Targeted survey for breeding Water fowl and Waders (Curlew, redshank, lapwing, snipe etc.)
8-9/06/2015	Dusk & Dawn	Cold, clear skies, light ground frost, no breeze, no precipitation	Throughout study area	Nocturnal bird species during Bat survey
09/06/2015	04:35-09:10	Cold, clear skies, light ground frost, no breeze, no precipitation	Throughout study area including Clooncullaan Lough and Cregga Turlough	Dawn breeding bird survey
24/06/2015	05:10-11:40	Mild, minimal cloud cover, no breeze, no precipitation	Throughout study area including Clooncullaan Lough and Cregga Turlough	Dawn breeding bird survey
23-24/07/2015	Dusk & Dawn	Mild, minimal cloud cover, no breeze, no precipitation	Throughout study area	Nocturnal bird species during Bat survey
24/07/2015	05:20-09:20	Mild, minimal cloud cover, no breeze, no precipitation	Throughout study area including Clooncullaan Lough and Cregga Turlough	Dawn breeding bird survey
29/07/2015	09:00-4:30	Mild, minimal cloud cover, light breeze, no precipitation	Clooncullaan Lough and adjacent habitats, Cregga Turlough, the 7 main watercourses and adjacent habitats	Targeted survey for breeding Water fowl and Waders (Curlew, redshank, lapwing, snipe etc.)

Marsh Fritillary

Field surveys were conducted, in accordance with best practice guidance (TII/NRA, 2009), and Marsh Fritillary *Euphydryas aurinia* Survey - Specific Requirements, Northern Ireland Environment Agency (NIEA, 2011). In accordance with the TII/NRA Guidelines (TII/NRA, 2009), Marsh Fritillary surveys are generally only required if there are existing desk study records for the locality and if the habitat with which they are likely to be associated would be affected by the proposals. Specific surveys may also be appropriate if, in the absence of existing records, areas of particularly suitable habitat are identified. Where records exist, surveys should focus on suitable patches of habitat within the vicinity of the known record. Should they be deemed necessary, a suite of surveys will usually be required, comprising a more detailed habitat suitability assessment, combined with surveys for adults (in May/June) and larvae (in August/September).

Detailed surveys were conducted in accordance with best practice guidance (TII/NRA, 2009). Surveys were undertaken on the 14th & 28th of July 2014, 11th of September 2014, the 9th of June 2015 and the 4th of September 2015.

Areas identified as having potential to support Marsh Fritillary based on the Multi-disciplinary walkover surveys and desk study results were targeted for further assessment. As per the TII/NRA guidelines, habitat suitability surveys should ideally be undertaken during September, when the species host plant (Devil's-bit Scabious *Succisa pratensis*) is most conspicuous. For each site, the suitability of the habitats for Marsh Fritillaries should be assessed according to the following categories, which provide an approximate gradation of habitat suitability (from highly suitable to not suitable): 'Good condition'; 'Suitable, under-grazed'; 'Suitable, overgrazed'; 'Suitable, sparse'; 'Overspill'; 'Potential, rank'; 'Not suitable'. The assessment is based upon percentage of Purple Moor-grass and Devil's-bit Scabious, scrub cover, sward height and presence of tussocks. Habitat suitability surveys were undertaken on the 14th & 28th of July 2014. An assessment of Sward height was undertaken. This involved walking transects at 20m intervals through the habitat, and selecting random points no greater than 20m apart along each transect. At each point, the presence or absence of Devil's-bit Scabious within 1m is recorded and sward height assessed using the following scale: <10 cm = 1; 10-20 cm = 2; >20 cm= 3. In order to qualify as a suitable habitat for Marsh Fritillary butterflies, Devil's-bit Scabious needs to be recorded within 1m of a minimum of 50% of all random points, and sward height should be within the range of 10-20cm in at least 75% of the random points.

Adult Surveys

The optimum period for detection of the adult butterflies is late-May and the first half of June. Males are very active on the wing in sunny conditions in late-morning and early-afternoon, flying constantly in search of females, and stopping frequently to take nectar, usually from Meadow Thistle (*Cirsium dissectum*), but also Tormentil (*Potentilla erecta*), Buttercup (*Ranunculus* spp.), Hawkbit (*Leontodon* spp.) and Milkwort (*Polygala* spp.). In overcast weather, butterflies of both sexes perch for long periods on low foliage, or in rabbit-scrapes or other depressions.

A survey for adult Marsh Fritillary butterflies was conducted on the 9th of June 2015 in the areas identified during the September 2014 surveys as having potential to support suitable habitat for Marsh Fritillary.

Larval Web Survey

The optimum survey period for larvae is during August and September, in sunny conditions, when colonies of individuals construct conspicuous webs over Devil's-bit Scabious leaves and adjacent vegetation. These webs are easily identifiable at some distance. Spring larval surveys can also be carried out, but the formation of large colonies is less common and hence surveys are less efficient.

The standard method of monitoring Marsh Fritillary populations is to count the larval webs. Due to the different development stages of the larvae, only occupied webs should be recorded. Where several occupied larval webs are in close proximity and visibly linked by old web material, they should be recorded as a single web having developed from a single egg batch.

The Larval Web Surveys were conducted on the 11th of September 2014 and the 4th of September 2015. The latter dates fall inside the recognised optimum larval web survey period (i.e. Late August and September).

Fisheries Including White-clawed Crayfish

Detailed Fish stock surveys were not conducted given that significant impacts to fisheries are not anticipated. This followed best practice guidance (TII/NRA, 2009) which states that "*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.*"

The main watercourses along the study corridor, which were determined in consultation with Inland Fisheries Ireland (IFI), include:

1. Scramoge/Mountain River
2. Strokestown River Ch. 51+150
3. Upper Owenur River
4. Un-named Stream Ch. 21+325
5. Owennaforeesha River
6. Un-named Stream Ch. 12+700
7. Carricknabraher River
8. Watercourse at Ch. 22+000
9. Watercourse at Ch. 33+250

The watercourses were assessed with regard to their potential to support Salmonids and Lamprey species. A desk study review of literature pertinent to the aquatic environment was conducted. This included a review of Inland Fisheries Ireland's Fish sampling records conducted in line with the Requirement of the Water Framework Directive (WFD) which aims to secure the ecological, quantitative and qualitative functions of water throughout the EU. It requires that all impacts on water will be analysed and actions will be taken to secure natural water resources for the future. A review of the Environmental Protection Agency (EPA) Q value status and WFD surface water status for the watercourses was also undertaken. The watercourses were assessed with regard to fisheries potential during the detailed watercourse assessment conducted on the 13th of February, 27th of March, 6th of October and the 23rd of November 2015.

The watercourses traversed by the proposed road were assessed with regard to having potential to support the Annex II species Freshwater White-clawed Crayfish (*Austropotamobius pallipes*). Where possible, hand searches were conducted for this species (Under Licence No. C161/2015) (See Appendix 7.4). Where encountered, Otter spraints were also examined for the presence of crayfish remains which would give an indication as to whether the species was present in the area.

Invasive Alien Species (IAS)

Due to the legislative requirements to control the spread of noxious weeds and non-native invasive plant species, it is important that any activities associated with the planning, construction and operation of national road schemes comply with the requirements of the Wildlife Acts, 1976-2012. During the multi-disciplinary walkover surveys and specialist field surveys the presence of non-native invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015) were recorded. Regulations 49 and 50 of these Regulations include legislative measures to deal with the dispersal and introduction of Invasive Alien Species (IAS). Regulation 49 deals with the *Prohibition on introduction and dispersal of certain species* while Regulation 50 relates to *Prohibition on dealing in and keeping certain species* (Regulation 50 has not yet

been commenced). IAS are also addressed by EU Regulation 1143/2014, which seeks to address the problem of IAS in a comprehensive manner so as to protect native biodiversity and ecosystem services, as well as to minimize and mitigate the human health or economic impacts that these species can have.

The Regulation foresees three types of interventions; prevention, early detection and rapid eradication, and management.

A list of invasive alien species of Union concern will be drawn up and managed with Member States using risk assessments and scientific evidence.

The following guidance documents and literature sources relate the management and treatment of IAS:

- National Roads Authority TII/NRA (2010). Guidelines on management of noxious weeds and non-native invasive plant species on national roads.
- Environment Agency (UK) (2013). The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013.
- Stokes, K., O'Neill, K. & McDonald, R.A. (2004) Invasive species in Ireland. Unpublished report.
- Irish Water Report. Information and Guidance Document on Japanese knotweed Asset Strategy and Sustainability

7.2.4 Ecological Evaluation and Impact Assessment Methodology

Ecological evaluation and Impact assessment within this chapter follows a methodology that is set out in Chapter three of the '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes*' (TII/NRA, 2009).

Evaluation of Ecological Resources

The criteria used for assessment of the value of the ecological resources follow those set out in Section 3.3 of the TII/NRA Ecological Impact Guidelines (2009). These guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The guidelines provide a basis for determination of whether any particular site is of importance on the following scales:

- International
- National
- County
- Local Importance (Higher Value)
- Local Importance (Lower Value)

The TII/NRA Ecological Impact Guidelines (2009) clearly sets out the criteria by which each geographic level of importance can be assigned. Locally Important (lower value) receptors contain habitats and species that are widespread and of low ecological significant and of any importance only in the local area. Internationally Important sites are either designated for conservation as part of the Natura 2000 Network (SAC or SPA) or provide the best examples of habitats or internationally important populations of protected flora and fauna.

All habitats and species along the proposed study corridor were assigned a level of significance on the above basis and the ZOI. KERs were established and classified on this basis.

Assessment of Impact Type and Magnitude

Reference is made to the following parameters wherever appropriate when characterizing impacts (Section 7.5):

- Magnitude relates to the quantum of impact, for example the number of individuals affected by an activity;
- Extent should also be predicted in a quantified manner and relates to the area over which the impact occurs;
- Duration is intended to refer to the time during which the impact is predicted to continue, until recovery or re-instatement;
- Reversibility should be addressed by identifying whether an impact is ecologically reversible either spontaneously or through specific action; and,
- Timing/frequency of impacts in relation to important seasonal and/or life-cycle constraints should be evaluated. Similarly, the frequency with which activities (and associated impacts) would take place can be an important determinant of the impact on receptors.

It is necessary to ensure that any assessment of impact takes account of construction and operational phases; direct, indirect and cumulative impacts; and, those that are temporary, reversible and irreversible. The criteria for assessment of impact magnitude, type and significance are given in Table 7.3 and 7.4. The following terms are defined when quantifying duration: (EPA, 2002):

- Temporary – up to 1 year
- Short-term – 1 to 7 years
- Medium term – 7 to 15 years
- Long term – 15 to 60 years
- Permanent – over 60 years

Table 7.3 Criteria for Assessing Impact Significance Based on (EPA, 2002)

Impact Magnitude	Definition
No change	No discernible change in the ecology of the affected feature
Imperceptible Impact	An impact capable of measurement but without noticeable consequences
Slight Impact	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate Impact	An impact that alters the character of the environment that is consistent with existing and emerging trends
Significant Impact	An impact which, by its character, its magnitude, duration or intensity alters a sensitive aspect of the environment
Profound Impact	An impact which obliterates sensitive characteristics

Table 7.4 Criteria for Assessing Impact Quality Based on (EPA, 2002)

Impact Type	Criteria
Positive	A change which improves the quality of the environment e.g. increasing species diversity, improving reproductive capacity of an ecosystem or removing nuisances
Neutral	A change which does not affect the quality of the environment

Impact Type	Criteria
Negative	A change which reduces the quality of the environment e.g. lessening species diversity or reducing the reproductive capacity of an ecosystem

Once the potential impacts are characterised, the significance of any such impacts on the identified KERs will be determined following the TII/NRA Guidelines (2009) and the '*Guidelines on the information to be contained in Environmental Impact Statements'* (EPA, 2002).

Process of Assessing Significance

The significance of any identified impacts is determined following guidance set out in Section 3.4.4.3 of the guidelines (TII/NRA, 2009) whereby impacts are assigned significance empirically on the basis of an analysis of the factors which characterise them, irrespective of the value of the receptor. Significance is determined by effects on conservation status or integrity, regardless of geographical level at which these would be relevant.

If impacts are not found to be significant at the highest geographical level at which the resource has been valued, they may be significant at a lower level and this is determined sequentially. Impacts may affect the conservation status of a valuable constituent habitat or species, albeit at a lower geographic scale. An equivalent approach has been applied to mitigation measures prescribed, which may have a significant beneficial impact, but at a higher or lower geographic scale than the receptor to which they have been applied.

Mitigation

The study corridor has been designed to specifically avoid, reduce and minimise impacts on all KERs. Where potential significant impacts on KERs are predicted, mitigation has been prescribed to address such impacts. In addition, mitigation has been employed to offset potential impacts and in some cases to result in an enhancement of the biodiversity value of an area.

Proposed best practice design and mitigation measures are specifically set out and are realistic in terms of cost and practicality. They have been subject to detailed design and have a high probability of success in terms of addressing the impacts on the identified KERs.

The potential impacts of the proposed road development were considered and assessed to ensure that all impacts on KERs are adequately addressed and no significant residual impacts remain following mitigation.

7.3 Description of the Existing Environment

This section of the Biodiversity chapter provides a detailed description of the ecology of the baseline environment within the study corridor. Firstly, the results of a detailed desk study are presented. This is followed by a general overview of the ecology of the study corridor. A detailed description of the flora and fauna of the study corridor that uses information gathered during the various field and desk studies undertaken is then provided. The dedicated surveys undertaken have been compiled into a suite of Technical Appendices which accompany this Chapter. The Technical Appendices provide detailed survey methodologies and outline the results of the desk and field studies undertaken.

7.3.1 Desk Study

Designated Site Information

The proposed road development does not encroach on any National or European sites designated for nature conservation. The potential for the proposed road development to impact on European Sites within the ZOI was considered as part of this assessment. The most proximal designated sites (within a 15km radius of the proposed N5 acquisition boundary) are presented in Table 7.5. The proposed development is located 0.2km from the nearest designated site, Bellanagare Bog SAC (NPWS Site Code: 000592).

Natural Heritage Areas and Proposed Natural Heritage Areas

Natural Heritage Areas (NHAs) are sites that are designated for the protection of flora, fauna, habitats and geological sites of national importance. Management of NHAs is guided by planning policy and the Wildlife Acts, 1976-2012. The nearest NHA to the proposed development is Bella Bridge Bog NHA (NPWS Site Code: 000591) located 3.6km to the north (see Figure 7.1).

Proposed NHAs (pNHAs) were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. Site Synopses are not currently available for pNHAs. The nearest pNHA to the proposed development is Bellanagare Bog pNHA (NPWS Site Code: 000592) located 0.2km to the south (see Figure 7.1).

European Sites

The Habitats Directive, together with the Birds Directive forms the cornerstone of Europe's nature conservation policy. It is built around two pillars: the Natura 2000 network of protected sites and the strict system of species protection. The aim of the Habitats Directive is to contribute towards maintaining biodiversity throughout Member States through the conservation of natural habitats and wild flora and fauna. The Birds Directive seeks to protect all wild birds and their most important habitats across their entire natural range within the EU.

With the introduction of the EU Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) (since replaced by Directive 2009/147/EC) which were transposed into Irish law as S.I. No. 94/1997 *European Communities (Birds and Natural Habitats) Regulations* 1997, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna, and also their habitats. The 1997 Regulations were subsequently amended and revised and consolidated in S.I. No. 477/2011- *European Communities (Birds and Natural Habitats) Regulations* 2011. This legislation requires the establishment and conservation of a network of sites of particular conservation value that are to be termed 'European Sites'.

Habitats Directive/Special Areas of Conservation

Articles 3 – 9 of the EU Habitats Directive (92/43/EEC) provide the EU legislative framework of protecting rare and endangered species of flora and fauna, and habitats. Annex I of the Directive lists habitat types whose conservation requires the designation of Special Areas of Conservation (SAC). Priority habitats, are also listed in Annex I. Annex II of the Directive lists animal and plant species (e.g. Marsh Fritillary, Salmon, and Killarney Fern) whose conservation also requires the designation of SACs. Annex IV lists animal and plant species in need of strict protection such as Lesser Horseshoe Bat and Otter, and Annex V lists animal and plant species whose taking in the wild and exploitation may be subject to

management measures. In Ireland, species listed under Annex V include Irish Hare, Common Frog and Pine Marten.

Candidate SACs (cSACs) are afforded the same protection from the time that they are proposed as Sites of Community Importance until they are approved as Special Areas of Conservation (SACs). Throughout this document no reference is made to cSACs with all sites referenced as SAC.

Birds Directive/Special Protection Areas

Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (Birds Directive) has been substantially amended several times. In the interests of clarity and rationality the said Directive was codified in 2009 and is now cited as Directive 2009/147/EC. The Directive instructs Member States to take measures to maintain populations of all bird species naturally occurring in the wild state in the EU (Article 2). Such measures may include the maintenance and/or re-establishment of habitats in order to sustain these bird populations (Article 3).

A subset of bird species has been identified in the Directive and are listed in Annex I as requiring special conservation measures in relation to their habitats. These species have been listed on account of inter alia: their risk of extinction; vulnerability to specific changes in their habitat; and/or due to their relatively small population size or restricted distribution. Special Protection Areas (SPAs) are to be identified and classified for these Annex I listed species and for regularly occurring migratory species, paying particular attention to the protection of wetlands (Article 4). The nearest SPA to the proposed development site is Bellanagare Bog SPA located 0.2km to the south of the proposed road development (see Figure 7.1).

Table 7.5 Most Proximal Designated Sites (within 15km) to the Proposed Road Development

Designated Site	Distance from Proposed Road Development
Special Areas of Conservation (SAC)	
Bellanagare Bog SAC (000592)	0.2km south
Annaghmore Lough (Roscommon) SAC (001626)	0.9km south
Callow Bog SAC (000595)	1.6km northwest
Cloonshanville Bog SAC (000614)	1.7km north
Tullaghanrock Bog SAC (002354)	3.9km northwest
Moygollan Turlough SAC (000612)	7.8km south
Lough Forbes Complex SAC (001818)	10km east
Corbo Bog SAC (002349)	9.8km east
Clooneen Bog SAC (002348)	10.3km northeast
Lough Ree (000440)	10.2km northeast
Drumalough Bog SAC (002338)	11.6km southwest
Cloonchambers Bog SAC (000600)	12.3km southwest
Brown Bog SAC (002346)	12.9km east
River Moy SAC (002298)	13.1km west
Derrinea Bog SAC (000604)	14.4km southwest
Flughany Bog SAC (000497)	14.5km northwest
Corrowbehy/Caher Bog SAC (000597)	14.5km southwest

Designated Site	Distance from Proposed Road Development
Special Protected Areas (SPA)	
Bellanagare Bog SPA (004105)	0.5km southwest
Lough Gara SPA (004048)	2.4km north
Ballykenny-Fisherstown Bog SPA (004101)	10km east
Lough Ree SPA (004064)	10.3km southeast
Natural Heritage Areas (NHA)	
Bella Bridge Bog (000591)	3.6km north
Cornaveagh Bog (000603)	4.5km north
Tullaghan Bog (Roscommon) (001652)	7.1km north
Derrycanan Bog (000605)	7.7km southeast
Aghnamona Bog (000422)	11.2km northeast
Lisnanarriagh Bog (002072)	11.9km southeast
Rinn River (000691)	12.1km northeast
Corracramph Bog (001420)	13.8km northeast
Cloonageeher Bog (001423)	14km northeast
Proposed Natural Heritage Areas (pNHA)	
Bellanagare Bog (000592)	0.2km south
Annaghmore Lough (Roscommon)	0.9km south
Lough Gara (000587)	1.6km north
Cloonshanville Bog (000614)	1.7km north
Ardagh Bog (001222)	3km north
Kilglass and Grange Loughs (000608)	3.2km northeast
Tullaghanrock Bog (002013)	3.9km north
Corbally Turlough (001627)	5.5km south
Ardakillin Lough (001617)	5.1km south
Mullygollan Turlough (000612)	7.5km south
Lough Glinn (001644)	8km southwest
Brierfield Turlough (000594)	8.5km south
Castleplunket Turlough (000598)	8.9km south
Lough Boderg and Lough Bofin (001642)	9.7km northeast
Corbo Bog (000602)	9.8km southeast
Lough Forbes Complex (001818)	10km east
Shad Lough (001648)	10.1km south
Lough Ree (000440)	10.2km southeast
Royal Canal (002103)	10.3km east
Clooneen Bog (000445)	10.4km east
Drumalough Bog (001632)	11.6km southwest
Lough Bannow (000449)	11.9km southeast
Carrowreagh Turlough (001624)	11.7km south
Cloonchambers Bog (000600)	12.5km south
Brown Bog (000442)	12.9km east

Designated Site	Distance from Proposed Road Development
Rathnalulleagh Turlough (000613)	14km south
Tawnaghbeg Bog (000547)	14.3km northwest
Derrinea Bog (000604)	14.4km southwest
Flughany Bog (000497)	14.4km northwest
Carrowbehy/Caher Bog (000597)	14.5km southwest
Kilgarriff Bog (000510)	14.5km northwest
Lough Drumharlow (001643)	14.6km north
Newtown Turlough (001646)	14.7km south
Derrynabrock Bog (000457)	14.9km northeast

Habitats, Flora and Fauna

The following sections give an overview of the desk study sources consulted and results obtained during the desk study. Comprehensive desk study details in relation to the specialised topics are presented in the suite of technical appendices that accompany this chapter.

NPWS Article 17 Metadata and Additional Habitat Databases

A review of the NPWS Habitat Directive - Article 17 (of the Habitats Directive) dataset, Irish Semi-natural Grassland Survey dataset, National Survey of Native Woodland dataset along with Long Established Woodland dataset was conducted prior to undertaking the multi-disciplinary walkover survey and again on the 16/11/2015. The datasets were downloaded and overlain on the study area.

The Article 17 Turlough (3180) point dataset identifies Cregga Turlough as "*Cuilrevagh.turlough se of Caldragh*" and classifies the Turlough as an Annex I habitat. The Turlough has been the subject of detailed assessment (See Appendix 7.3).

The remaining Article 17 datasets do not identify any Annex I habitat types within or adjacent to the study corridor.

The Irish Semi-natural Grassland Survey GIS files were reviewed. There were a number of assessment points located in close proximity to the proposed road development; however the database does not identify any Annex I habitats within or adjacent to the proposed land acquisition associated with the proposed road development.

In relation to woodlands, the Ancient and Long Established Woodland (LEW) database, maintained by the NPWS, contained an identified woodland stand along the entrance lane to Mantua House (Chainage 18+300). This woodland stand is not traversed by the proposed road development. As per the database, the woodland age classification is defined as *a stand for which there is evidence that the site is not ancient LEW (II)*. The woodland is described as dominated by non-native broadleaved species (NNB). Consequently, the woodland does not correspond to an Annex I habitat type. Given that the woodland is a non-native stand it was not selected for detailed Annex I Woodland habitat assessment.

The National Survey of Native Woodland dataset contains woodland records located in close proximity to the proposed road development at Mantua and Kiltrustan.

Neither assessment stop points/woodlands corresponded to an Annex I habitat types.

National Parks and Wildlife Service Data

National Parks and Wildlife Service (NPWS) are a division of the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs with responsibility for nature conservation and implementation of the Government's responsibility with regard to the management of habitats and species that are protected under Irish and EU legislation in the Republic of Ireland. NPWS online records were searched to see if any rare or protected species of flora or fauna were recorded in the 10km grid squares (Hectads) in which the study area falls (M69, M78, M79, M88, M97, M98). An information request was also sent to the NPWS requesting details on rare and protected species records from the hectads which overlap with the study area. Tables 7.6 and 7.7 list rare and protected species records obtained from NPWS. All of these species are protected under the Wildlife Acts, 1976-2012.

Table 7.6 Records for Rare and Protected Species, NPWS

Common Name	Scientific Name	Status	Grid Square
Freshwater Crayfish	*Austropatamobius pallipes*	Annex II, WA 1976-2012	M78, M79, M88, M98
Whooper Swan	*Cygnus cygnus*	Annex I, WA 1976-2012	M98
Geyer's Whorl Snail	*Vertigo (vertigo) geyeri*	Annex II, W.A. 1976-2012	M88, M98
Otter	*Lutra lutra*	Annexes II,IV WA 1976-2012	M69, M78, M79, M88, M98

Table 7.7 Species Protected Under the Wildlife Acts, 1976-2012, NPWS

Common Name	Scientific Name	Status	Grid Square
Irish Hare	*Lepus timidus subsp. hibernicus*	WA 1976/2000 Annex V	M69. M78, M79, M88. M98
West European Hedgehog	*Erinaceus europaeus*	WA 1976/2000	M69, M88
Pine Marten	*Martes martes*	WA 1976/2000 Annex V	M98
Badger	*Meles meles*	WA 1976/2000	M69, M78, M79, M88, M98
Irish Stoat	*Mustela ermine subsp. hibernica*	WA 1976/2000	M69
Common Frog	*Rana temporaria*	WA 1976/2000 Annex V	M69, M78, M79, M88, M98
Smooth Newt	*Lissotriton vulgaris*	WA1976/2000	M98
Red Squirrel	*Sciurus vulgaris*	WA 1976/2000	M98

Biodiversity Ireland Database

The National Biodiversity Ireland Database (NBDC) was accessed prior to conducting the multi-disciplinary walkover surveys and was rechecked for updates on the 11th of April 2016. Table 7.8 lists the rare and protected species recorded within

the hectads pertaining to the current study area. Table 7.9 lists the Invasive Alien Species (IAS) recorded within these hectads.

Table 7.8 NBDC Records for the Relevant Hectads

Common Name	Scientific Name	Status	Grid Square
Common Frog	*Rana temporaria*	Annex V, WA 1976/2000	M69, M78, M79, M88, M97, M98
Kingfisher	*Alcedo atthis*	Annex I, WA 1976/2000	M69, M78, M79, M88, M97, M98
Smooth Newt	*Lissotriton vulgaris*	WA 1976/2000	M69, M79
Red Squirrel	*Sciurus vulgaris*	WA1976/2000	M69, M78, M79, M98
Pygmy Shrew	*Sorex minutus*	WA1976/2000	M69, M97
Hen Harrier	*Circus cyaneus*	Annex I, WA 1976/2000	M69, M78, M79, M88, M97
Corncrake	*Crex crex*	Annex I, WA 1976/2000	M78, M79, M98
Whooper Swan	*Cygnus cygnus*	Annex I, WA 1976/2000	M69, M78, M79, M88, M97, M98
Greater White-fronted Goose	*Anser albifrons*	Annex I, WA 1976/2000	M69, M79, M98
Merlin	*Falco columbarius*	Annex I, WA 1976/2000	M88
Peregrine Falcon	*Falco peregrinus*	Annex I WA 1976/2000	M69
Dunlin	*Calidris alpina*	Annex I, WA 1976/2000	M79, M97
Golden Plover	*Pluvialis apricaria*	Annex I, WA 1976/2000	M69, M78, M79, M88, M98
Little Egret	*Egretta garzetta*	Annex I, WA 1976/2000	M98
Common Tern	*Sterna hirundo*	Annex I WA 1976/2000	M69, M79, M88, M98
Otter	*Lutra lutra*	Annex II, IV, WA 1976/2000	M69, M78, M79, M88, M97, M98
Marsh fritillary	*Euphydryas aurinia*	Annex II, WA 1976/2000	M79,
Geyer's Whorl Snail	*Vertigo (vertigo) geyeri*	Annex II, WA 1976/2000	M88, M98
Freshwater White-clawed Crayfish	*Austropotamobius pallipes*	Annex II, V, WA 1976/2000	M69, M78, M79, M88, M98
Myotis Bat	*Myotis spp.*	Annex IV, WA 1976/2000	M78,
Daubenton's Bat	*Myotis daubentonii*	Annex IV, WA 1976/2000	M69, M98
Natterer's Bat	*Myotis nattereri*	Annex IV, WA 1976/2000	M79
Leisler's Bat	*Nyctalus leisleri*	Annex IV, WA 1976/2000	M69, M78, M88, M97, M98

Common Name	Scientific Name	Status	Grid Square
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Annex IV, WA 1976/2000	M69, M78, M88, M97, M98
Pipistrellus	*Pipistrellus pipistrellus sensu lato*	Annex IV, WA 1976/2000	M69, M78, M97, M98
Brown Long-eared Bat	*Plecotus auritus*	Annex IV, WA 1976/2000	M88, M98
Pine Marten	*Martes martes*	Annex V, WA 1976/2000	M79, M88, M97, M98

Table 7.9 Invasive Alien Species (IAS) Recorded Within the Relevant Hectads

Common Name	Scientific Name	Grid Square
Cananadian Waterweed	*Elodea canadensis*	M69, M79, M97
Curly Waterweed	*Lagarosiphon major*	M98
Japanese Knotweed	*Fallopia japonica*	M69, M78, M79, M98
Cherry Laurel	*Prunus laurocerasus*	M69, M78,
Rhododendron	*Rhododendron ponticum*	M79,
Zebra Mussel	*Dreissana (Dreissana) polymorpha*	M69, M79, M98
Fallow Deer	*Dama dama*	M97
American Mink	*Mustela Vison*	M78, M97, M98

New Flora Atlas

A search was made in the '*New Atlas of the British & Irish Flora'* (Preston *et al*., 2002) to investigate whether any rare or unusual plant species listed under the Flora (Protection) Order, 2015, had been recorded in the relevant 10km squares in which the study site is situated (M78, M79, M88, M97, M98). Records were also checked for species protected under Annex II of the EU Habitats Directive as well as the Irish Red Data Book. 1., Vascular Plants (Curtis, 1988). No Flora Protection Order or Annex II species were recorded in any of the hectads in which the road development is proposed. One species was recorded in grid square M78 that is listed as *rare* under the Irish Red Data Book List; Bald Brome *(Bromus racemosus)*. The remaining grid squares M79, M88, M97 and M98 also held records for Bald Brome (*Bromus racemosus*) and one other species listed as '*rare'* under the Irish Red Data Book List; Golden Dock (*Rumex maritimus*).

Bat Conservation Ireland Database

A search for records of bat activity and roosts within the hectads which overlap with the proposed road development was conducted. A number of identified roosts and survey results are available for the relevant hectads. The results of the database search, per hectad, is provided below in Table 7.10. There were no additional surveys, roosts or transects listed on the database.

Table 7.10 BCI Data from Hectads M79, M78, M88, M98 and M97

Survey Type	Hectad/Details	Species Recorded	Survey	Bat Species Designation
Roost	M78, Oweynagat Cave (approx. 4km south of proposed road development (PRD))	Unidentified bats, Natterer's Bat	Observation	Annex IV
Transect	M88, Multiple transects in hectad (2003-2014)	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Myotis spp.	BCIreland Car Based Bat Monitoring Scheme	Annex IV
	M97, Scramoge River (3km upstream of crossing point) (2009)	Daubenton's Bat	All Ireland Daubenton's Bat Waterways Survey	Annex IV
	M97, Multiple transects in hectad	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat	BCIreland Car Based Bat Monitoring Scheme	Annex IV
	M98, Multiple transects in hectad (2004-2014)	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Myotis spp., Brown Long-eared Bat	BCIreland Car Based Bat Monitoring Scheme	Annex IV
Other Observation	M78	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Myotis spp.	BATLAS 2010	Annex IV
	M78, Bellanagare Bridge	Soprano Pipistrelle, Leisler's Bat	Ad hoc Observation	Annex IV
	M79	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Natterer's Bat	Heritage Council Farm Building Survey	Annex IV
	M88	Soprano Pipistrelle, Leisler's Bat, Daubenton's Bat, Brown Long-eared Bat	BATLAS 2010	Annex IV
	M97	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Daubenton's Bat, Myotis spp.	BATLAS 2010	Annex IV
	M98	Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Daubenton's Bat,	BATLAS 2010	Annex IV
	M98, Strokestown	Common Pipistrelle	EIA Survey (Scott Cawley)	Annex IV

Bird Atlas Data

Previous Atlases

Previous Bird Atlases have been the primary source of information on the distribution and abundance of British and Irish birds prior to Bird Atlas 2007–11. The three previously published atlases were:

- Sharrock, J.T.R. (1976) *The atlas of breeding birds in Britain and Ireland*.
- Lack, P.C. (1986) *The atlas of wintering birds in Britain and Ireland*.
- Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993) *The new atlas of breeding birds in Britain and Ireland: 1988-1991.*

Bird Atlas 2007-11

The most recent bird atlas project took place over four winters and four summers between November 2007 and July 2011. The data has been published in *Bird Atlas 2007-11, The breeding and wintering birds of Britain and Ireland*' (Balmer *et al*., 2013). Distribution map data is also available online from BTO Map store http://blx1.bto.org/mapstore/StoreServlet.

Breeding Birds

Of the species recorded in the above dataset from the relevant hectads (M78, M79, M88 M97 and M98), 15 are protected under the Birds Directive or mentioned on the BoCCI Red List. Breeding evidence for three Annex I listed bird species (Kingfisher, Hen Harrier and Common Tern) has been recorded from the hectads that overlap with the proposed road development. Breeding evidence for twelve species listed on the BoCCI red list was recorded.

Wintering Birds

Of the species recorded in the above dataset from the relevant hectads (M78, M79, M88 M97 and M98), 20 are protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) Red List. Eight birds recorded as wintering in the relevant 10km squares are protected under Annex I of the EU Habitats Directive: Whooper Swan, Greenland White-fronted Goose, Hen Harrier, Merlin, Golden Plover, Dunlin, Peregrine and Kingfisher. A further 12 birds that are listed on the BoCCI Red List were recorded in the atlas as wintering in the area.

Inland Fisheries Ireland Fish Sampling

A total of eight species of fish were recorded from the Scramoge River by IFI as part of the Water Framework Directive fish sampling conducted in 2012: Perch (*Perca fluviatilis*), Gudgeon (*Gobio gobio*), Pike (*Esox lucius*), Lamprey sp. (*Lampetra* sp.), Roach (*Rutilus rutilus*), Stoneloach (*Barbatula barbatula*), Eel (*Anguilla anguilla*), Brown Trout (*Salmo trutta*) (Sampling Fish for the Water Framework Directive, Rivers, Shannon International River Basin District 2012). The fish sampling was conducted at Carrowclogher and Riverdale, which are located approximately 4km downstream of the proposed crossing point on the Scramoge River. There was no fish sampling available for the remaining watercourses traversed by the proposed road.

Water Quality EPA

The EPA Envision web-mapper was consulted on the 10th of December 2015 regarding the water quality status of the watercourses within the study corridor. The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values and water quality classes are assigned using a combination of habitat characteristics and structure of the macro invertebrate

community within the waterbody. Individual macro invertebrate species are ranked for their sensitivity to organic pollution and the Q-value is assessed based, primarily, on their relative abundance within a biological sample.

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. River Basin Districts are the natural geographical and hydrological units for water management and are used instead of administrative or political boundaries. The online EPA Envision web-mapper provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters.

Table 7.11 shows the information recorded regarding available water quality status at river crossings within the proposed study corridor.

Table 7.11 EPA Envision Water Quality Results

River	WFD Status 2010-2012	Q-Value Status (2004-Present)
Scramoge River	This watercourse has been assigned *Poor Status* at the proposed crossing point	Q4 – Good Status (Sample point upstream of the crossing location, Scramoge Bridge, Grid ref; 195279, 279468)
Stream C51+110 (Strokestown River)	This watercourse has been assigned *Poor Status* at the proposed crossing point	Q3-4 – Moderate Status (Sample point upstream of crossing at Grid Ref: 194263, 280948)
Upper Owenur River	The watercourse has been assigned *Good Status* at the proposed crossing point	Q4 – Good Status (Sample point downstream of crossing at Bridge near Ballyoughter House, Grid Ref: 187249, 286534)
Unnamed Stream C32+175	The watercourse has been assigned *Good Status* at the proposed crossing point	Q4 – Good Status (Sample point downstream of crossing at N61 Bridge, Grid Ref: 173666, 290293)
Owennaforeesha River	The watercourse has been assigned *Poor Status* at the proposed crossing point	Q3-4 – Moderate Status (Sample point upstream of crossing at Bellanagare Bridge, Grid Ref: 175020, 287506)
Unnamed Stream C12+700	The watercourse has been assigned *Poor Status* at the proposed crossing point	None available for Watercourse
Carricknabraher River	The watercourse has been assigned *Good Status* at the proposed crossing point however the status reduces to Poor further downstream to the east of the N5.	Q4 – Good Status (Sample point downstream of crossing at Cloonshanville Bridge, Grid Ref: 173666, 290293)
Watercourse at Ch. 22+000	None available for Watercourse	None available for Watercourse
Watercourse at Ch. 33+250	None available for Watercourse	None available for Watercourse

7.3.2 Field Assessment

General Description and Context

The western end of the proposed road development connects with a relatively recently constructed section of road that forms the N5 Ballaghaderreen bypass. The

proposed route passes through an open agricultural landscape with hedges and tree lines marking the boundaries of fields of improved and wet grassland. Whilst these habitats are of some ecological significance, they are widespread in the local and wider area and were not considered as KERs of the road project.

Moving in an easterly direction, the proposed road passes through an area of approximately 3.5km in length where the grasslands are interspersed with large blocks of species poor coniferous forestry. The grasslands in this area are wetter and less intensively managed with some scrub encroachment and in places, considered of a higher local ecological and biodiversity value than the grasslands described to the west. The Carricknabraher River is crossed in this area and the proposed road passes to the north of some peatland (Raised Bog) habitats. It is in this area that the proposed road development passes at its closest to the Bellanagare Bog SAC and SPA that are located to the south.

Continuing east, the study corridor passes over the existing N5 road to the west of Bellanagare and through fields of improved pasture with hedges and treelines. Further eastwards the road descends into an area with wet grasslands and broadleaved woodland surrounding an area of Degraded Raised Bog (to the north that is actively cut). The proposed road development then crosses the Owennaforeesha River and continues through wet grasslands with small patches of woodland and scrub, which have encroached on cut over degraded raised bog and wet grassland along with conifer plantations. These kind of habitats persist for approximately 3.5km.

In the area of Mantua and Corry West, the study corridor passes through coniferous forestry, agricultural grasslands, wet grasslands and drainage ditches with large mature treelines and broadleaved woodlands. This extensive network of tree lines, hedgerows and broadleaved woodlands continues for a distance of approximately 2km before returning to wet grassland and forested habitats for a further 2.5km.

Moving east, the road traverses open grassland as it crosses the existing N61 road. It then descends into a shallow valley near Killeen West and Lurgan avoiding a drained wetland to the north.

The study corridor then passes to the north of Clooncullaan Loughs and its bordering fens and wetlands in the Tullyloyd area. This area is dominated by steep terrain with an extensive network of mature hedgerows and treelines.

The proposed road then veers south through open fields of improved agricultural grassland with some hedges and treelines. It passes to the east of Cregga Turlough, avoiding it entirely and traversing open grassland habitats until it is directly to the east of Strokestown. At this location, the study corridor passes through scrub, woodland and grassland habitats that surround an area of cut over and drained degraded raised bog.

The eastern end of the study corridor passes through fields of improved and wet grasslands, crosses the Scramoge River and skirts some broadleaved woodland areas before tying back in to the existing N5 at a location approximately 4.5km to the south east of Strokestown.

7.3.3 Description of Baseline Environment

A description of the existing environment is provided in the following Sections, which provide information on the habitats and fauna encountered during field surveys.

Habitats and Flora

The general landscape is dominated by agricultural grassland pasture associated with hedgerows and treelines alongside commercial coniferous forest. Habitats within the study area were classified according to Fossitt (2000). These habitats are described below.

Detailed surveys of habitats of conservation interest have been completed, as per the methodologies outlined in Section 7.2.3 above. The habitats of conservation interest are described in relation to the KERs within which they occur. A description of habitats identified as KERs is presented in Table 7.15.

The proposed road does not traverse any National or European designated sites of nature conservation.

Habitat Descriptions

The following sections describe the habitats encountered during field surveys within the study area. A total of 31 habitats and 2 habitat mosaics were recorded within study area (Table 7.12). Habitat maps are provided as Figures 7.27-7.51 in Vol. 3 of the EIAR.

Table 7.12 Habitats Recorded Within the Study Corridor Along With Their Respective Codes, the Habitat Classifications and Codes Rorrespond to Fossitt (2000).

Habitat Name	Fossitt Code
Amenity Grassland	GA2
Bog Woodland	WN7
Buildings and Artificial Surfaces	BL3
Conifer Plantation	WD4
Cutover Bog	PB4
Dense Bracken	HD1
Depositing/lowland River	FW2
Drainage Ditch	FW4
Dry Calcareous and Neutral Grassland	GS1
Dry Calcareous and Neutral Grassland/Scrub Mosaic	GS1/WS1
Dry Meadows and Grassy Verges	GS2
Earth banks	BL2
Eroding/Upland River	FW1
Hedgerow	WL1
Improved Agricultural Grassland	GA1
Marsh	GM1
Mesotrophic Lake	FL4
Mixed Broadleaved Woodland	WD1
Mixed Broadleaved/conifer Woodland	WD2
Other Artificial Lakes and Ponds	FL8
Raised Bog	PB1
Recolonising Bare Ground	ED3
Reed and Large Sedge Swamp	FS1

Habitat Name	Fossitt Code
Rich Fen and Flush	PF1
Scrub	WS1
Spoil and Bare Ground	ED2
Stone Walls and Other Stonework	BL1
Transition Mire	PF3
Treeline	WL2
Turlough	FL6
Wet Grassland	GS4
Wet Grassland/Scrub	GS4/WS1
Wet Willow-alder-ash Woodland	WN6

Amenity Grassland (GA2)

Amenity Grassland was most commonly associated with buildings such as domestic dwellings and was recorded in numerous areas throughout the study area. This habitat was actively managed and was characterised by a low sward height and low species diversity. Species recorded from amenity grassland areas included Perennial Ryegrass (*Lolium perenne*), Meadow grasses (*Poa* spp.) Daisy (*Bellis perennis*), Dandelion (*Taraxacum agg.*), Rib-wort plantain (*Plantago lanceolata*) and White clover (*Trifolium repens*).

Bog Woodland (WN7)

Where Bog Woodland (WN7) occurred along the proposed route, it was assessed according to Perrin (2008) and classification was aided by Irish Wildlife Manual no. 69 '*Results of a Monitoring Survey of Raised Bog'* (NPWS, 2013). This manual provides classification details for the Annex I Priority Habitat Bog Woodland 91D0. This Annex I habitat requires a very high water table and a high proportion of Sphagnum mosses in the ground flora (>25%). In all cases, where Bog Woodland was encountered, it was found to be drained with little or no Sphagnum present in the ground flora and therefore did not conform to the Annex I Habitat Type. Full details of the assessment of Identified Bog Woodland is presented in Appendix 7.5.

Buildings and Artificial Surfaces (BL3)

Throughout the study area the most common forms of this habitat type included domestic dwellings, abandoned buildings, agricultural sheds and yards, concrete bridges and tarmac roadways. Generally built habitats are not considered of high ecological significance and do not offer high quality floral or faunal habitat.

Conifer Plantation (WD4)

Commercial conifer plantation occurs frequently within the study area. The most extensive areas of this habitat occur in the townlands of Corskeagh and Mullenduff, to the west of the proposed road development. This habitat was dominated by composition of Sitka Spruce (*Picea sitchensis*) and Lodgepole Pine (*Pinus contorta*) with limited ground flora. In several areas this habitat type was fringed by a narrow strip of Alder (*Alnus glutinosa*). Forestry encountered during the site visit varied from recently planted areas to mature plantations. Areas of conifer plantation were not subject to detailed woodland assessment.

Cutover Bog (PB4)

Cutover bog occurred frequently throughout the study area and was typically found in conjunction with Raised Bog, Wet Grassland and/or Scrub habitat. Large areas of this habitat were located in the townlands of Leggatinty, Drummin and Corskeagh. Active peat cutting and drainage occurred occasionally in these areas however, most areas of cutover bog have been revegetated with heath and grassland species. Species recolonising these areas include Ling Heather (*Calluna vulgaris*), Purple Moorgrass (*Molinia caerulea*), Heath Milkwort (*Polygala serpyllifolia*) and Tormentil (*Potentilla erecta*). Cutover Bog is identified at KERs 2a(LH), 2b(N), 6a(N), 6b(N), 6b(C), 6b(LH), 6c(N), 6c(LH), 6c(LL), 7a(N), 7b(LH), 11(LH) & 17(LH).

The proposed development will not result in the loss of any area of Annex I peatland Habitat. Full details of these surveys are provided in Appendix 7.1.

Dense Bracken (HD1)

Dense Bracken was limited in its extent throughout the study area and occurred in association with areas of Scrub encroachment and Bog woodland as was the case at Drummin.

Depositing/Lowland River (FW2)

The Scramoge River, the Upper Owenur River, the Owennaforeesha River and three unnamed streams were classified as depositing/lowland rivers. These watercourses were identified as sensitive habitats and were subject to detailed surveys. All identified watercourses are classified as KERs and are described in further detail in Section 7.4 below.

Dry Calcareous & Neutral Grassland (GS1)

Dry calcareous grassland is defined as '*unimproved or semi-improved dry grassland that may be either calcareous or neutral, but not acid'* (Fossitt, 2000). This habitat was recorded close to karstic features such as exposed calcareous bedrock and seasonal lakes (Cregga Turlough). The habitat was also found in agricultural fields that had not been reseeded and that were subject to low intensity farming. This habitat formed intimate mosaics with Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*) dominated Scrub in some locations. KER 17(LH) incorporates this habitat type. This habitat has links to the following Annex I habitats in Ireland:

- Semi-natural dry grasslands and scrubland facies on Calcareous substrates (Festuco-Brometea) (*Important Orchid Sites) (6210)
- *Juniperus communis* formations on Heaths or Calcareous Grasslands (5130)

The potential for any areas of Dry Calcareous & Neutral Grassland to support the above Annex I habitats was assessed as part of the multidisciplinary walkover survey. None of the grasslands encountered were considered to have any such potential, due to the lack (or low percentage cover and abundance) of indicator species as set out in '*The Irish Semi-natural Grasslands Survey. 2007 – 2012'* (O'Neill *et al*., 2013).

Dry Meadows and Grassy Verges (GS2)

The presence of rank, overgrown grassland dominated by tall tussocky grasses and creeping herbs is generally indicative of the habitat 'Dry Meadows and Grassy Verges' as described in *'A Guide to Habitats in Ireland'* (Fossitt, 2000). Under-grazed or under-mown areas of tall grassland vegetation within the study area are

best described as Dry Meadows and Grassy Verges. Additionally, this habitat was found along the unmown or annually mown bank margins at many locations along existing roadside verges.

This habitat has links to the following Annex I habitats in Ireland:

- Lowland Hay Meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510]

The potential for any areas of Dry Meadows & Grassy Verges to support the above Annex I habitat was assessed as part of the multidisciplinary walkover survey. None of the grasslands encountered were considered to have any such potential, due to the lack (or low percentage cover and abundance) of indicator species as set out in '*The Irish Semi-natural Grasslands Survey. 2007 – 2012'* (O'Neill *et al*., 2013).

Earth Banks (BL2)

Earth banks occurred sporadically within the study area, often as field boundaries or in conjunction with Treelines and typically supported species such as Foxglove (*Digitalis purpurea*), Lesser Knapweed (*Centaurea nigra*), Ox-eye Daisy (*Leucanthemum vulgare*) and Primrose (*Primula vulgaris*).

Eroding/Upland River (FW1)

The Carricknabraher River was classified as an eroding/upland river. The River is considered in further detail as KER 3.

Hedgerow (WL1)/Treeline (WL2)

An abundance of treeline and hedgerow habitats was recorded within the study area. These habitats varied in species composition and management. The dominant hedgerow species included Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Dog Rose (*Rosa canina*), Bramble (*Rubus fruticosus agg.*), Willow (*Salix* spp.), Elder (*Sambucus nigra*) and Gorse (*Ulex europaeus*).

Treelines were recorded throughout the study area and were dominated by Ash, (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*) and Alder (*Alnus glutinosa*) with Beech (*Fagus sylvatica*) recorded occasionally.

Areas where significant networks of well-developed hedgerows and tree lines have been identified are included as KERs. These areas provide important wildlife corridors and are likely to be of significance for a range of fauna including bats.

Improved Agricultural Grassland (GA1)

Improved Agricultural grassland is the dominant habitat within the study area. Much of this land is highly managed and would revert to wet grassland in the absence of current land management practices. Commonly occurring species recorded from the agricultural fields included Perennial Ryegrass (*Lolium perenne*), White Clover (*Trifolium repens*), Dandelion (*Taraxacum officinale*), Silverweed (*Potentilla anserina*), Yorkshire Fog (*Holcus lanatus*), Cocksfoot (*Dactylis glomerata*), Creeping Buttercup (*Ranunculus repens*), Annual Meadow Grass (*Poa annua*) and Mousear (*Cerastium fontanum*).

Marsh (GM1)

Marsh occurred within a wetland complex in the townland of Killeen West. This habitat supports a floating mat and tall vegetation and species including Yellow Loosestrife (*Lysmachia vulgaris*), Purple Loosestrife (*Lythrum salicaria*), Valarian

(Valariana officinalis) and Meadowsweet (*Filipendula ulmaria*). Species rich areas of this habitat are represented in KER 13(Lh).

This habitat type has links to the following Annex I habitat in Ireland:

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

The potential for any areas of Marsh to support the above Annex I habitat was assessed as part of the multidisciplinary walkover survey. The Marsh encountered was not considered to have any such potential, due to the lack (or low percentage cover and abundance) of indicator species as set out in '*The Irish Semi-natural Grasslands Survey. 2007 – 2012'* (O'Neill *et al*., 2013). In addition, this habitat type was entirely avoided in the design of the development.

Mesotrophic Lake (FL4)

A small pond classified as a Mesotrophic Lake was recorded to the south west of the proposed road development at chainage 35+500. This lake is bordered by Scrub and Marsh.

Mixed Broadleaved (WD1) & Mixed Broadleaved Conifer Woodland (WD2)

Woodlands of this type are generally comprised of a mixture 25% minimum cover to 75% maximum cover broadleaved trees and conifers. This habitat type was not commonly recorded from the study area. These woodland types were recorded at surrounding Mantua House and in the townland of Scramoge. Species recorded from the woodland included Beech (*Fagus sylvatica*), Birch (*Betula* sp.), Ash (*Fraxinus excelsior*) and Spruce (*Picea* sp.). Mixed Broadleaved Woodland is included as KER 20(LH).

Other Artificial Lakes and Ponds (FL8)

Three small artificial ponds have been identified within the study area in the townlands of Cregga and Corry East. These ponds occur within pastoral fields and two occur within the footprint of the proposed road development. The excavated ponds are utilised to water livestock.

Raised Bog (PB1)

Raised bog was primarily encountered towards the western section of the proposed road development in the townlands of Leggatinty, Drummin and Mullen. Areas of Annex I habitat 'Degraded raised bogs still capable of natural regeneration (7120)' have been identified within Raised Bog habitat. These areas are outside the footprint of the proposed road development. Species include Ling Heather (*Calluna vulgaris*), Cross-leaved heath (*Erica tetralix*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), Carnation Sedge (*Carex panicea*) and various bog mosses (*Sphagnum* spp). KERs 2a(LH), 2b(N), 6a(N), 6b(N), 6b(C), 6b(LH), 6c(N), 6c(LH), 6c(LL), 7a(N), 7b(LH) include Raised Bog. This habitat type is known to have links to the following Annex I Habitats:

- '*Depressions on Peat Substrates of the Rynchosporion (7150)'*.
- Active Raised Bog (7110) (Priority)
- Degraded Raised Bog Still Capable of Regeneration (7120)

No areas of Annex I peatland habitat occur within the land acquisition boundary.

Recolonising Bare Ground (ED3)

Small areas of recolonising bare ground were recorded within the study area. These areas were heavily trampled and dominated by bare soil and ruderal plant species. These areas included species such as Ribwort Plantain (*Plantago lanceolata*), Annual Meadow-grass (*Poa annua*), Creeping Bent Grass (*Agrostis stolonifera*) and occasionally Creeping Thistle (*Cirsium arvense*).

Reed and Large Sedge Swamp (FS1)

This habitat is classified as being a species poor stand of herbaceous vegetation that is dominated by reeds and other large grasses or sedges. This habitat was found in two locations i.e. as an infilling lake in Cloonboyoge and fringing a depositing river in the townland of Cloonradoon. The habitat at this location was dominated by a stand of Bullrush (*Typha latifolia*) and Common Reed (*Phragmites australis*). KER 13(LH) includes reed swamp.

Rich Fen and Flush (PF1)

Rich Fen occurs adjacent to Clooncullaan Lake in the townland of Tullyloyd. Some sections of the Rich Fen to the south of the proposed road development conforms to the Annex I habitat 'Alkaline Fen [7230]'. The study corridor was the subject of detailed botanical analysis and the area within the land acquisition boundary was found to be heavily degraded with a severely altered hydrology (through drainage and agricultural activity). The area within the land acquisition boundary does not conform to Annex I status. Species in this area include Black Bog Rush (*Schoenus nigricans*), Meadowsweet (*Filipendula ulmaria*), Floating Sweetgrass (*Glyceria fluitans*), Yorkshire Fog (*Holcus lanatus*), Tormentil (*Potentilla erecta*) and Devilsbit Scabious (*Succisa pratensis*). There are none of the Brown Mosses that are indicator species for the Annex I Alkaline Fen (7230) such as *Drepanocladus revolvens* and *Scorpidium scorpiodes* within the construction footprint and the area is heavily drained and does not support water at ground level. KER 15a (LH) includes an area of degraded Fen traversed by the proposed road development at Tullyloyd. KER 15c (N) includes a wetland complex to the south of the proposed road which includes Annex I Alkaline Fen habitat.

Scrub (WS1)

An abundance of Scrub (WS1) was recorded during the field surveys. The habitat varied in species composition. The main species recorded in these habitat areas included Willow (*Salix* spp), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Bramble (*Rubus fruticusus agg.*), Elder (*Sambucus nigra*) and Gorse (*Ulex europaeus*). This habitat has links to the following Annex I habitat in Ireland:

- *Juniperus communis* formations on Heaths or Calcareous Grasslands (5130)

The potential for any areas of Scrub to support the above Annex I habitats was assessed as part of the multidisciplinary walkover survey. None of the Scrub encountered was considered to have any such potential, due to the lack (or low percentage cover and abundance) of indicator species as set out in '*The Irish Semi-natural Grasslands Survey. 2007 – 2012'* (O'Neill *et al*., 2013).

Spoil and Bare Ground (ED2)

Paved trackways and areas dominated by spoil were classified as Spoil and bare ground (ED2). This habitat was commonly found in association with conifer plantations and farm access ways. This habitat generally supported little vegetation cover except for common grasses and herbs growing up through the road gravel, e.g.

Yorkshire Fog (*Holcus lanatus*), Annual Meadow-grass (*Poa annua*), Common Mouse-ear (*Cerastium fontanum*), and Rib-wort Plantain (*Plantago lanceolata*).

Stone Walls and Other Stonework (BL1)

The habitat Stone walls and other stonework (BL1) was recorded in scattered locations within the study area. This habitat includes stone walls, other than those of intact buildings and bridges. Stone walls are likely to provide wildlife corridors.

Transition Mire (PF3)

A small area of Transition Mire was identified south of the proposed road development at chainage 34+800. Species recorded within this habitat include Bogbean (*Menyanthes trifoliata*), Lesser Spearwort (*Ranunculus flammula*), Marsh Cinquefoil (*Potentilla palustris*) and a number of sedge species (*Carex* spp.). This habitat was recordedwithin KER 15d(C). Habitats with floating scraw and transition mire characteristics were recorded among Marsh and Reedswamp at KER 13(LH). This habitat has links to the Annex I habitat 'Transition mire and quaking bogs [7140]'.

Turlough (FL6)

Cregga Turlough occurs to the west of the proposed road development at chainage 37+000. Species recorded include Water Mint (*Mentha aquatica*), Amphibious Bistort (*Persicaria amphibia*), Lesser Spearwort (*Ranunculus flammula*), Meadowsweet (*Filipendula ulmaria*) and Tawny Sedge (*Carex hostiana*). This habitat is recorded at KER 16 (N). This habitat has links to the Annex I priority habitat 'Turlough [3180]'.

Wet Grassland (GS4)

Wet Grassland is one of the dominant habitats present along the proposed road development. Wet Grassland areas support species such as Soft Rush (*Juncus effusus*), Marsh Foxtail (*Alopecurus geniculatus*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Creeping Bent (*Agrostis stolonifera*), Silverweed (*Potentilla anserina*), Common Bent (*Agrostis capillaris*), Yorkshire Fog (*Holcus lanatus*), Devilsbit Scabious (*Succisa pratensis*), Watermint (*Mentha aquatica*), Rib-wort Plantain (*Plantago lanceolata*), Meadow Buttercup (*Ranunculus acris*), Creeping Buttercup (*Ranunculus repens*) and Lesser Spearwort (*Ranunculus flammula*). This habitat type was widespread throughout the study area and was variable in its form often forming mosaics with improved agricultural grassland. This habitat has links to the following Annex I habitats in Ireland:

- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (6410)

The potential for any areas of Wet grassland to support the above Annex I habitats was assessed as part of the multidisciplinary walkover survey.

In some areas, e.g. Leggatinty and Turlaghnamaddy this habitat was found to correspond to the Annex I habitat '*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils. These areas have been avoided by the proposed road development. These areas are recorded at KERs 1a(N), KER 1b(C), KER 4(C) & KER 5(N) .

Wet willow-alder-ash Woodland (WN6)

Small areas of this habitat were found within the study area including within the townlands of Leggatinty and Scramoge. The woodland canopy was dominated by Ash (*Fraxinus excelsior*) and Alder (*Alnus glutinosa*). The understory was dominated Hazel (*Corylus avellana*) and occasional Hawthorn (*Crataegus monogyna*). Species

recorded from the ground flora included Brambles (*Rubus fruticosus* agg.), Herb Robert (*Geranium robertianum*), Wood Sorrell (*Oxalis acetosella*), Remote Sedge (*Carex remota*), Enchanter's Nightshade (*Circaea lutetiana*) and Wood Melick (*Melica uniflora*). This habitat is recorded at KER 18(LH). This habitat has links to the following Annex I habitat in Ireland:

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

The potential for the area of this woodland type to support the above Annex I habitat was assessed as part of the multidisciplinary walkover survey. A dedicated survey was undertaken in accordance with criteria set out in National Survey of Native Woodlands 2003-2008: Volume II: Woodland classification (2008). The woodland was found not to correspond to this protected woodland type.

Fauna

The Wildlife Acts 1976-2012 provides legislative protection for most of Irelands native fauna, while the European Communities Birds and Natural Habitats Regulations (2011) protect the most sensitive and threatened species. The EU Habitats Directive and the EU Birds Directive provides further protection for vulnerable and sensitive habitats and species within European Member States. Additionally, the EU Water Framework Directive (2000/60/EC) provides further protection to water quality and aquatic habitats. This section provides a summary of the findings of general and dedicated faunal surveys carried out in 2014, 2015 and 2016 within the study area.

Terrestrial Mammals

Otter

Otter is listed under Annex II and Annex IV of the EU Habitats Directive and is also protected under the Irish Wildlife Acts 1976-2012 and is evaluated as being Near Threatened in the most recent Red Data list for mammals (Kingston, 2012). This species is distributed throughout Ireland and can have a home range of up to 10 or 20km (NPWS, 2013). As per the NPWS Article 17 Reporting, the range, population, habitat and future prospects for this species in Ireland have been assessed as favourable. On the basis of the above, the overall assessment of conservation status is favourable (NPWS, 2013). Favourable conservation status is where the natural range and distribution of a species or habitat is considered to be stable or increasing and the specific structure and functions necessary for the long-term maintenance of the species or habitat are likely to continue to exist for the foreseeable future.

During dedicated surveys for this species, Otter activity or visual accounts were recorded along three watercourses (Scramoge River, Strokestown River and the Owennaforeesha River) and in two locations near smaller drainage ditches. Evidence of Otter activity included sprainting sites, prints, slides and couches. No holts were observed during the dedicated surveys. It is however considered that the species is likely to utilise all watercourses along the proposed route to some extent. This species is likely to be impacted by the proposed development and has been included among the KERs of the development.

Bats

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts, 1976-2012.

A number of detailed bat surveys in the form of walked or driven mobile detector surveys, fixed point surveys and roost surveys were conducted within the ZOI (i.e. up to 1km buffer of proposed road development as per TII/NRA 2006). Walked transect surveys undertaken in 2015 identified a dominance of Pipistrelle species within the ZOI. Other species recorded during the surveys included Leisler's Bat, Daubenton's Bat, Brown Long-eared Bat and un-identified *Myotis spp*. (The fixed point detector surveys backed up the findings of the walked transects in that the bat activity was largely dominated by Pipistrelle species and recorded a similar species assemblage. Brown Long-eared Bat was the only species recorded during the transect surveys (1 contact) that was not recorded during the fixed point detector surveys.

The entire length of the proposed road was assessed for its potential as bat habitat during both desk top and field assessments followed by targeted transect surveys. Bat activity was highest in areas with prominent and mature vegetative linear landscape features and watercourses. Bat activity throughout the remainder of the ZOI had a constant but patchy distribution and where recorded, activity was positively associated with treelines and mature hedgerows. Very little activity was observed from the more open and exposed areas, with the exception of occasional contacts with Leisler's bat. Three main areas of particular importance for bats were identified during the survey and are listed below:

Mantua, Corry East and Corry West Ch. 15+500 to Ch. 20+050. This section of the proposed route includes Broadleaved woodland and mature tree-lines that provide good potential foraging roosting and commuting habitat.

Lurgan through Tullyloyd and as far as Lugboy, Ch. 31+650 to Ch. 35+400. This section of the proposed route provides high quality bat habitat with an extensive network of mature tree lines, hedgerows and wetlands to the north and south (with good vegetative connectivity) and a number of old stone buildings with mature trees in the surrounding area.

Strokestown, Bumlin & Scramoge (Ch. 50+000 to Ch. 54+250). After crossing the road at Kildalloge, the study corridor continues into an area that that includes bog woodland, wetlands, peatlands and watercourses. The proposed road development crosses an un-named stream (Ch. 51+175) that provides connectivity with the woodlands and grounds of Strokestown Demesne and the Scramoge River.

In addition, all larger watercourses within the study corridor (i.e. Scramoge/Mountain River, Strokestown River, Upper Owenur River Owennaforeesha River, Unnamed stream (Ch. 21+325), Un-named Stream (near Leggatinty Ch. 12+700), Carricknabraher River) were identified as linear features of significance to bat species as they provide commuting corridors and an excellent potential source of prey items. Retention of bat habitat connectivity along the watercourses is particularly important in these areas.

No bat roosts were identified within the land acquisition boundary during the surveys undertaken. A number of roosts were identified during targeted surveys of buildings in the area surrounding the proposed road development. These are listed below:

Mantua House (Ch.18+425) is located 850m to the north of the proposed road development and is a large confirmed Soprano Pipistrelle Roost site that is surrounded by very good network of mature tree lines.

Two small roosts were identified at Bumlin (Ch. 52+500 and Ch. 52+650) (Brown Long Eared and Pipistrelle respectively). These roosts are located a minimum distance of 80m to the south of the proposed road development.

A large, mature Oak tree on the bank of the Scramoge River at Bumlin (Ch. 52+850) was identified as a Pipistrelle bat roost during the emergence surveys that were undertaken. This roost is located just outside the land acquisition boundary.

The desk study and initial walkover survey and inspection identified networks of mature tree lines as being of potential significance for bat species at the following locations: Mantua, Corry West, Corry East, from Lurgan through Tullyloyd to Lugboy and at Bumlin & Scramoge. In these areas, not only did the tree-lines provide good potential for foraging and commuting bats but many of the individual trees were considered to have definite bat potential for smaller roosts (single bats). These areas were included within the transect surveys undertaken but no tree roosts were specifically identified. Semi-mature beech trees to the north of the proposed road development close to the Owennaforeesha River were also considered but follow up bat detector surveys revealed low levels of bat activity in March, June, July and September. In addition, mature tree lines at Portaghard (Ch. 3+500), and undermanaged fields at Leggatinty (Ch. 12+000) were identified as areas with potentially high quality habitat for bats during the initial desktop survey (aerial photography). They were then discounted following the walkover assessment when the areas were found to be open and exposed with little connectivity to the wider area and trees that displayed no obvious potential for roosting bats.

Badger

Badgers (*Meles meles*) occur throughout the island of Ireland and is afforded protection under the Wildlife Acts, 1976-2012. Badger activity was observed in four locations within the ZOI.

- Ballaghcullia/Bellanagare
- Drummin
- Mullenduff/Peak
- Scramoge

Evidence observed included active setts (Main and Subsidiary), disused setts (Outlier and Main), latrines, prints, trails and snuffle holes.

No active main setts were recorded within the footprint of the proposed road development. The two active *Main* setts recorded were located in the townlands of Ballaghcullia and Mullenduff. The setts were located a minimum distance of 80m from the proposed land take boundary.

One active *Subsidiary* sett was recorded within the land take boundary in the townland of Scramoge.

New road infrastructure may directly or indirectly impact on badgers. Construction may result in death or injury to badgers within setts, as well as the destruction of setts, loss of foraging habitat or dissection of their foraging areas (TII/NRA, 2006). This species is likely to be impacted by the proposed development and has been included among the KERs of the development.

Pine Marten (Martes martes)

Pine Marten is listed under Annex V of the EU Habitats Directive and Appendix III of the Bern Convention. Under national legislation, this species is protected under the Wildlife Acts 1976-2012. This species was not recorded during the multi-disciplinary walkover surveys or during any additional surveys (particularly woodland assessment) associated with the project. However, this species has a relatively widespread distribution throughout Ireland, having been recorded in 521 hectads (NBDC, 2016). The species displays a preference for woodland habitat including Conifer Plantations which occurs frequently within the footprint of the proposed road development. Therefore, it is likely that this species is present, at least occasionally, within the study area. However, it is not considered that the proposed development will impact significantly on this species at the population level and it is not included as a KER.

Irish Hare (Lepus timidus hibernicus)

The Irish Hare is protected under Annex V of the EU Habitats Directive, the Bern Convention, Game Preservation Act (1930) and the Wildlife Acts, 1976-2012. The Irish Hare can be found in a range of open habitats but generally require a patchwork of grassland habitats to provide quality grazing and suitable shelter (Reid *et al*., 2007). Irish Hare was recorded on occasion during field surveys but it is not considered that the proposed road development will result in significant effects on this species given the distribution of available habitat in the wider area and range of the species. It is not included as a KER.

Additional Mammal Species

Evidence of Deer, likely Fallow Deer (*Dama dama*), was recorded in the study area near chainage Ch. 21+350 in the form of tracks in one location. The species was not seen and the lack of evidence recorded during the surveys in any other areas suggests that a large population is not present.

Irish Stoat (*Mustela ermina hibernica*) is a protected species under the Wildlife Acts, 1976-2012 and has a widespread distribution in Ireland. No evidence of this species was recorded during field surveys however there are existing records form the NPWS Rare and Protected Species Database for Hectad M69 which overlaps with the footprint of the proposed road development.

The Red Squirrel (*Sciurus vulgaris*) is protected under the Wildlife Acts, 1976-2012 and is listed as Near Threatened on the Irish Red Data List (Kingston, 2012). No evidence of this species was recorded within the study area during field surveys, however, it is considered probable that this species occurs within the study area. However, given that evidence of the species was not recorded and the habitats through which the proposed development passes (mainly open grassland habitats avoiding woodland where possible), it is considered unlikely that the proposed road development will impact significantly on this species. In accordance with TII/NRA Guidelines (2009), no further surveys are considered necessary.

Other species that are protected under the Wildlife Acts, 1976-2012 which are likely to occur within the study area but for which evidence was not observed include, Pygmy Shrew (*Sorex minutus*) and Hedgehog (*Erinaceous europaeus*). Significant impacts on any of the above species are not anticipated and they are not included as KERs of this road development and no further surveys are required.

Fox (*Vulpes vulpes*), a species not protected by wildlife law, was recorded occasionally during field surveys. Rabbit (*Oryctolagus cuniculus*) is similarly unprotected and was recorded during the surveys on few occasions.

Birds

Certain bird species are listed on Annex I of the EU Birds Directive (2009/147/EC) and are thus protected under European Legislation. The status of birds in Ireland has been classified by BirdWatch Ireland and the Royal Society for the Protection of Birds (RSPB) as detailed in the '*Birds of Conservation Concern in Ireland. 2014-2019*' (Colhoun & Cummins, 2013). Birds on the Red List are of high conservation interest in Ireland and are priority species for conservation action, whilst Amber List species are of medium conservation concern. Dedicated Breeding and Wintering Bird surveys were completed during the course of field surveys.

Four species listed under Annex I of the EU Birds Directive were recorded within the study area; Whooper Swan (*Cygnus cygnus*), Golden Plover (*Pluvialis apricaria*), Hen Harrier (*Circus cyaneus*) and Kingfisher (*Alcedo atthis*).

A single observation of Kingfisher was recorded along the Carricknabraher River during the surveys but no further records of this species were observed during dedicated breeding or wintering bird species. In addition, no suitable breeding habitat was recorded at any of the points where the proposed road development crosses any watercourses. This species has not been included as a KER.

A small flock of Golden Plover were recorded on one occasion at Cregga Turlough during the 2015/2016 winter survey season. This species was only recorded on one occasion during the two winter survey seasons and was not recorded during the breeding bird surveys. Golden Plover has not been included as a KER.

Hen Harrier was only recorded during the 2015-2016 winter survey season. This species was observed commuting at Bellanagare Bog. No winter roost sites or breeding evidence was recorded and this species has not been included as a KER.

A maximum of 81 individuals of Whooper Swan were recorded at Cregga Turlough and surrounding fields, some of which will be directly impacted by the proposed road development. The maximum number recorded equates to 10.8% of the Co. Roscommon population for this species (Boland *et al*., 2010). The potential for the proposed development to impact on this species has been identified and Whooper Swan is included as a KER.

Cregga Turlough was found to support the greatest range of sensitive bird species recorded during the surveys undertaken. Breeding Red Listed species including Lapwing (*Vanellus vanellus*), Meadow Pipit (*Anthus pratensis*) and Redshank (*Tringa totanus*) were recorded from the Turlough basin and adjacent habitats. A number of Amber and Green Listed bird species were also recorded breeding within or adjacent to the Turlough. However, the proposed road avoids the Turlough itself and significant impacts on these breeding species are not anticipated and are not included as KER.

Reptiles and Amphibians

Common Frog (*Rana temporaria*) was encountered frequently throughout the study area. Frogspawn was identified in a number of drainage ditches and wet areas within fields at various locations throughout the study area. However, it is considered that the proposed road will not result in an overall loss of suitable habitat for this

species. The road will provide attenuation ponds and ditches as part of the design and it is considered that suitable wet fields, ditches and drains are extremely widespread in the study area and beyond. No likely significant effects on this species are anticipated and therefore further survey/ assessment was not deemed necessary.

Smooth Newt (*Lissotriton vulgaris*) was recorded in the desk study from hectads M98, M69, M79 which overlap with the footprint of the proposed road. It was not however encountered during field surveys. No ponds or optimal wetland habitats for this species are traversed by the proposed road and many of the drainage ditches were deep, shaded or choked with vegetation and thus did not provide the preferred habitat for this species. No shallow unshaded ditches with limited flow and good diversity of submerged or emergent vegetation, which are favoured by this species, were recorded during the multidisciplinary walkover survey. The proposed road will result in the provision of attenuation ponds that are likely to provide new and better quality habitat for this species than any drains that may be lost. Drainage ditches form part of the proposed road drainage design. On the basis of lack of high quality habitat for the species encountered, or any field evidence of presence, no likely significant effects on this species are anticipated and therefore further survey/ assessment was not deemed necessary.

The desk study revealed no records for Viviparous Lizard and none were recorded during the site surveys. It is not considered that the proposed road will impact significantly on this species or result in a significant loss of habitat given the abundance of suitable habitat in the area. No requirement for further survey was identified.

Aquatic Fauna

The status and occurrence of aquatic fauna listed on Annex II of the EU Habitats Directive (92/43/EC) in the study corridor are described below.

Fish Species

Detailed Fish stock surveys were not conducted given that significant impacts to fisheries are not anticipated. This followed the guidance outlined in TII/NRA's ecological surveying guidelines (2009).

Lamprey

It is considered that suitable habitat for Lamprey species exist in the form of watercourses within the ZOI. Lamprey are protected under Annex II of the EU habitats directive and under the Wildlife Acts 1976-2012. The Scramoge River, in particular, contains silt accumulations which may provide suitable nursery areas for Lamprey ammocoetes. The watercourse surveys undertaken did not identify any areas of particular significance (i.e. optimum spawning habitat and nursery areas) for this species and whilst the watercourses were identified as Key Ecological Receptors, Lamprey species were not.

Salmonids

Salmonid species including Atlantic Salmon which is listed under Annex II and V of the EU Habitats Directive may occur within the ZOI. Several watercourses were subjected to detailed assessments including assessing the suitability for Salmonids. The Owennaforeesha River and the Carricknabraher River were found to provide good spawning potential and nursery areas. The remaining surveyed watercourses including the Scramoge River and Upper Owenur River were found to have low cover

of suitable spawning sites. Watercourses with the greatest potential to support salmonids included the Carricknabraher River, Owennaforeesha River and Scramoge River. Each of these watercourses shall be traversed by clear span bridges with no requirement for instream works. The project has been designed to ensure that there will be no net loss of fisheries habitat at any watercourse crossing location. The final design of watercourse diversions and new channel sections has incorporated best practice measures to enhance their fishery value and to ensure that there will be no significant impact on downstream aquatic habitat or on the upstream passage of fish during construction or operation. Salmonids were not classified as a KER given that there will be no net loss of fisheries habitat associated with the development.

White-clawed Crayfish

The White-clawed Crayfish is the only native freshwater crayfish in Ireland. Populations of this species have been in decline throughout Europe and Ireland is seen as a stronghold for this species. The species is classified as vulnerable and rare in the IUCN Red List and is protected in Ireland under the Wildlife Acts, 1976-2012 in addition to being listed under Annex II and V of the EU Habitats Directive. The species displays preference for waterbodies underlain by Carboniferous Limestone or glacial drift. White-clawed Crayfish were not encountered during dedicated surveys which suggests that the watercourses at the crossing point are not utilised by a resident or regularly occuring population of ecological significance. However, the remains of the species were identified in Otter spraint recorded along three watercourses (i.e. Scramoge River, Strokestown River and the Owennaforeesha River).

Therefore, it is considered highly likely that White-clawed Crayfish occur, albeit in low numbers, within watercourses within the ZOI. The project has been designed to ensure that there will be no net loss of fisheries/crayfish habitat at any watercourse crossing location. The design of watercourse diversions and new channel sections has incorporated best practice measures to enhance their fishery value and to ensure that there will be no significant impact on downstream aquatic habitat or on the upstream passage of fish/crayfish during construction or operation. Given that the species was not recorded during dedicated surveys at the proposed crossing points the species was not classified as a KER.

Freshwater Pearl Mussel (Margaritifera margaritifera)

The Freshwater Pearl Mussel is one of the longest-living invertebrates in existence. This species is under increasing pressure from a number of sources and is continuing to decline throughout Europe. The species is now classified as Endangered on the IUCN Red List of Endangered Species and is listed under Annex II of the EU Habitats Directive. Dedicated surveys for this species were not deemed necessary as the proposed road development is located entirely outside and is not hydrologically connected to any Freshwater Pearl Mussel Sensitivity Areas. This species does not occur in the Zone of Influence and is not included as a KER.

Terrestrial Invertebrates

Marsh Fritillary (Euphydryas aurinia)

The Marsh Fritillary is considered to be one of the most endangered species in Ireland. Marsh Fritillary Butterfly is listed under Annex II of the EU Habitats Directive, the Bern Convention and the Wildlife Acts, 1976-2012. Dedicated surveys for adults and larval webs of this species were conducted within habitats identified as having potential to support the species. Detailed surveys conducted in May/June (for adults) and August/September (for larvae) were completed over two years (i.e. 2014 &

2015). Despite detailed repeated surveys, no evidence of this species was recorded within the ZOI. As this species was not recorded during the surveys undertaken and the proposed road development will not result in the loss of any suitable habitat, it is not considered further as a KER.

Geyer's Whorl Snail (Vertigo geyeri)

As per TII/NRA (2009), '*general surveys for terrestrial invertebrates are only likely to be required should the desk study and/or an assessment of the habitats within the study corridor during the multi-disciplinary walkover survey reveal that important assemblages are likely to be present'*. This species is among the Qualifying Interests of the Annaghmore Lough SAC (0.9km to the west), and taking a precautionary approach, suitable habitat for this species was considered during the multi-disciplinary walkover surveys. Geyer's Whorl Snail are very limited in their distribution, being adapted to a highly restricted set of habitat parameters (in this case, constantly humid calcareous flush-fens that are fed by tufa-depositing springs) (TII/NRA, 2009). Any areas of suitable fen or wetland habitat were specifically avoided in the design of the proposed road development. No potential supporting habitat for Geyer's Whorl Snail was identified within the study area. The proposed road development avoids direct and indirect impacts on any potential supporting habitat for this species. Consequently based on the lack of suitable habitat within the study area, Geyer's Whorl Snail is not included as a KER and specialist targeted surveys were not considered necessary.

Invasive Alien Species (IAS)

During field surveys, observations of Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) were recorded. Regulations 49 and 50 of these Regulations include legislative measures to deal with the dispersal and introduction of invasive alien species. Regulation 50 has not yet been commenced. IAS are also addressed by EU Regulation 1143/2014, which seeks to address the problem of invasive alien species in a comprehensive manner so as to protect native biodiversity and ecosystem services, as well as to minimize and mitigate the human health or economic impacts that these species can have.

The non-native invasive species Japanese Knotweed (*Fallopia japonica*) was recorded on the proposed road development at one location in the townland of Vesnoy (Ch. 51+250).

An IAS Management Plan will be prepared in relation to the treatment of the identified stand of Knotweed. The management plan shall follow the guidance outlined in the following documents:

- National Roads Authority TII/NRA (2010). Guidelines on management of noxious weeds and non-native invasive plant species on national roads.
- Environment Agency (UK) (2013). The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013).

7.4 Key Ecological Receptors

This section of the report provides details of the KERs that were identified in the desk study and in the subsequent field studies. The desk study provided information on designated sites of conservation interest in relation to the proposed road development. This included an assessment of European Sites with the potential to be impacted by the proposed road and also a study of sites that are designated

under National Legislation (Natural Heritage Areas (NHAs). Proposed Natural Heritage Areas (pNHAs) were also considered within the study. On first principles, the road was designed to avoid these designated sites and to minimise any potential for impacts thereon. Nonetheless, where any potential pathway for impact was identified on any such site it was included within the potential zone of influence (TII/NRA, 2009) of the proposed road and was included as a KER of the proposed road development. Where designated sites have been identified during the desk study exercise, they are described using the prefix KER followed by a letter (as in KER A, B, C etc.).

Where KERs were identified during the field surveys that have been undertaken, these are numbered from west to east along the proposed road development.

7.4.1 Identification of Designated Site KERs

Nationally Designated Sites

The locations of the Nationally designated sites within the identified ZOI of the proposed road development are displayed on Figure 7.1. The potential for the proposed road development to impact on these NHAs and pNHAs was considered and is presented in Table 7.13 below. Each of the NHAs within the identified ZOI was assessed for potential for impacts to occur as a result of the proposed road development.

Table 7.13 Assessment of Potential Pathways for Impact in Relation to Nationally Designated Site

NHA/pNHA	Distance from Proposed Road Development	Potential Pathways for Impact
Natural Heritage Areas (NHA)		
Bella Bridge Bog (000591)	3.6km north	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Cornaveagh Bog (000603)	4.5km north	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Tullaghan Bog (Roscommon) (001652)	7.1km north	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Derrycanan Bog (000605)	7.7km southeast	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Aghnamona Bog (000422)	11.2km northeast	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Lisnanarriagh Bog (002072)	11.9km southeast	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Rinn River (000691)	12.1km northeast	No pathways by which the proposed road development could impact on this NHA, which is located over 12 km away and in a separate hydrological catchment were identified during the assessment

NHA/pNHA	Distance from Proposed Road Development	Potential Pathways for Impact
Corracramph Bog (001420)	13.8km northeast	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Cloonageeher Bog (001423)	14km northeast	No pathways by which the proposed road development could impact on this terrestrially based NHA were identified during the assessment.
Proposed Natural Heritage Areas (pNHA)		
Bellanagare Bog (000592)	0.2km south	The potential for impacts on this pNHA are considered along with the potential for impacts on the Bellanagare Bog SAC and the Bellanagare Bog SPA
Annaghmore Lough (Roscommon)	0.9km south	The potential for impacts on this pNHA are considered along with the potential for impacts on the Annaghmore Lough SAC
Lough Gara (000587)	1.6km north	The potential for impacts on this pNHA are considered along with the potential for impacts on the Lough Gara SPA
Cloonshanville Bog (000614)	1.7km north	The potential for impacts on this pNHA are considered along with the potential for impacts on the Cloonshanville Bog SAC
Ardagh Bog (001222)	3km north	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Kilglass and Grange Loughs (000608)	3.2km northeast	This pNHA is located downstream of the proposed development (approximately 7km hydrological distance) and whilst potential pathways for impact exist in the form of water pollution, measures are in place that prevent any potential for significant effects on this site
Tullaghanrock Bog (002013)	3.9km north	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Corbally Turlough (001627)	5.5km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Ardakillin Lough (001617)	5.1km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Mullygollan Turlough (000612)	7.5km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Lough Glinn (001644)	8km southwest	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Brierfield Turlough (000594)	8.5km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages

NHA/pNHA	Distance from Proposed Road Development	Potential Pathways for Impact
Castleplunket Turlough (000598)	8.9km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Lough Boderg and Lough Bofin (001642)	9.7km northeast	This pNHA is located downstream of the proposed development (approximately 14 km hydrological distance) and whilst potential pathways for impact exist in the form of water pollution, measures are in place that prevent any potential for significant effects on this site
Corbo Bog (000602)	9.8km southeast	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Lough Forbes Complex (001818)	10km east	The potential for impacts on this pNHA are considered along with the potential for impacts on the Lough Forbes Complex SAC
Shad Lough (001648)	10.1km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Lough Ree (000440)	10.2km southeast	This pNHA is located downstream of the proposed development (approximately 50km hydrological distance) and whilst potential pathways for impact exist in the form of water pollution, measures are in place that prevent any potential for significant effects on this site.
Royal Canal (002103)	10.3km east	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages.
Clooneen Bog (000445)	10.4km east	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Drumalough Bog (001632)	11.6km southwest	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Lough Bannow (000449)	11.9km southeast	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Carrowreagh Turlough (001624)	11.7km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Cloonchambers Bog (000600)	12.5km south	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Brown Bog (000442)	12.9km east	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.

NHA/pNHA	Distance from Proposed Road Development	Potential Pathways for Impact
Rathnalulleagh Turlough (000613)	14km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Tawnaghbeg Bog (000547)	14.3km northwest	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Derrinea Bog (000604)	14.4km southwest	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Flughany Bog (000497)	14.4km northwest	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Carrowbehy/Caher Bog (000597)	14.5km southwest	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Kilgarriff Bog (000510)	14.5km northwest	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.
Lough Drumharlow (001643)	14.6km north	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Newtown Turlough (001646)	14.7km south	No pathways by which the proposed road development could impact on this pNHA were identified during the assessment. There were no hydrological or hydrogeological linkages
Derrynabrock Bog (000457)	14.9km northeast	No pathways by which the proposed road development could impact on this terrestrially based pNHA were identified during the assessment.

Where a NHA or pNHA occurs in conjunction with a European Site, impacts were considered alongside the European Site as follows:

- Cloonshanville Bog pNHA
- Bellanagare Bog pNHA
- Lough Gara pNHA
- Annaghmore Lough pNHA
- Lough Forbes Complex pNHA

No pathway for significant impacts were identified in relation to the remaining nationally designated sites as set out in Table 7.13 above.

No Nationally designated sites were classified as Key Ecological Receptors.

European Sites

With regard to European Sites, a Screening assessment was carried out to provide the competent authority, with the information necessary to complete a Screening for Appropriate Assessment for the proposed road development in compliance with

Article 6(3) of the Habitats Directive. The Screening for Appropriate Assessment concluded as follows:

> *"It cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge and on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, would have a significant effect on the following European Sites referred to in List 2.*
>
> *List 2 European Sites*
>
> *A. Annaghmore Lough (Roscommon) SAC (001626)*
> *B. Bellanagare Bog SAC (000592)*
> *C. Bellanagare Bog SPA (004105) (004105)*
> *D. Cloonshanville Bog SAC (000614)*
> *E. Lough Forbes Complex SAC (001818)*
> *F. Lough Gara SPA (004048) "*

The above European Sites are included as KERs and are identified as KERs A-F. The locations of the designated sites are displayed on Figure 7.1. All European designated site KERs have been assigned *International Importance* as per TII/NRA 2009.

7.4.2 KERs Identified During Field Surveys

The KERs identified during field surveys are described in greater detail in Table 7.14 together with an ecological valuation for each. KER Location maps which outline the identified KER receptor importance/ecological significance are provided as Figures 7.3-7.26 in Volume 3 of this EIAR. The qualifiers utilised in the naming of receptors (i.e. National (N),County (C), Local importance higher value (LH) and Local importance lower value (LL)) are based on the ecological significance of the receptors as per TII/NRA 2009.

Table 7.14 Key Ecological Receptors Identified During Field Surveys

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KERs 1a(N) and 1b(C) (4+000 – 4+500)	Area of species rich Wet Grassland (GS4) with recently cleared Scrub (WS1). Vegetation in this KER is dominated by rushes (*Juncus effusus; J. articulates; and, J.acutiflorus*) along with abundant Devils Bit Scabious (*Succisa pratensis*) in places. Other species included Sedges (*Carex spp.*), Sweet Vernal Grass (*Anthoxanthum odoratum*), Purple Moor Grass (*Molinia caerulea*) and Meadow Thistle (*Cirsium dissectum*). The bryophytes in this area included abundant bog mosses in places. This area is crossed with deep drainage channels and has been the subject of scrub clearance in the recent past. A detailed botanical survey of the area was undertaken in July and August 2015 to determine its conservation status with regard to the Annex I Habitat '*Molinia* Meadows on Calcareous, Peaty or clayey silt laden soils (Code 6410)'. This habitat was identified in two locations. These were mapped as KERs 1a(N) and 1b(C). The areas classified as *Molinia* Meadows corresponded to suitable habitat for Marsh Fritillary Butterfly due to the abundance of the food plant - Devils Bit Scabious. Dedicated surveys for this species were carried out in July and September 2014 and June and September 2015. No evidence of this species was recorded.	KER 1a(N) is approximately 5.6 hectares and is located 30m to the south of the proposed road development (PRD). This is classified as National Importance on the basis of containing viable areas of Annex I [6410] Molinia Meadow habitat which is listed in the Habitats Directive. 'Viable areas' are defined in TII/NRA 2009 as areas of a habitat which are of sufficient size, shape and integrity (in terms of species composition, ecological processes and function) such that it will endure in the face of unpredictable change. KER 1b(C) is an area of 0.5 hectares that is fragmented from similar habitat through agricultural improvement and drainage. It is classified as County Importance on the basis of containing an area of the [6410] habitat type listed in Annex I of the Habitats Directive that does not fulfil the criteria for valuation as International or National Importance (TII/NRA 2009). With regard to Marsh Fritillary habitat, both KERs are classified as being of County Importance on the basis that the site contains habitat suitable for Marsh Fritillary, that is rare and undergoing a decline at a national level. No evidence of Marsh Fritillary was recorded during the dedicated surveys undertaken during 2014 and 2015.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KERs 2a(LH) and 2b(N) (5+000-Ch 5+500)	These KERS are dominated by degraded and intact raised bog. The bog is likely to correspond to the Annex I habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120' on the high bog with the cutover sections corresponding to Cutover Bog (PB4) but regenerating well with an active Sphagnum carpet and quaking peat with bog vegetation. The north eastern edge of the bog was highly drained and very dry under foot. This area is Cutover Bog (PB4) but contains extensive Scrub (WS1) dominated by Willow (*Salix cinerea*), Bramble (*Rubus fruticosus*), and rank Grasses. It is elevated and drained and does not correspond to any Annex I habitat. There is an existing drain that runs parallel to the edge of the cutover bog and the strip of dry scrub that originated from Cutover Bog.	KER 2a(LH) relates to scrubby/dry bog margins considered to represent habitats of Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and a high degree of naturalness in a local context. KER 2b(N) is assigned National Importance on the basis of the presence of Annex I habitat. The uncut sections of Raised Bog area correspond to habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120'. In the wetter sections of Cutover Bog there is the potential for small patches of the Annex I habitat 'Depressions on Peat Substrates of the Rhynchosporion 7150' to occur. None were recorded during the walkover survey and assessment but, following the precautionary principle, there is the potential for small areas of habitat to occur. These areas have been classified as being of National Importance.
KER 3(LH) (10+125-10+150)	The Carricknabraher River is classified as an Upland/Eroding River (FW1) which has been the subject of channel maintenance in the past but still maintains a relatively natural substrate and flow path. Two large Drainage Ditches (FW4) flow into the river close to the PRD crossing point. One drains from the north and the other from the south.	The River is assigned Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and a high degree of naturalness. In addition, it has the capacity to function as a conduit to more sensitive areas downstream. The River also has potential as a habitat for a number of species that are listed on Annex II of the EU Habitats Directive (Otter and potentially Salmonids, Lamprey and White Clawed Crayfish). The Annex I species Kingfisher (*Alcedo atthis*) was observed commuting along this watercourse.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KER 4(C) (10+750-10+850	Wet Grasslands (**GS4**) with encroaching Scrub (WS1) are dominant within this KER. Outside the identified KER, the adjacent fields are dominated by Soft Rush (*Juncus effuses*). The areas included within the KER contain finer grasslands with more abundant sedges (*Carex spp.*), Compact Rush (*Juncus conglomeratus*), Purple Moor Grass (*Molinea caerulea*) and Water Mint (*Mentha aquatica*). The grassland habitat within the KER corresponds with the Annex I Habitat '*Molinia* Meadows on Calcareous, Peaty or clayey silt laden soils (Code 6410)'. The area was considered to contain suitable habitat for Marsh Fritillary Butterfly. Dedicated surveys for this species were carried out in July and September 2014 and June and September 2015. No evidence of this species was recorded.	The KER is assigned County Importance on the basis of the presence of [6410] Annex I Molinia meadow habitat that do not meet the criteria for SAC designation, being of small size, fragmented and encroaching with scrub. Additionally, this assessment was made on the basis that the site contains habitat (suitable for Marsh Fritillary) that is rare and undergoing a decline at a national level. No evidence of Marsh Fritillary or larval webs were recorded during targeted surveys in this area.
KER 5(N) (11+600 – 12+150)	The dominant habitats within this KER are Wet Grasslands (**GS4**) with encroaching Scrub (WS1). The areas included within the KER contain grasslands with more abundant sedges (*Carex* spp.), Rushes (*Juncus* spp.), Purple Moor Grass (*Molinea caerulea*) and Devil's Bit Scabious (*Succisa pratensis*) alongside Ash (*Fraxinus excelsior*), Grey Willow (*Salix cinerea*), Hawthorn (*Crataegus monogyna*) and Bramble (*Rubus fruticosus agg.*). This habitat corresponds with the Annex I Habitat '*Molinia* Meadows on Calcareous, Peaty or clayey silt laden soils (Code 6410)' but is becoming threatened by encroaching scrub. The area was considered to contain suitable habitat for Marsh Fritillary Butterfly and dedicated surveys for this species were carried out in July and September 2014 and June and September 2015. No evidence of this species was recorded.	This KER is considered to be of National Importance on the basis of the presence of large un-fragmented areas of Annex I Molinia Meadow habitat. This assessment was further informed on the basis that the site contains habitat (suitable for Marsh Fritillary) that is rare and undergoing a decline at a national level. No evidence of Marsh Fritillary or larval webs were recorded during targeted surveys in this area.
KERs 6a(N), 6b(N), 6b(C), 6b(LH), 6c(N), 6c(LH), 6c(LL) (10+900 – 12+350)	The KERs relate to a peatland complex which supports areas of Raised Bog (PB1), Cutover Bog (PB4) and small fragmented sections of Wet Heath (HH3) that are located to the south of the proposed road development. These habitats have been the subject of detailed surveys. Areas of uncut high bog corresponds to the Annex I habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120' with small fragments of the Cutover Bog which has revegetated with ericaceous species and corresponds to 'Northern Atlantic Wet Heaths with *Erica tetralix* 4010'. Much of the Cutover Bog does not correspond to any Annex I or protected habitat and in some areas has been recolonised by species associated with Wet Grassland (GS4) or Scrub (WS1).	The peatlands within this habitat complex are classified as National and County Importance where they correspond to Annex I habitats and Local Importance (higher value) where they have been cut over or degraded and no longer correspond to Annex I Habitats. Areas recolonised with Wet Grassland and Scrub that form part of the habitat complex are assigned Local Importance (Lower value)

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KERs 7a(N) and 7b(LH) (13+950 – 14+450)	This area includes a complex of habitats associated with a Raised Bog (PB1) that is located to the north of the PRD. Cutover Bog (PB4) with associated Bog Woodland (WN7) on areas of cutover and drained bog along the margins. Scrub (WS1), Dense Bracken (HD1) and rank Wet Grasslands (GS4) with dominant Soft Rush and Creeping Bent also occur along the margins. The Bog Woodland was investigated to assess its potential to conform to the Annex I habitat 'Bog Woodland [91D0]'. This woodland was very dry underfoot with dominant Birch (*Betula pubescens*) with some Grey Willow (*Salix cinerea*). The understorey was dominated by Bramble (*Rubus fruticosus agg.*) and Pteridophyta (*Dryoptris sp.*) in many areas with Bracken (*Pteridium aquilinum*) in clearings. The woodland was highly drained with many drainage ditches throughout and a cover of Sphagnum mosses close to zero. When considered according to the National Survey of Native Woodlands (Perrin, 2008), this woodland corresponded closely with the *Rubus fruticosus - Dryopteris dilitata* variant of the *Betula pubescens – Molinia Caerulea* woodland group. This habitat has no correspondence with the Annex I Priority Habitat 'Bog Woodland'. The bog is drained and actively cut to the north of the proposed road development and supports bare peat, encroaching Scrub with Cutover Bog. The tree lines that surround the Woodland, Cutover Bog and fields of Wet Grassland are well developed and act as habitat network extensions of the woodland. The uncut bog is likely to correspond to the Annex I habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120' on the high bog. Some areas of the Cutover Bog (to the north), that are located further from the PRD than those discussed above were not the subject of detailed survey work but using the precautionary principle may correspond to the Annex I habitat 'Depressions on Peat Substrates of the Rynchosporion 7150'. Badgers were recorded in this area.	KER 7a(N) relates to uncut sections of Raised Bog which correspond to the habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120' and as such are classified as being of National Importance on the basis of the presence of Annex I habitat. Whilst none were recorded there is the potential for small patches of the Annex I habitat 'Depressions on Peat Substrates of the Rynchosporion 7150' to occur in areas of cutover bog (to the north of the detailed survey area). These areas are considered highly unlikely to be impacted by the proposed road. Nonetheless, following the precautionary principle, there is the potential for small areas of Habitat of National Importance to occur within the wetter areas of cutover bog and these have been classified and mapped accordingly. KER 7b(LH) relates to a complex of Cutover Bog, Woodland, Tree Lines and Wet Grassland classified as being of Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness.
KER 8(LH) (14+450 – 14+800)	The Owennaforeesha River is a modified channel but has a gravel substrate and is relatively fast flowing. It appears to have good stocks of Brown Trout (*Salmo trutta*) (visual assessment) and has been subject to fisheries enhancement with good spawning potential. There is a large network of managed drainage ditches located to the east of the river and some of these were included in the watercourse survey that was undertaken and are included in the KER.	The Owennaforeesha River is classified as Local Importance (higher value) as it represents potential habitat for a number of species that are listed on Annex II of the EU Habitats Directive (Otter, Salmonids, Lamprey and White Clawed Crayfish)

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KER 9(LH) (14+500 – 14+650)	This KER is Bog Woodland (WN7) and is dominated by Birch and Grey Willow with some Holly in the understorey. It is surrounded by drainage ditches and is dry underfoot and heavily grazed with little ground flora. When considered according to the National Survey of Native Woodlands (Perrin, 2008), this woodland corresponded closely with the *Rubus fruticosus - Dryopteris dilitata v*ariant of the *Betula pubescens – Molinia Caerulea* woodland group. This habitat is typical of dry peat areas and has no affinity with the Annex I Priority Habitat 'Bog Woodland [91D0]'.	The Bog Woodland, although with no links to any Annex I habitat are classified as being of Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness.
KER 10(LH) (15+150 – 15+300)	This KER is Bog Woodland (WN7) dominated by Birch and Grey Willow and is drained. It is wetter underfoot than the previously described Bog Woodland KERs but still lacks cover of Sphagnum and has a ground flora that is dominated by Bramble. It is classified according to Perrin (2008) as *Rubus Fruticosus - Dryopteris dilitata* variant of the *Betula pubescens – Molinia Caerulea* woodland group. This KER is subject to less grazing pressure than the previously described examples of this habitat. This habitat is typical of dry peat areas and has no affinity with the Annex I Priority Habitat 'Bog Woodland'.	The Bog Woodland, although with no links to any Annex I habitat are classified as being of Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness.
KER 11(LH) (16+700 – 17+200)	This KER is located on an area of Cutover Bog (PB4) that has now been planted with Coniferous Forestry (WD4). In some areas, there is fringing woodland that is classified as Bog Woodland (WN7) and areas dominated by Birch and Grey Willow classified as Scrub (WS1) in the wetter areas. There are drainage ditches throughout and it is heavily grazed in many areas with little vegetation in the understorey. In other areas, the ground flora is dominated by Bramble. When considered according to the National Survey of Native Woodlands (Perrin, 2008), this woodland corresponded most closely with the *Rubus fruticosus - Dryopteris dilitata* variant of the *Betula pubescens – Molinia Caerulea* woodland group. This habitat is typical of dry peat areas and has no affinity with the Annex I Priority Habitat 'Bog Woodland'. Evidence of Badger was recorded in this area including trails, latrines and an active sett.	Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness.
KER 12(LH) (18+250 – 20+250)	This KER supports a good network of Tree Lines (WL2) and Mixed Broadleaved Woodland (WD4). A small pond also occurs adjacent to and north of the land acquisition boundary. 19+100 – 19+150. Bat activity was recorded in this area and roost sites including Mantua House were identified outside the land acquisition boundary.	On the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness, this KER has been assigned Local Importance (higher value). This area also provides good quality bat habitat and the area is used extensively by Pipistrelle Bats.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KER 13(LH) (30+550 – 31+950)	The Upper Owenur River, at the point where the proposed road crosses it, is a highly modified channel which has clearly been the subject of straightening, bank re-profiling and regular dredging. There is no natural pattern of riffles, glides and pools as would be expected in a natural channel. The KER, including the watercourse crossing, consists of a drained wetland complex that supports habitats including Marsh (GM1) with floating mat and tall vegetation and grades into species rich Wet Grassland (GS4). Reedswamp (FS1) is also present in the form of a dense stand of Greater Pond Sedge (*Carex riparia*) surrounding an infilling lake to the north of the river. Areas that had affinities with Poor Fen (PF2) are also present and there are patches of Willow Scrub (WS1) in some areas. This wetland complex is drained by the Owenur River (FW2) and numerous drainage ditches (FW4) that are subject to regular maintenance. No Annex I habitats were recorded however, the site may have the capacity to revert to fen and transition mire habitats should drainage activities cease long term.	The wetland complex to the north and crossing of the Owenur River is classified as Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness.
KER 14(LH) (32+900 – 34+450)	This KER represents an extensive network of Tree Lines (WL2) within agricultural lands. This KER occurs within steeply sloping (drumlin) fields of improved Wet Grassland (GS4) that are surrounded by many large Tree Lines (WL2) dominated by Ash and Hawthorn. There are a series of small fields that are surrounded by these tree lines. These greatly add to the biodiversity and habitat connectivity in the area. This area is considered to provide potentially high quality habitat for bat species.	These are considered to be of Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and a high degree of naturalness and habitat connectivity throughout the wider area.
KERs 15a(LH), 15b(LL), 15c(N), 15d(C), 15e(C) (33+350 – 35+750)	KERs 15a(LH), 15b(LL) and 15c(N) include Lough Clooncullaan and surrounding habitats including Rich Fen (PF1) and Reed Swamp (FS1). These wetland habitats stretch to the north from the lake. A detailed habitat assessment was undertaken of this area. This assessment confirms that whilst some of the Rich Fen (Ker 15c(N)) surrounding the lake does conform to the Annex I Habitat 'Alkaline Fen (7230), this habitat does not continue as far north as the proposed road development and is restricted by a managed drainage channel that effectively cuts it off from the wider wetland habitat. KER 15d(C) relates to a small area of Annex I habitat Transition Mire surrounded by Rich Fen habitat. While KER 15e(C) relates a Wetland complex. Both KERs are subject to drainage.	KER 15a(LH) which includes the area of Fen traversed by the proposed road development at Tullyloyd is considered to be of Local Importance (higher value). KER 15b(LL) which corresponds to non-annex I grassland surrounding KER 15a(LH) was considered to be of Local Importance (lower value). KER 15c (N) including the wetland complexes to the south of the drain are classified as National Importance due to the presence of Annex I Alkaline Fen habitat. KERs 15d(C) and 15e(C) were assigned County Importance due to the presence and potential presence of Annex I habitats.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KER 16(N) (36+650 – 37+950)	Cregga Turlough is situated in a depression with a rounded ridge of hills along the eastern side and relatively high land to the west except at the central point where the contours lead to Annaghmore Lough, less than 1km away. The Turlough corresponds to the Annex I Priority Habitat Turloughs [3180]. The floor of the basin is undulating with a number of depressions trending northwest to southeast. They hold temporary or more permanent ponds with the deepest being at the northern end. An extensive area of Blackthorn and Hawthorn Scrub (WS1) was recorded to the north east of the turlough during the 2014 surveys; however this area of Scrub was fully eradicated by land reclamation during the winter of 2014/2015	Cregga Turlough (50m south of the proposed road development) corresponds to the Annex I priority habitat 'Turlough' [3180]. The Turlough has been assigned National Importance given the presence of a priority Annex I habitat at a site that is considered to be of National value, given that it is a site which merits designation as a NHA (TII/NRA, 2009). The turlough assessment report is provided as Appendix 7.3.
KER 17(LH) (50+850-51+800)	This KER is a complex of habitats that has formed at the edge of Cutover Bog (PB4) and includes Bog Woodland (WN7), Scrub (WS1) and grasslands. The Bog Woodland is replaced by Birch and Grey Willow Scrub in wetter areas. Occasional Alder (*Alnus glutinosa*) was also recorded along the fringes. There are drainage ditches throughout and it is moderately grazed to the west of the Strokestown River with little vegetation in the understory. To the east of the Strokestown River, the ground flora is dominated by Bramble (*Rubus fruticosus* agg.). The woodland was subject to a detailed assessment and was found to have no affinities with the Annex I Priority Habitat 'Bog Woodland. Details of the dedicated survey are provided in Appendix 7.5. The Strokestown River at the proposed crossing point is a highly modified channel which has clearly been the subject of straightening, bank re-profiling and regular dredging. There is no natural pattern of riffles, glides and pools as would be expected in a natural channel. A stand of Reed and Large Sedge Swamp (FS1) dominated by *Typha latifolia* was recorded to the east of the proposed crossing point. Continuing to the south, the habitat grades into rank, species poor and seasonally grazed Dry Meadows and Grassy Verges (GS2). The non-native Invasive Alien Species (IAS) Japanese Knotweed (*Fallopia japonica*) was identified in this area. Further south, the habitat reverts to a large open area of Wet Grassland (GS4). Occasionally isolated patches of Devilsbit Scabious (*Succisa pratensis*) was recorded from this area. Continuing south the study corridor passes through an area of limestone outcrop and Dry Calcareous and neutral grassland (GS1).	The habitats in this area has been assigned Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness and habitat connectivity throughout the wider area. In addition, this area supports Otter, a species listed on Annex II of the EU Habitats Directive.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
KER 18(LH) (52+150 – 52+650)	This KER is a narrow strip of Wet Willow Alder Ash Woodland (WN6) with a dry fringe of Hazel (*Corylus avellana*) Scrub (WS1) that is located to the north of the proposed road development. It is not located on alluvial soils and is not subject to flooding. The woodland was subject to a detailed assessment and had no affinities with the Annex habitat Alluvial Woodland (91EO). Details of the dedicated survey are provided in Appendix 7.5. Bat activity was recorded in this area at the woodland edge during fixed point and transect surveys.	This Woodland Habitat and was assigned Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness and habitat connectivity throughout the wider area.
KER 19(LH) (52+850 – 53+250)	This KER consists of the Scramoge River. It is a lowland river (FW2) that is regularly maintained and which has good fisheries potential up and downstream of the proposed crossing. The KER also includes a tributary of this river, which flows from the southeast. Extensive evidence of Badger was recorded along this section in the form of an active sett, trails, feeding signs and latrines, all of which were located to the east of the Scramoge River. No evidence of badger was recorded to the west of the river. Habitat for Otter was recorded along the river corridor and adjacent habitats. An Otter sprainting site was recorded on the eastern bank of the Scramoge river. A single Otter was observed in the Scramoge River during field surveys. The tributary of the Scramoge river, located to the east, also provides suitable habitat for Otter. No active/inactive holts were recorded from the riverbank or adjacent habitats. The hedgerows and woodland edge and river habitats in this area have been the focus of dedicated observation with high levels of bat activity recorded at the crossing point of the Scramoge River.	The Scramoge River, its tributary and surrounding lands were assigned Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness and habitat connectivity throughout the wider area. In addition, this area supports Otter, a species listed on Annex II of the EU Habitats Directive.
KER 20(LH)(53 +300 – 53+950)	This KER consists of a Mixed Broadleaved /Conifer Woodland (WD2) at the edge of the existing N5 National Primary Route. The proposed road development encroached on the southern edge of this woodland area and on a small stream that is located within the woodland (included within the boundaries of KER 19(LH)).	This KER was assigned Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness and habitat connectivity throughout the wider area.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
Badger	Badger (*Meles meles*) occur throughout the island of Ireland and is afforded protection under the Wildlife Acts, 1976-2012 Badger activity was observed in four locations within the ZOI. • Ballaghcullia/Bellanagare (Badger) • Drummin (Badger) • Mullenduff/Peak (Badger) • Scramoge (Badger) Evidence observed included active setts (Main and Subsidiary), disused setts (Outlier and Main), latrines, prints, trails and snuffle holes. No active main setts were recorded within the proposed land acquisition boundary. The two active *Main* setts recorded were located in the townlands of Ballaghcullia and Mullenduff. The setts were located a minimum distance of 80m from the proposed land take boundary. A disused *Outlier* sett was recorded at Ballaghcullia and two disused *Main* setts were recorded at Drummin. These disused setts are within the proposed land acquisition boundary. One active *Subsidiary* sett was recorded within the land take boundary in the townland of Scramoge. New road infrastructure may directly or indirectly impact on badgers. Construction may result in death or injury to badgers within setts, as well as the destruction of setts, loss of foraging habitat or dissection of their foraging areas (TII/NRA 2006).	This KER is assigned Local Importance (higher value) on the basis of being a resident and regularly occurring populations of a species protected under the Wildlife Acts, 1976-2012. The presence of setts within the land take and within 80m of the proposed road development and recorded field signs of Badger foraging indicate the presence of a population of Local Importance (higher value).
Otter	Otter signs were observed on three of the main watercourses within the study corridor: Owennaforeesha River, Strokestown River and Scramoge River. No Otter breeding sites or holts were observed. The watercourses in the ZOI offer potential foraging and commuting habitat for the species. While no Otter holts were identified in the study corridor. it is likely that there are breeding holts located in the wider area. Whilst not providing optimum habitat for Otter it is considered likely that the smaller land drains located within the study area may be utilised, on occasion, as commuting corridors between larger watercourses.	This KER is assigned Local Importance (higher value) on the basis of being a resident population of species protected under the Wildlife Acts and Annex II and IV of the EU Habitats Directive.

KER & Chainage	Description	Receptor Importance/Ecological Valuation (TII/NRA Ecological Impact Assessment Guidelines, 2009)
Bats	The study site was widely and extensively used by foraging Pipistrelle bats along with smaller numbers of Leisler's, Daubenton's, Brown Long-eared Bat and *Myotis* spp. Bat activity was greatest in areas with prominent and mature vegetative linear landscape features and watercourses. Bat activity throughout the remainder of the ZOI had a constant but patchy distribution and where recorded, activity was positively associated with treelines and mature hedgerows. Very little activity was observed from open areas, with the exception of occasional contacts with Leisler's bat, as would be expected. The study corridor and surrounding area include a number of potential and identified roost features. These sites were searched as part of the survey and evidence of roosting activity was positively recorded. Identified bat roosts are located at Brackloon, Cloonyeffer, Bumlin and Scramoge, though none will be destroyed or significantly impacted upon by the proposed road development. Species confirmed from the identified roost sites included Pipistrelles and Brown Long-eared Bat. These identified roosts are linked to the wider environment by a complex network of linear landscape features including watercourses, tree lines and hedgerows.	This KER is assigned Local Importance (higher value) on the basis of resident and/or locally occurring populations of Annex IV species under the EU Habitats Directive and protected under the Wildlife Acts, 1976-2012.
Whooper Swan (includes foraging habitat identified as KER 16a(C) (Ch.36+600-38+050))	Whooper Swans were observed roosting or preparing to roost on Cregga Turlough during seven of 20 Vantage Point (VP) surveys conducted during the overwintering periods 2014/15 & 2015/2016. Varying peak numbers (1-81) were observed roosting on the Turlough and adjacent land during each of the survey days, either during the VP surveys or during the Point Count Surveys. Whooper Swans were observed foraging on the improved agricultural pasture to the northeast and south of Cregga Turlough during four of the VP surveys. The peak count of 81 foraging Whooper Swans (approx. 11% of known Roscommon population) were observed on the 26th of February 2015 within improved pasture located to the northeast of the proposed road development. Whooper swan were recorded with numbers of County Level Importance at Cregga Turlough (VPA) on four occasions during the 2014/2015 survey season. Whooper swan were recorded with numbers of County Level Importance at Cregga Turlough (VPA) on three occasions during the 2015/2016 survey season. Additional species recorded utilising the Turlough habitat during the winter period included Wigeon, Tufted Duck, Teal, Mute Swan, Mallard, Tufted Duck, Moorhen, Little Grebe and Golden Plover . None of these species occurred in numbers of County, National or International significance.	Whooper swan were recorded with numbers of County Level Importance at Cregga Turlough (Vantage Point A) on seven occasions during the two year (2014-2016) survey period. The supporting habitat of this population has been assigned County Importance.

7.5 Description of Likely Impacts (Unmitigated)

7.5.1 Impacts on Designated Areas

The proposed road development does not traverse the boundaries of any European or Nationally designated site important for nature conservation (Figure 7.1). There will be no direct impacts on any designated site as a result of the construction and operation of the proposed road development.

Potential pathways for indirect impact have been identified in relation to the European Sites identified as KERs A-F.

A. Annaghmore Lough (Roscommon) SAC (001626)

B. Bellanagare Bog SAC (000592)

C. Bellanagare Bog SPA (004105) (004105)

D. Cloonshanville Bog SAC (000614)

E. Lough Forbes Complex SAC (001818)

F. Lough Gara SPA (004048)

The sites have been included for further assessment based on identifiable hydrological connectivity, the potential for hydrological change and surface water pollution, potential for drainage related impacts, potential for habitat loss and potential for disturbance, fragmentation and displacement of fauna. Such impacts could, in the absence of appropriate design and mitigation, result in potential Long-tern moderate-significant negative impacts on the internationally important KERs.

Table 7.15 European Sites with Potential Pathways for Impact

European Site & Qualifying Interests	Distance from Proposed Road Development (km)	European Sites Identified Within the Zone of Influence
Special Areas of Conservation (SAC)		
Bellanagare Bog SAC (000592) Qualifying Interests: Active Raised Bog [7110], Degraded raised bogs still capable of natural regeneration [7120], Depressions on peat substrates of the Rhynchosporion [7150]	0.2km	There is no potential for direct impact on the European Site. Potential pathways for indirect impacts on the European site were identified in the form of potential hydrological changes resulting from road drainage. The pathways that would allow impacts to occur were considered in the design of the proposed road development and a range of measures, as outlined in Section 7.6 and in the Construction Erosion and Sediment Control Plan (EIAR Appendix 10.1), are in place to avoid hydrological change during both construction and operation. Post implementation of avoidance and control measures the residual impact on Bellanagare Bog SAC will be imperceptible. The design of the proposed road development has been developed with an overall objective of avoiding impacts on ecologically sensitive sites. Direct and indirect impacts on the peatland habitats for which the SAC has been designated have been avoided through the design and associated control measures. Based on the above, it can be concluded, beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant effect on Bellanagare Bog SAC.
Annaghmore Lough (Roscommon) SAC (001626) Qualifying Interests: Alkaline fens [7230] Vertigo geyeri (Geyer's Whorl Snail) [1013] 0.	0.9km	There is no potential for direct impact on the European Site. Potential pathways for indirect impacts on the European site were identified in the form of emissions to surface and ground waters and potential hydrological changes resulting from road construction and operation. The pathways that would allow impacts to occur were considered in the design of the proposed road development and a range of measures, as outlined in Section 7.6 and in the Construction Erosion and Sediment Control Plan (Appendix 10.1), are in place to avoid hydrological change during both construction and operation. Post implementation of avoidance and control measures the residual impact on Annaghmore Lough (Roscommon) SAC would be imperceptible. The design of the proposed road development has been developed with an overall objective of avoiding impacts on ecologically sensitive sites. Based on the above, it can be concluded, beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant effect on Annaghmore Lough (Roscommon) SAC.

European Site & Qualifying Interests	Distance from Proposed Road Development (km)	European Sites Identified Within the Zone of Influence
Cloonshanville Bog SAC (000614) Qualifying Interests: Active Raised Bog [7110], Degraded raised bogs still capable of natural regeneration [7120], Depressions on peat substrates of the Rhynchosporion [7150], Bog Woodland [91D0)	1.7km	There is no potential for direct impact on the European Site. Potential pathways for indirect impacts on the European site were identified in the form of potential hydrological changes and resulting from road drainage. The pathways that would allow impacts to occur were considered in the design of the proposed road development and a range of measures, as outlined in Section 7.6 and in the Construction Erosion and Sediment Control Plan (Appendix 10.1), are in place to avoid hydrological change during both construction and operation. Post implementation of avoidance and control measures the residual impact on Cloonshanville Bog SAC would be imperceptible. The design of the proposed road development has been developed with an overall objective of avoiding impacts on ecologically sensitive sites. Direct and indirect impacts on the peatland habitats for which the SAC has been designated have been avoided through the design and associated control measures. Based on the above, it can be concluded, beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant effect on Cloonshanville Bog SAC.

European Site & Qualifying Interests	Distance from Proposed Road Development (km)	European Sites Identified Within the Zone of Influence
Lough Forbes Complex SAC (001818) Qualifying Interests Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150] Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	10.0km, 30km hydrologically	There is no potential for direct impact on the European Site. The peatland habitats within the SAC are not Hydrologically linked to the proposed road development as the water regime governing this bog complex will not be affected by emissions or drainage effects from the road construction and operation. There is no potential for significant effects on these habitats and they are not considered further in this document. Potential pathways for indirect impacts on the European site in relation to the surface water dependent habitats Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150] and Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]. The pathways that would allow impacts to occur were considered in the design of the proposed road development and a range of measures, as outlined in Section 7.6 and in the Construction Erosion and Sediment Control Plan (Appendix 10.1), are in place to avoid hydrological change during both construction and operation. Post implementation of avoidance and control measures the residual impact on Lough Forbes Complex SAC would be imperceptible. The design of the proposed road development has been developed with an overall objective of minimising the impact on ecologically sensitive sites. Direct and indirect impacts on the peatland habitats for which the sac has been designated have been avoided through the design and associated control measures. Based on the above, it can be concluded, beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant effect on Lough Forbes Complex SAC.

European Site & Qualifying Interests	Distance from Proposed Road Development (km)	European Sites Identified Within the Zone of Influence
Special Protected Areas (SPA)		
Bellanagare Bog SPA (004105) Special Conservation Interests Greenland White Fronted Goose (Anser albifrons flavirostris) (A395)	0.5km	A review of desktop literature pertaining to the SPA was conducted. The Natura 2000 Standard Data Form, as updated in 2014, states that the population of Greenland White Fronted Goose for which the SPA was designated was a sub-population of the population centered on Lough Gara. The species has not occurred at Bellanagare in several years and the population now feed mainly on intensively managed grassland bordering Lough Gara and seldom use the bogs in the area. In addition, the African-Eurasian Migratory Waterbird Agreement Technical Series No.45 International Single Species Action Plan for the Conservation of the Greenland White-fronted Goose (AEWA, 2012) identifies that the Bellanagare Bog population have abandoned the SPA. To assess whether there is connectivity between the proposal and the Special Conservation interests it is important to consider the distances that some species may travel outside SPAs. The core winter foraging range for Greenland White Fronted Goose is 5-8km (SNH Guidance 2013). In relation to disturbance, the zone of sensitivity of the species is 600m (McGuinness et. al., 2015). The latter zone of sensitivity relates specifically to wind farm developments but has been adopted in this instance using the precautionary principle. The proposed road development does not encroach on the SPA and is approx. 500m away at its nearest point. The road development is buffered from the SPA by conifer plantations and does not traverse intensively managed pasture likely to be utilised by Greenland White-fronted Goose for foraging. Winter bird surveys were conducted during the 2015/2016 overwintering period at Bellanagare Bog. Greenland White-frontend Geese were not recorded during these surveys and the species was not recorded during the 2014/2015 survey period. Based on the above, it can be concluded, beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant effect on Bellanagare Bog SPA.

European Site & Qualifying Interests	Distance from Proposed Road Development (km)	European Sites Identified Within the Zone of Influence
Lough Gara SPA (004048) Special Conservation Interests Greenland White Fronted Goose (Anser albifrons flavirostris) (A395) Whooper Swan (Cygnus cygnus) [A038]	2.4km	The core winter foraging range of Whooper Swan is <5km and the core range of Greenland White Fronted Goose is 5-8km (SNH, 2013). There is potential for indirect impacts on bird populations for which the SPA was designated where these populations occur outside the SPA. There is hydrological connectivity between the proposed road development and the SPA. The potential for hydrological change/pollution of the SPA has been considered on a precautionary basis The proposed road development does not traverse intensively managed wet grasslands that would provide suitable foraging habitat for the SCI species within a 5-8k radius of the SPA and these species were not recorded during any of the fieldwork undertaken in these areas. It is considered unlikely that the proposed road will impact on the present or future use of the European Site by the SCI populations in respect of habitat loss or disturbance outside or within the SPA. Potential pathways for indirect impact in the form of water pollution, leading to loss and deterioration of supporting habitat within Lough Gara SPA have been identified on a precautionary basis. Pathways that would allow impacts to occur were considered in the design of the proposed road development and a range of measures, as outlined in Section 7.6 and in the Construction Erosion and Sediment Control Plan (Appendix 10.1), are in place to avoid hydrological change during both construction and operation. Post implementation of avoidance and control measures, the residual impact on Lough Gara SPA would be imperceptible. The design of the proposed road development has been developed with an overall objective of minimising the impact on ecologically sensitive sites. Direct and indirect impacts on the SPA have been avoided through the design and associated control measures. Based on the above, it can be concluded, beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant effect on Lough Gara SPA.

7.5.2 Impacts on Receptors of Local Importance (Lower Value)

General impacts on flora and fauna that are typical of a road scheme are described in this section where they occur in areas that have not been identified as KERs. The majority of the study corridor has been identified as being of Local Importance (Lower Value) from an ecological perspective (Table 7.15 above).

Habitat Loss

The road construction will result in the complete loss of habitats within the land take of the preferred route option. In this case, the road is approximately 33.4 km long with junction layouts, cut and fill areas, peat storage areas attenuation ponds and other ancillary land-take requirements. The total area within the CPO boundary for the proposed road development is 357 hectares. Outside identified KERs, the majority of the study corridor passes through agricultural and forested lands with Hedgerows, Stone walls, Drainage Ditches and Tree lines.

The permanent loss of Improved and Semi Improved Grasslands (GA1 & GS4) is not considered to be of ecological significance as these habitats are relatively species poor, support limited biodiversity and are widespread throughout the island of Ireland. Where areas of more species rich or ecologically sensitive grassland were identified, they were classified as KERs.

The permanent loss of non-native monoculture commercial forest plantation (WD4) is considered of low conservation value and not considered to be of ecological significance.

The permanent loss of Hedgerows and Tree Lines (WL1 & WL2) provides species diversity in the otherwise managed agricultural lands and provide good habitat and refuge for fauna and is considered of higher ecological significance. Where they occur in well-developed networks, these features are identified as KERs. In most cases, they are isolated and have been classified as being of some local importance to wildlife and thus their loss in these areas is not considered to be a significant ecological impact at the International, National or County scales.

The permanent loss of Drainage ditches (FW4) is not considered to be of ecological significance as these habitats are regularly maintained and support a diversity of aquatic plants and animals that are considered to be of some local importance to wildlife. These features can act as conduits for pollution to sensitive habitats potentially located downstream. The sensitive watercourses have been identified as KERs.

Habitat Fragmentation

The proposed road will inevitably result in some fragmentation as it bisects certain areas of habitat. Sensitive features such as woodlands, watercourses and well developed networks of Tree lines have been identified as KERs and potential impacts on these areas are discussed in Section 7.5.3 below. The proposed development will result in the loss of 19.4 km of hedgerow, 15.3 km of treeline, 78.4 ha of conifer plantation, 3.7 ha of scrub and immature woodland and 9.01 ha of broadleaved woodland.

Run Off of Pollutants

Best practice methods have been incorporated into the design of the proposed road development to avoid the run off of pollutants to the wider environment outside the

construction footprint. No significant impacts are predicted in this regard on the habitats surrounding the study corridor outside the identified KERs.

Hydrological Impact on Habitats

The proposed road construction could potentially result in hydrological changes to the area surrounding the development due to drainage or waterlogging. This is not considered significant when applied to the habitats of Local Importance (Lower Value) that surround the proposed development.

Displacement/Disturbance of Fauna

The proposed road project will result in habitat loss, disturbance and displacement to the fauna that reside along the proposed route. Where fauna of particular ecological significance or potential habitat for such species was recorded, these were included as KERs and are described in the following sections. A typical range of common bird species was recorded throughout the study area and will be impacted through habitat loss, disturbance and displacement associated with the proposed works. Mammal species such as Hedgehog and Irish Hare are similarly, likely to be affected, however impacts on these species are not considered likely to be of significance given the lack of evidence to suggest that the study corridor of the proposed road development provides important habitat. In addition, they are considered to be receptors of Local Importance (Lower Value) and are not considered to be KERs.

7.5.3 Impacts on Key Ecological Receptors

Impacts on the key ecological receptors as defined in the preceding sections are described in Table 7.16 following.

Table 7.16 Impact Characterisation for Key Ecological Receptors Based on EPA (2002) and TII/NRA (2009)

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KERs 1a(N) and 1b(C) (4+000 – 4+500)	These KERs comprises of two areas of species rich wet grassland that correspond to the Annex I habitat 'Molinia Meadows on Calcareous, Peaty or clayey silt laden soils (Code 6410)'. The larger, southern area, KER 1a(N), is considered to be of National Importance with the smaller southern area considered to be of County importance. In addition, the grasslands support potential habitat for Marsh Fritillary Butterfly, though the species was not recorded during two years of surveying and no impact is anticipated. The proposed road development avoids direct impacts on these KERs. The following potential indirect impacts of the proposed road development were identified: Drainage effects associated with the construction of a road either causing the drying out of surrounding habitats or preventing drainage and resulting in wetting of surrounding habitats. Molinia Meadows are hydrologically dependant habitats and are located a minimum of 30m from the footprint of the proposed road. There are drainage ditches running under the proposed road at this location, which if blocked, could alter the hydrological regime in the area.	No direct operational impacts are anticipated on the KERs. Indirect operational impacts include the same potential drainage impacts as were associated with the construction phase.	Given that the road land acquisition boundary is located over 30m at its closest point from the sensitive habitats within the KERs, impacts associated with drainage are considered to constitute a Long-term Slight to Moderate Negative impact at the local level. This could be considered to be in line with existing practices; as the land in this area has been subject to recent drainage and scrub clearance as part of agricultural improvement. It is considered that drainage impacts are reversible through appropriate design and mitigation. It is considered that the proposed road development does not have the potential to result in significant impacts on the KERs either at the National, County or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KERs 2a(LH) and 2b(N) (5+000-5+500)	The KERs consist of a Raised Bog that has been cut in places but still supports uncut sections which are likely to correspond to the Annex I habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120' and as such are classified as being of National Importance. The edge of the bog has been extensively drained and now supports dry scrubby habitat that is classified as Local importance (Higher Value). In the wetter sections of Cutover Bog there is the potential for small patches of the Annex I habitat 'Depressions on Peat Substrates of the Rynchosporion 7150' to occur. The proposed road has been designed to avoid any direct impacts on the KERs and given the extent of existing drainage and separation from the sensitive bog habitats, indirect impacts during construction are not anticipated.	No direct operational impacts are anticipated on the KERs. A potential impact during the operational phase is the deposition of dust and pollutants from road operation over a long period of time Interceptor toe drains and a culvert are proposed in the vicinity of the KERs which could potentially alter the drainage in the KERs.	Impacts associated with drainage are considered to constitute potential Long-term slight-moderate negative impacts at the local level. It is considered that the proposed road development does not have the potential to result in significant impacts on the KERs either at the National, County, or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 3(LH) (10+125 – 10+150)	The Carricknabraher River is classified as being of Local Importance (Higher Value) at this location. The proposed development is designed to cross this river using a clear span structure and therefore no channel diversion or other works within the river are proposed. The proposed development will however require the diversion and culverting of a drainage ditch that flows into the river at this location. Direct impacts of the proposed road development on this KER potentially include the following: Loss of aquatic habitat through shading (the flow and bed of the channel will not be altered). Habitat fragmentation and barrier effect may occur if Otter and other aquatic species are not able to migrate along the watercourses following the construction of the bridge. This impact could also affect birds and bats that may use this section of river as a commuting route. Fish and species that migrate in the water itself are not likely to be impacted as the bridge is short and the bed and flow of the river is not going to be altered. Indirect impacts may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the river.	Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase. Potential Indirect impacts include the run off of silt and discharge of pollutants from road drainage during the operation of the road.	The direct loss of habitat associated with the road development is not considered to be significant as it involves only the shading of a short section (32m) of a receptor of Local Importance (Higher Value). This is considered to constitute a Permanent Moderate negative impact over a very small section of the overall receptor. The impact will alter the character of the environment in this area. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Moderate-Significant Negative Impact as it applies to sensitive species such as Otter and Bats that are likely to use the watercourse for commuting to wider areas within their ranges. It is reversible through retention of commuting and foraging corridors for wildlife. The potential for pollution of the river during the construction phase, is considered to constitute a potential Short-term Moderate-Significant Negative Impact as it has the potential to alter a sensitive receptor over a short period of time and over a far wider area than the site itself. It is a reversible impact.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 3(LH) (10+125 – 10+150) contd			The potential for pollution of the river during the operational phase, is considered to constitute a potential Long-term Slight - Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is a reversible impact. It is considered that the road development does not have the potential to result in significant impacts on this KER either at the National or County level. The road development does have the potential to result in significant impacts at the Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 4(C) (10+750 – 10+850)	This KER comprises an area of species rich wet grassland that correspond to the Annex I habitat 'Molinia Meadows on Calcareous, Peaty or clayey silt laden soils (Code 6410)'. This KER was also considered to provide potential habitat for Marsh Fritillary. The KER was considered to be of County Importance. In addition, the grasslands support potential habitat for Marsh Fritillary Butterfly, though the species was not recorded during two years of surveying and no impact is anticipated. The proposed road development avoids direct impacts on this KER. The following potential indirect impacts of the proposed road development were identified: Drainage effects associated with the construction of a road either causing the drying out of surrounding habitats or preventing drainage and resulting in wetting of surrounding habitats. Molinia Meadows are hydrologically dependant habitats but are located at closest approximately 10m from the land acquisition boundary of the proposed road. There are drainage ditches running under the proposed road at this location, which if blocked, could alter the hydrological regime in the area.	No direct operational impacts are anticipated on this KER. Operational impacts include the same potential drainage impacts as were associated with the construction phase.	Given that the road is located over 10m at its closest point from the sensitive habitats within the KER, impacts associated with drainage are considered to constitute a potential Long–term Imperceptible-Slight Negative impact on the KER. It is considered that drainage impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 5(N) (11+600 – 12+150)	This KER comprises of an area of species rich wet grassland that corresponds to the Annex I habitat 'Molinia Meadows on Calcareous, Peaty or clayey silt laden soils (Code 6410)' This area was also considered to provide potential habitat for Marsh Fritillary. The KER was considered to be of National Importance. In addition, the grassland supports potential habitat for Marsh Fritillary Butterfly, though the species was not recorded during two years of surveying and no impact is anticipated. The proposed road development avoids direct impacts on this KER. The following potential indirect impacts of the proposed road development were identified: Drainage effects associated with the construction of a road either causing the drying out of surrounding habitats or preventing drainage and resulting in wetting of surrounding habitats. Molinia Meadows are hydrologically dependant habitats but are located at closest approximately 12m from the footprint of the proposed road. There are drainage ditches running under the proposed road at this location, which if blocked, could alter the hydrological regime in the area.	No direct operational impacts are anticipated on this KER. Operational impacts include the same potential drainage impacts as were associated with the construction phase. Another potential impact during the operational phase is the deposition of dust and pollutants from road operation over a long period of time.	Given that the road construction zone is located over 12m at closest from the sensitive habitats within the KER, impacts associated with drainage are considered to constitute a Long-term Slight to Moderate Negative impact. This could be considered to be in line with existing practices as the land in this area has been subject to recent drainage and scrub clearance as part of agricultural improvement. It is considered that drainage impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KERs 6a(N), 6b(N), 6b(C), 6b(LH), 6c(N), 6c(LH), 6c (LL) (10+900 – 12+350)	The KERs refers to a peatland complex which supports areas of Raised Bog (PB1), Cutover Bog (PB4) and small fragmented sections of Wet Heath (HH3) that are located to the south of the proposed road development. The Cutover Bog does not correspond to any Annex I or protected habitat and in some areas has been recolonised by species associated with Wet Grassland (GS4) or Scrub (WS1). The proposed road will result in the loss of a mosaic of habitats that do not correspond to Annex I Habitat and are considered to be of Local Importance (Higher Value). In terms of Indirect Impacts, the proposed road development is within 15m of Raised Bog habitat that corresponds to Annex I Habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120'. Potential indirect impacts are drainage effects associated with the construction of a road either causing the drying out of surrounding habitats or preventing drainage and resulting in wetting of surrounding habitats. Raised Bogs are hydrologically dependant habitats but are located at closest approximately 15m from the footprint of the proposed road. There are drainage ditches running under the proposed road at this location, which if blocked, could alter the hydrological regime in the area.	No direct operational impacts are anticipated on the KERs. Operational impacts include the same potential drainage impacts as were associated with the construction phase.	Loss of mosaic of Non Annex I Habitat of Local Importance (Higher Value) is considered to be a Permanent Slight Negative Impact in that it only involves the loss of a small area that is of impoverished ecological value that is at the edge of a peatland habitat. Given that the road is located over 15m at closest from the sensitive habitats within the KERs, impacts associated with drainage are considered to constitute a Long-term Slight-Moderate Negative impact on a small part of the edge of the KERs. It is considered that drainage impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on the KERs either at the National, County or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KERs 7a(N) and 7b(LH) (13+950 – 14+450)	The KERs form part of a complex of habitats associated with a Raised Bog (PB1) that is located to the north of the proposed road development. The mosaic is dominated by Raised Bog (PB1), Cutover Bog (PB4) with associated Bog Woodland (WN7) (non Annex I), Tree Lines (WL2) and Scrub (WS1) with Dense Bracken (HD1) and rank Wet Grasslands (GS4). The Raised Bog habitat is identified as KER 7a(N) and is considered to be of National Importance. This KER is avoided in the design of the scheme entirely. The remaining habitats are identified as KER 7b(LH) and classified as Local Importance (Higher Value). Badger were also recorded at this site and are discussed as a separate KER below. The proposed road development will result in the following direct impact on KER 7b(LH): loss of approximately 1.2 hectares of broadleaved woodland with associated tree lines. Indirect drainage effects associated with the construction of a road either causing the drying out of surrounding habitats or preventing drainage and resulting in wetting of surrounding habitats	No further direct impacts are likely to be associated with the operation of the proposed road. Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase Operational impacts include the same potential drainage impacts as were associated with the construction phase.	The proposed development will result in a Permanent Significant Negative Impact at a local scale on approximately 1.2 Hectares of broadleaved woodland that is classified as being of Local Importance (Higher Value). This is a small fraction of the overall woodland in the area. It is an irreversible Impact. Impacts associated with drainage are considered to constitute a Long-term Slight-Moderate Negative impact on a small part of the edge of the KER 7b (LH) with no impact on KER 7a (N) identified. It is considered that drainage impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on the KERs either at the National or County level. The road development has the potential to result in significant impacts at the local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 8(LH) (14+450 – 14+800)	The Owennaforeesha River is classified as being of Local Importance (Higher Value) at this location The proposed development is designed to cross this river using a clear span structure and therefore no channel diversion or other works within the river are proposed. Direct impacts of the proposed road development on this KER potentially include the following: Loss of aquatic habitat through shading and alteration to the substrate. Habitat fragmentation and barrier effect may occur if Otter and other aquatic species are not able to migrate along the watercourses following the construction of the bridge. This impact could also affect birds and bats that may use this section of river as a commuting route. Fish and species that migrate in the water could potentially be prevented from doing so if the design of the proposed culvert does not provide for continued passage along the watercourse. Indirect impacts may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the river.	Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase. Potential Indirect impacts include the run off of silt and discharge of pollutants from road drainage during the operation of the road	The direct loss of habitat associated with the proposed road development is not considered to be significant as it involves only the loss of a short section (40m) of a receptor of Local Importance (Higher Value). This is considered to constitute a Permanent Significant negative impact over a very small section of the overall receptor. The impact will alter the character of the environment in this area. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Moderate-Significant Negative Impact as it applies to the sensitive species such as Otter and Bats that are likely to use the watercourse for commuting to wider areas within their ranges. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for pollution of the river during the construction phase is considered to constitute a potential Short-term Moderate-Significant Negative Impact as it has the potential to alter a sensitive receptor over a short period of time and over a far wider area than the site itself. It is considered that impacts could be reversible through appropriate design and mitigation.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 8(LH) (14+450 – 14+800) contd.			The potential for pollution of the river during the operational phase is considered to constitute a potential Long-term Slight - Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.
KER 9(LH) (14+500 14+650)	This KER is Bog woodland and is dominated by Birch and Grey Willow with some Holly in the understorey. It is classified as being of Local Importance (Higher Value). Direct impacts on this KER include loss of approximately 0.16 hectares at the very edge of this broadleaved woodland, No significant faunal activity was recorded in this section of woodland. No significant indirect impacts are anticipated	No further impacts are likely to be associated with the operation of the proposed road.	The loss of 0.16 hectares at the edge of this small section of woodland is considered to be a Permanent Moderate Negative Impact on a receptor of Local Importance (Higher Value). It is an irreversible Impact. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 10(LH) (15+150 15+300)	This area comprises Bog Woodland (WN7) This is considered to be of Local Importance (Higher Value). Badger signs were recorded in this area. Badger were also recorded at this site and are discussed as a separate KER below. The proposed road development will result in the loss of approximately 0.5 hectares of broadleaved woodland with associated tree lines.	No further direct impacts are likely to be associated with the operation of the proposed road.	The proposed road development will result in a Permanent Significant Negative Impact at the local scale on approximately 0.5 Hectares of broadleaved woodland that is classified as being of Local Importance (Higher Value). This is a small fraction of the overall woodland in the area. It is an irreversible Impact. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.
KER 11(LH) (16+700 17+200)	This KER is located on an area of Cutover Bog (PB4) that has now been planted with Coniferous Forestry (WD4). In some areas, there is fringing woodland that is classified as Bog Woodland WN7. Badger were also recorded at this site but are discussed as a separate KER below. The proposed road development will result in the following direct impacts. Loss of approximately 0.28 hectares of broadleaved woodland.	No further direct impacts are likely to be associated with the operation of the proposed road.	The proposed development will result in a Permanent Moderate Negative Impact on approximately 0.28 Hectares of broadleaved woodland that has been damaged through the planting of forestry and is classified as being of Local Importance (Higher Value). This is a small fraction of the overall woodland in the area. It is an irreversible Impact. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the National, County or Local levels.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 12(LH) (18+250 20+250)	This KER covers an area with a well-developed network of tree lines that provide good faunal habitat and structural diversity. This KER is classified as Local Importance (Higher Value). High levels of Bat activity were recorded in this area. Direct Impacts include Habitat Loss with the proposed road leading to loss of tree line habitat. Indirect impacts include fragmentation and barrier effect for foraging and commuting species such as bats.	No further direct impacts are likely to be associated with the operation of the proposed road. Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase.	The proposed road development will result in a Long-term Moderate Negative Impact in respect of habitat loss at this location. It is considered moderate as much of the network has been retained in the design of the scheme. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Moderate Negative Impact as it applies to the sensitive species such as Bats that are likely to use the area for commuting within their ranges It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 13(LH) (30+550 31+950)	The Upper Owenur River at the point where the proposed road crosses it is a highly modified channel which has clearly been the subject of straightening, bank re-profiling and regular dredging. It is classified as Local Importance (Higher Value). No diversions are required on the Owenur River; however diversions are required in relation to drainage channels located to the south of the crossing point of the river. This KER also includes an extensive network of wetland habitats that have been the subject of drainage to some extent but are still considered to be of Local Importance (Higher Value). These wetlands within the KER have been largely avoided in the design of the scheme and a very small section of wet grassland will be lost at the edge of the KER. Direct impacts of the proposed works on this KER potentially include the following: Loss of aquatic habitat through shading (the flow and bed of the channel will not be altered). Habitat fragmentation and barrier effect may occur if Otter and other aquatic species are not able to migrate along the watercourses following the construction of the bridge. This impact could also affect birds that may use this section of river as a commuting route. Fish and species that migrate in the water itself are not likely to be impacted as the bridge is short and the bed and flow of the river is not going to be altered. Indirect impacts may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the river and wetlands.	Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase. Potential Indirect impacts include the run off of silt and discharge of pollutants from road drainage during the operation of the road.	The direct loss of habitat associated with the proposed road development is not considered to be significant as it involves only the loss of a short section of a receptor of Local Importance (Higher Value). This is considered to constitute a Permanent Moderate Negative Impact over a very small section of the overall receptor. The impact will alter the character of the environment in this area. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Slight-Moderate Negative Impact as it applies to the sensitive species such as Otter and Bats that are likely to use the watercourse for commuting to wider areas within their ranges. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for pollution of the river during the construction phases is considered to constitute a potential Short-term Moderate-Significant Negative Impact as it has the potential to alter a sensitive receptor over a short period of time and over a far wider area than the site itself.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 13(LH) (30+550 31+950) contd.			It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for pollution of the river during the operational phase is considered to constitute a potential Long-term Slight - Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the road development does not have the potential to result in significant impacts on this KER either at the National or County level. The road development does have the potential to result in significant impacts at the Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 14(LH) (32+900 – 34+450)	This KER represents an extensive network of Tree Lines (WL2) within agricultural lands. This KER is within steeply sloping (drumlin) fields of improved Wet Grassland (GS4) that are surrounded by many large Tree Lines (WL2) with dominant Ash and Hawthorn and is classified as Local Importance (Higher Value). Direct Impacts include Habitat Loss with the proposed road leading to loss of tree line habitat. Indirect impacts include fragmentation and barrier effect for foraging and commuting species such as bats.	No further direct impacts are likely to be associated with the operation of the proposed road. Fragmentation and barrier effect are potential ongoing indirect impacts during the operational phase.	The proposed road development will result in a Long-term Moderate Negative Impact in respect of habitat loss at this location. It is considered moderate as much of the network has been retained in the design of the scheme. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Moderate Negative Impact as it applies to the sensitive species such as Bats that are likely to use the area for commuting within their ranges. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the National, County or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KERs 15a(LH), 15b(LL), 15c(N), (33+350 – 34+350)	KERs 15a(LH), 15b(LL) and 15c(N) include a large Lough (Lough Clooncullaan), which is surrounded by wetland habitats including Rich Fen (PF1) and Reed Swamp (FS1). Habitats surrounding the lake include the Annex I Habitat Alkaline Fen (7230) though this is avoided by the proposed road development. The proposed N5 land take will result in the loss of a small section of 0.8 Ha of this KER that does not represent Annex I habitat and is highly degraded and drained and is grading with species poor Wet Grassland. This area is classified as Local Importance (Higher Value) and is separated from the Annex I Habitats by a functioning maintained drain. Indirect impacts on the Annex I Fen will not occur as the proposed road is separated from this area by a functioning and maintained drain. Indirect impacts may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the drain and wider area downstream. Indirect impacts might also include, in the absence of mitigation the interception of drainage paths by the permeable road formation resulting in diversion of waters and in a dewatering effect on adjacent soils and wetland areas.	No further direct impacts are likely to be associated with the operation of the proposed road. Potential Indirect impacts include the run off of silt and discharge of pollutants from road drainage during the operation of the road. Interception of drainage paths by the permeable road formation resulting in diversion of waters and in a dewatering effect on adjacent soils and wetland areas.	Direct Impacts on the Annex I Alkaline Fen Habitat have been avoided by the proposed road development. The impact of losing a small section of highly drained and degraded Alkaline Fen is considered to be a Permanent Slight Negative Impact in that it only involves the loss of a very small area at the edge of a wetland habitat that is of local ecological value. The potential for pollution of the wetlands is considered to constitute a Permanent Slight-Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is an irreversible impact. The possible interception of drainage paths by permeable road formation, in the absence of mitigation, is considered to have the potential to result in Long Term Significant Negative Impacts on the KERs. It is considered that the proposed road development has the potential to result in significant impacts on the KERs at the National level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KERs 15d(C), 15e(C)	These KERs include small remnant wetlands that contain small areas of Annex I Habitats Transition Mire [7140] and Alkaline Fen [7230], which, are classified as being of County Importance. The proposed road development avoids direct impacts on these KERs. The following potential indirect impacts of the proposed road development were identified: Drainage effects associated with the construction of a road either causing the drying out of surrounding habitats or preventing drainage and resulting in wetting of surrounding habitats. Alkaline Fen and Transition Mire are hydrologically dependant habitats but are located at closest approximately 170m from the footprint of the proposed road development	No direct operational impacts are anticipated on these KER.s Operational impacts include the same potential drainage impacts as were associated with the construction phase.	Given that the road is located over 170m at closest from the sensitive habitats within the KERs, impacts associated with drainage are not considered significant at the National, County or Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER16(N) (36+650-37+950)	This KER is a Turlough of National Importance that is located approximately 55m to the south of the proposed land acquisition boundary. The road has been designed to avoid any emissions to this sensitive receptor. No direct impacts on this receptor will occur. Indirect impacts potentially include changes to the hydrological regime of the Turlough resulting from road construction, cut and fill located up gradient of the Turlough. Construction activity may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the Turlough. Other possible indirect impacts in the absence of mitigation include the interception of drainage paths by the permeable Road formation resulting in diversion of waters and in a dewatering effect on adjacent soils and wetland areas.	Potential Indirect operational impacts on hydrology are similar to those predicted during the construction phase. The deep cutting will intercept hill slope runoff, interflow and groundwater recharge and flow which will potentially impact on the flow regime, the water balance and the water chemistry of the Turlough. Such an impact is considered to represent a potential significant impact to the hydrological function of the Turlough Habitat.	Pollution of the Turlough during the construction phase is considered to be a potential Short Term Moderate-Significant Negative Impact in that it would potentially result in an alteration of the character of the habitat rather that a permanent or widespread alteration of the habitat. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. Changes to the hydrological regime represent a more Permanent Significant Negative Impact in that the proposed works have the potential to permanently alter the hydrological function of this Turlough habitat on an ongoing basis. It is considered that this impact is irreversible. It is considered that, in the absence of mitigation, the proposed road development has the potential to result in significant impacts on this KER at the National level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 17(LH) (50+850 51+800)	The complex of habitats in this area comprises cutover raised bog, bog woodland, scrub and grasslands and a small, highly managed river channel (Strokestown River). Due to the extent of semi-natural habitat and the connectivity throughout the wider environment, this area has been categorised as local importance (higher value). No Annex I habitats were recorded within this KER. The proposed road development will result in the following direct impacts. Loss of approximately 3.2 hectares of broadleaved woodland and approximately 3.6 hectares of semi natural grassland. Loss of aquatic habitat through shading and alteration to the substrate. Habitat fragmentation and barrier effect may occur if otter and other aquatic species are not able to migrate along the watercourses following the construction of the culvert. This impact could also affect birds and bats that may use this section of river as a commuting route. Fish and species that migrate in the water could potentially be prevented from doing so if the design of the proposed culvert does not provide for continued passage along the watercourse. Indirect impacts may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the river. Habitat fragmentation for species such as bats where foraging areas among the grasslands and tree lines may be fragmented by the proposed road. The proposed construction of the road is also likely to result in a certain amount of disturbance and displacement of a range of species.	No further direct impacts are likely to be associated with the operation of the proposed road development. Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase.	The Loss of Woodland and Grassland habitat is considered to be a Permanent Significant Negative Impact at a local scale on approximately 3.2 hectares of broadleaved woodland and 3.6 hectares of grassland that is classified as being of Local Importance (Higher Value). This is a small fraction of the overall woodland/grassland in the area. Impacts are not considered significant at the National of County level. It is an irreversible Impact. The direct loss of riverine and riparian habitat associated with the proposed road development is not considered to be significant as it involves only the loss of a short section (47m) of a receptor of Local Importance (Higher Value). This is considered to constitute a Permanent Significant negative impact, at the local level, over a very small section of the overall receptor. The impact will alter the character of the environment in this area. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Slight-Moderate Negative Impact as it applies to the sensitive species such as Otter and Bats that are likely to use the watercourse for commuting to wider areas within their ranges.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 17(LH) (50+850 51+800) contd.			It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for pollution of the river during the construction phase is considered to constitute a potential Short-term Moderate-Significant Negative Impact as it has the potential to alter a sensitive receptor over a short period of time and over a far wider area than the site itself. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for pollution of the river during the operational phase is considered to constitute a potential Long-term Slight - Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development has the potential, in the absence of mitigation, to result in significant impacts on this KER at the Local level. Impacts are not considered significant at the National of County level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 18(LH) (52+150 52+650)	This KER is a narrow strip of Wet Willow Alder Ash Woodland (WN6) that has a dry fringe of Hazel (*Corylus avellana*) Scrub (WS1) that is located to the north of the proposed road development. It is not located on alluvial soils and is not subject to flooding. It is classified as being of Local Importance (Higher Value). Direct impacts on this KER include loss of approximately 0.12 hectares at the very edge of this broadleaved woodland No significant faunal activity was recorded in this section of woodland. • No significant indirect impacts are anticipated	No further impacts are likely to be associated with the operation of the proposed road.	The proposed road development will result in a Permanent Moderate Negative Impact at the local scale on approximately 0.12 Hectares of woodland that is classified as being of Local Importance (Higher Value). This is a small fraction of the overall woodland in the area. It is an irreversible Impact. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER19(LH) (52+850 - 53+250)	The Scramoge River is classified as being of Local Importance (Higher Value) at this location. The proposed development is designed to cross this river using a clear span structure and therefore no channel diversion or other works within the river are proposed. The proposed development will however require the diversion and culverting of a drainage ditch that flows into the river at this location. Direct impacts of the proposed works on this KER potentially include the following: Loss of aquatic habitat through shading (the flow and bed of the channel will not be altered). Habitat fragmentation and barrier effect may occur if Otter and other aquatic species are not able to migrate along the watercourses following the construction of the bridge. This impact could also affect birds and bats that may use this section of river as a commuting route. Fish and species that migrate in the water itself are not likely to be impacted as the bridge is short and the bed and flow of the river is not going to be altered. Indirect impacts may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the river.	Fragmentation and barrier effect are potential ongoing direct impacts during the operational phase. Potential Indirect impacts include the run off of silt and discharge of pollutants from road drainage during the operation of the proposed road development.	The direct loss of habitat associated with the proposed road development is not considered to be significant as it involves only the loss of a short section (32m) of a receptor of Local Importance (Higher Value). This is considered to constitute a Permanent Moderate negative impact over a very small section of the overall receptor. The impact will alter the character of the environment in this area. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for habitat fragmentation and barrier effect is considered to constitute a Long-term Slight-Moderate Negative Impact as it applies to the sensitive species such as Otter and Bats that are likely to use the watercourse for commuting to wider areas within their ranges. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. The potential for pollution of the river during the construction phase is considered to constitute a potential Short-term Moderate-Significant Negative Impact as it has the potential to alter a sensitive receptor over a short period of time and over a far wider area than the site itself. It is considered that impacts could be reversible through appropriate design and mitigation.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
KER 19(LH) (52+850 - 53+250) contd.			The potential for pollution of the river during the operational phase is considered to constitute a potential Long-term Slight - Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is considered impacts can be effectively avoided, remedied or reduced through appropriate design and mitigation as described in the following sections of this report. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.
KER 20(LH) (53+300 53+950)	This KER consists of a Mixed Broadleaved /Conifer Woodland (WD2) at the edge of the existing N5 National Primary Route. It is classified as being of Local Importance (Higher Value). Direct impacts on this KER include loss of approximately 0.34 hectares at the very edge of this broadleaved woodland. No significant faunal activity was recorded in this section of woodland. No significant indirect impacts are anticipated	No further impacts are likely to be associated with the operation of the proposed road development.	The proposed road development will result in a Permanent Significant Negative Impact at the local scale on approximately 0.34 Hectares of broadleaved woodland that is classified as being of Local Importance (Higher Value). This is a small fraction of the overall woodland in the area. It is an irreversible Impact. It is considered that the proposed road development does have the potential to result in significant impacts on this KER at the Local level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
Badger	Badger activity was observed at four locations within the ZOI. Evidence observed included active setts (Main and Subsidiary), disused setts (Outlier and Main), latrines, prints, trails and snuffle holes. No active main setts were recorded within the Proposed road development land take. The two active *Main* setts were located in the townlands of Ballaghcullia and Mullenduff. The setts were located a minimum distance of 80m from the proposed land take boundary. A disused *Outlier* sett was recorded at Ballaghcullia and two disused *Main* setts were recorded at Drummin. These disused setts are traversed by the proposed road development. One active *Subsidiary* sett was recorded within the land take boundary in the townland of Scramoge. New road infrastructure may directly or indirectly impact on badgers. Construction may result in death or injury to badgers within setts, as well as the destruction of setts, loss of foraging habitat or dissection of their foraging areas (TII/NRA 2006). At Drummin there is potential for loss of badger foraging habitat. Badger feeding signs were observed in this area but no active setts, trails or latrines were recorded. There is potential for loss of foraging habitat and dissection of foraging areas at Ballaghcullia / Bellanagare Mullenduff / Peak and Scramoge. Trails, latrines and feeding signs were observed within and from areas located to the north and south of the proposed land take. There will be no direct impacts on the identified badger setts at Ballaghcullia and Mullenduff but there is potential for direct impacts on the Subsidiary Badger Sett recorded at Scramoge which is located on the land take boundary.	No further direct impacts are likely to be associated with the operation of the proposed road. Potential operational impacts include: Habitat fragmentation, barrier effect, disturbance and potential collision and road deaths	The disused setts at Ballaghcullia and Drummin will be directly impacted upon. The impact is classified as Permanent Slight Negative Impact given that they are disused, single holes in areas that support ample opportunities for setts at other locations. The active *Subsidiary* sett recorded within the land take boundary in the townland of Scramoge will be directly impacted which is considered to be a Permanent Moderate Negative Impact. Subsidiary setts are generally not used by badger as breeding sites. At the other locations where Badger signs were recorded, any setts were located at a distance of over 80m from the proposed land acquisition boundary. As such, these active setts are unlikely to be impacted by the proposed road development. In terms of indirect impacts, the proposed road development will bisect some territories and create a barrier between the setts and foraging areas at some locations and may lead to disturbance. This is considered to be no greater than a Permanent Moderate, Negative Impact at the local level only, as there is adequate foraging habitat in the wider area regardless. It is considered that impacts could be reversible through appropriate design and mitigation.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
Badger contd.			Given the nature of the habitats recorded, disturbance impacts are not considered likely to be significant. In respect of collisions, Badger would be at risk where roads are constructed in the way of traditional routes between setts and foraging routes. This would be considered to be a potential Permanent Significant Negative Impact at the local scale as there is the potential for individuals within the population to be killed or injured. It is considered that impacts could be reversible through appropriate design and mitigation. It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the National or County level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
Otter	Otter signs were observed on three of the main watercourses within the ZOI: Owennaforeesha River, Strokestown River and Scramoge River. No Otter breeding sites or holts were observed. The watercourses described above offer potential foraging and commuting habitat for the species. While no Otter holts were identified in the ZOI, it is likely that there are breeding holts located in the wider area as Otter is known to occur in the area, can have a home range of 18km (NPWS, 2009) and has a widespread distribution and favourable range throughout the country (NPWS, 2013). Whilst not providing optimum habitat for Otter it is considered likely that the smaller land drains located within the ZOI may be utilised, on occasion, as commuting corridors between larger watercourses. It is considered unlikely that there will be any significant direct impact on Otter as a result of the proposed development as none of the habitat at the crossing points of the rivers was considered to be of particular significance as Otter Habitat. Indirect impacts may include fragmentation of habitat, barrier effect, disturbance, deterioration of habitat quality (water quality and loss of habitat) and potential death by collision.	No further direct impacts are likely to be associated with the operation of the proposed road. Indirect impacts may include ongoing barrier effect, disturbance, deterioration of habitat quality (water quality and loss of in-stream fishery habitat) and potential death by collision	No significant direct impacts are anticipated on this species given the nature of the habitats at the crossing points and given that no breeding or resting places were recorded at the proposed crossing points. The potential for habitat fragmentation and barrier effect is considered to constitute a Permanent Significant Negative Impact at the local scale as it applies to the sensitive species such as Otter that are likely to use the watercourse for commuting to wider areas within their ranges. It is considered that impacts could be reversible through appropriate design and mitigation. The potential for pollution of watercourses during the construction phase is considered to constitute a potential Short-term Moderate-Significant Negative Impact as it has the potential to alter a sensitive receptor over a short period of time and over a far wider area than the site itself. It is considered that impacts could be reversible through appropriate design and mitigation. The potential for pollution of watercourses during the operational phase is considered to constitute a potential Long-term Slight - Moderate Negative Impact as it has the potential to alter a sensitive receptor over a long period of time and over a far wider area than the site itself. It is considered that impacts could be reversible through appropriate design and mitigation.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
Otter contd.			Construction and operation of the road may lead to disturbance related impacts. This is considered to be a Potential Long-term, Moderate Negative impact at the local scale. Given the nature of the habitats recorded and lack of signs of anything other than transient Otter activity, disturbance impacts are not considered likely to be significant. In respect of collisions, Otter would be at risk where roads are constructed in the way of traditional commuting routes between watercourses in the wider area. This would be considered to be a potential Permanent Significant Negative Impact at the local scale as there is the potential for individuals within the population to be killed or injured. Impacts on Otter at the National or County Level are not anticipated.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
Bats	Bat species are considered to be a KER of Local Importance (Higher Value). The ZOI in relation to bats (i.e. 1km buffer of land acquisition boundary) was widely and extensively used by foraging Pipistrelle bats along with smaller numbers of Leisler's, Daubenton's, Brown Long-eared Bat and un-identified Myotis Bats. Bat activity was greatest in areas with prominent and mature vegetative linear landscape features. The areas of highest activity for bats were as follows; Corry West, Corry East, Lurgan, Tullyloyd, Lugboy, Strokestown, Bumlin & Scramoge along with the watercourses along the study corridor. Bat roosts were identified in buildings, outside the land acquisition boundary, at Brackloon, and Bumlin. A bat roost was also identified from a decaying Oak tree located on the eastern banks of the Scramoge River. The identified bat roosts will not be directly impacted by the proposed road and is located just outside the land acquisition boundary. Treelines at Mantua, Corry West, Corry East, from Lurgan through Tullyloyd to Lugboy and Bumlin and Scramoge were identified as good bat foraging and commuting habitat. In these areas, not only did the tree-lines provide good potential for foraging and commuting but many of the individual trees were considered to have definite bat potential for smaller roosts (single bats). These areas were included within the transect surveys undertaken. No tree roosts were specifically identified. It is not anticipated that large bat roosts are present in these trees and no trees with multiple, highly suitable features for roosting bats were recorded. Nonetheless, all trees will be the subject of a pre-commencement survey (As per TII/NRA 2005b). Indirect impacts on bats are likely to include barrier effect, fragmentation of habitat where the proposed road blocks commuting routes between areas of foraging habitat and roosts.	Indirect impacts are likely to include barrier effect and fragmentation of habitat. Lighting is not proposed at any locations which were identified as being of significance for bats and impacts in this regard are not anticipated.	It is considered that indirect impacts on bats are likely to be Long-term Slight Negative Impacts resulting from loss of foraging habitat with some potential for loss of potential tree roosting habitat. Pre-construction surveys shall be required in accordance with TII/NRA (2006b). The habitat loss associated with the proposed road development is considered to be minor given the available habitat in the area. It is considered that impacts could be reversible through appropriate design and mitigation. It is considered that there is the potential for Permanent Moderate Negative Impacts associated with the blocking of potential commuting and foraging routes along the river channels and tree lines and near identified roosts. It is considered that impacts could be reversible through appropriate design and mitigation. Significant impacts on Bats are not anticipated at the National, County or Local Level.

Key Ecological Receptor	Construction Phase Impacts	Operational Phase Impacts	Ecological Significance if Unmitigated
Whooper Swan (includes foraging habitat identified at KER 16a(C)(Ch.36+600-38+050))	This KER includes habitat for a population of Whooper Swan that are classified as County Importance. A flock of swans was recorded utilising Cregga Turlough for roosting and the fields to the north and east for foraging during the 2014/2015 survey season. During 2015/2016 surveys, Whooper Swan were not recorded utilising the foraging habitat identified on the study corridor. There will be a direct loss of 4 hectares of irregularly utilised foraging habitat, however the flock is known to use a variety of sites in the area and was not dependant on this area as a foraging habitat given the abundance of similar habitat in the surrounding landscape. Whooper Swan were recorded from the turlough basin during the 2015/2016 survey season. The road will create a potential barrier between the roosting site on the Turlough and the foraging areas to the north and east. The road is in cut over much of this area (where the majority of the flight paths have been recorded) but there is a high embankment in a section of this area (though very few birds were recorded flying in this area). The road also has the potential to disturb/displace the birds from using these foraging areas during the construction phase with extensive rock breaking and blasting activity undertaken during road construction.	No further direct impacts are likely to be associated with the operation of the proposed road. Fragmentation, barrier effect and disturbance / displacement are potential ongoing indirect impacts during the operational phase.	The loss of habitat is considered to be a Permanent Moderate Negative Impact in that it will result in the loss of a small section (4ha) of foraging habitat. An abundance of suitable foraging habitat was recorded in the wider area. Suitable foraging habitat within a core wintering range is readily available and Whooper Swan show variable degrees of site fidelity in relation to foraging areas. Displacement, barrier effect and disturbance are considered also to constitute a potential Short Term Moderate Negative Impact during the construction phase. During the operational phase the impact is considered to be a potential Permanent Slight Negative Impact. Whooper Swan are known to habituate to disturbance in the form of road projects (McElwaine & Spouncer, 2006) but construction activity may include blasting on a regular basis though for a limited period of time (more so than the adjacent quarry). Significant impacts on Whooper Swans are not anticipated at the National, County or Local level.

7.6 Mitigation

This section describes the measures that are in place to mitigate any harmful or negative impacts associated with the proposed road development and the identified KERs as described in the preceding sections. General mitigation measures included within the design of the proposed road development are described first, with more specific measures to prevent or minimise impacts on the individual receptors provided subsequently. Maps showing the locations of the prescribed mammal mitigation measures are provided in Figures 7.2 – 7.26.

7.6.1 General Mitigation

Mitigation by Avoidance

The proposed road development avoids ecologically sensitive areas and has been constraints led from the initial phases of route selection, throughout an iterative design process and into the final proposed road development. A series of workshops involving the entire project team were held to identify inter-relationships and potential cumulative impacts between the various environmental topics. The proposed road development has followed the basic principles outlined below to eliminate the potential for ecological impacts on KERs where possible and to minimise such impacts where total elimination is not possible.

- The proposed road development has been selected to avoid any direct, in-direct or residual adverse impacts on European sites or other designated sites for nature conservation. In relation to European Sites where it could not be excluded, on the basis of objective information, that the proposed road development would not have significant effects (See Table 4.1 above and the AA Screening Report), a Natura Impact Statement has been prepared which presents the data and information on the project and on each site and provides an analysis of the potential effects on each site. Screened in European Sites are identified as KERs A – F and the predicted and residual impacts on each are fully described in the NIS. The findings presented in the NIS are that the proposed road development, by itself or in combination with other plans and projects, in light of best scientific knowledge in the field, will not adversely affect the integrity of any of the sites and no reasonable scientific doubt remains as to the absence of such effects.
- The proposed road development was designed to avoid these designated sites entirely with no direct impacts possible. The closest designated site is Bellanagare Bog SAC, which is located approximately 200m from the preferred route option. Indirect impacts on any designated sites have also been avoided with a full assessment of the potential for significant effects on the integrity of these sites provided in the Natura Impact Statement that accompanies this application. Potential indirect impacts include disturbance to fauna that are among the Qualifying Interests/Special Conservation Interests of identified European sites, water pollution and hydrological changes. The NIS objectively concludes that the proposed road development, in view of best scientific knowledge and on the basis of objective information, either individually or in combination with other plans or projects, is not likely to have significant effects on the Conservation Objectives of any European site(s).
- The proposed road development has also been designed to avoid impacts on habitats that correspond to those that are listed on Annex I of the EU Habitats Directive outside of the European and Nationally designated sites. There will be no direct impacts on Annex I habitats resulting from this development. The construction of the proposed road development will maintain a drainage neutral

situation (See Hydrology Chapter 10) thus there will be no indirect impacts on sensitive habitats.

- The proposed road development has been designed to minimise direct or indirect impacts on any habitats or species that were classified as being of County or Local Importance (Higher Value) in the design of the scheme (See Section 7.6.2 below).

Through careful planning and design, direct or indirect impacts on receptors of International and National importance have been avoided at the route selection stage. In addition, the proposed road development minimizes the potential for impacts on receptors of County and Local Importance (Higher Value).

Mitigation by Design

The proposed road development has been progressed having regard to all relevant TII/NRA guidelines, for the planning and construction of National Road Schemes, and National and European legislation. The guidelines for the planning and construction of national roads provide, within the design, for the protection of the environment. The following is an overview of the design measures that will be employed throughout the entire length of the proposed road development to minimise and avoid significant negative impacts on the ecological receptors within the ZOI.

- The land acquisition boundary associated with the proposed road will be fenced off at the outset of the construction phase of the project and will avoid the potential for loss of habitat outside of the construction footprint.
- The Landscape Master Plan associated with the proposed road will involve the planting of native hedgerow and woodland to compensate for losses associated with the proposed road development. The locations of the planting have been designed to minimise the impacts resulting from loss of such habitat throughout the proposed road development but in particular in relation to identified KERs where good networks of hedgerow and tree line have been identified.
- The watercourse crossings have been designed to minimise the potential for both short and long term negative ecological impacts on all watercourses including drainage ditches. The design of the proposed road development minimises loss of habitat through appropriate design, ensures that the crossing points do not result in a barrier effect and that significant changes to the nature of the channel are avoided. Details of the design of the watercourse crossings and associated mitigation are provided in Appendix 7.4.
- A Construction Erosion and Sediment Control Plan has been prepared in respect of the construction phase of the project and is provided as Appendix 10.1 of Volume 2 to this EIAR. The potential for run off of pollutants during the construction phase of the development will be fully managed with impacts on significant receptors avoided
- The proposed operational road drainage has been designed to avoid the potential for ongoing pollution of the wider environment during the lifetime of the road and is likely to lead to a positive impact.

Construction Phase Mitigation

Specific measures are described in relation to individual receptor types in the following sections.

Watercourses

The Five major watercourses (i.e. Carricknabraher, Owennaforeesha, Owenur, Strokestown River and Scramoge River) that will be crossed by the proposed road development have been identified as KERs due to the presence of potential habitat for a number of species that are listed on Annex II of the EU Habitats Directive (Otter, Salmonids, Lamprey and White-clawed Crayfish). The following mitigation is provided to ensure that the proposed road does not impact significantly on the water quality within any watercourse at, upstream or downstream of the crossing point. Whilst no significant habitat for any of these species was recorded at the crossing point of any of the watercourses, the following mitigation will ensure that there is no significant impact on habitat for these species.

All works in proximity to watercourses shall follow the specific protection and mitigation measures described in the Construction Erosion and Sediment Control Plan and the best practice guidance outlined in the following documents:

- TII/NRA 'Guidelines for the crossing of Watercourses During Construction of National Road Schemes (2008);
- Shannon Regional Fisheries Board (SRFB) Protection and Conservation of Fisheries Habitat with Particular reference to Road Construction (2009);
- Inland Fisheries Ireland requirements publication" Guidelines on protection of fisheries during construction works in and adjacent to waters" (2016)

No Net Loss (SRFB 2009)

The no net loss principle is fundamental to the habitat conservation goal. The principle takes into consideration the habitat and water quality requirements of fish, in the context of site-specific evaluations, in order to avoid losses of habitats or habitat components that can limit the production of fisheries resources.

There must be no net loss of fish habitat or in the ability or potential for the fisheries and aquatic habitat to maintain fish stocks or the food of fish. All culverts and diversions have been designed to ensure that will be no net loss of fisheries habitat.

Crossings

Structures required for the proposed road development include clear span bridges, box culverts and pipe culverts.

The culverts have been designed so that velocities through them will be acceptable to allow the passage of fish at any time. The inclusion of baffles, pools or weirs or similar mechanisms to reduce flow velocity and assist the passage of fish, may be required.

Culverts have generally been kept as short as possible by squaring the watercourse crossing to be perpendicular to the propose road development. This improves the amount of light that would enter into the Culvert, allows for the passage of fisheries personnel, and can also allow the passage of wildlife.

Where a box culvert is required, the invert of the culvert has been set at least 500 mm below the existing bed level, and at the same gradient or near the same gradient as the existing bed. Where necessary, additional works to reduce flow and minimise bank erosion and facilitate passage of fish, such as the installation of baffles or pools and rock armour to protect the banks will be undertaken.

Where a pipe culvert is required, the invert of the culvert will be set at least 300mm below the existing bed level, and at the same gradient or near the same gradient as the existing bed. Where necessary, additional works to reduce flow and minimise bank erosion and facilitate passage of fish, such as the installation of baffles or pools and rock armour to protect the banks will be undertaken.

The original bed material will be reinstated or where imported will consist of rounded washed gravels which will be either placed upstream of the culvert or will be placed in the culvert before it becomes live.

Over sized culverts have been designed with rock armour training from the inside of the headwalls back to natural channel width to form a low flow channel.

Offline culverts will require channel stabilisation works (for all channels) and fisheries development works which will be undertaken in conjunction with Inland Fisheries Ireland.

The screening of temporary or permanent culverts to prevent trash build up can cause an obstruction to fish passage and will not be permitted.

Diversions

Where watercourses are to be diverted, dewatering will be required. IFI or a suitably qualified contractor will conduct an electrofishing operation to remove any fish from the channel prior to dewatering.

Where a temporary/permanent river diversion is required (e.g. Tributary of Scramoge River), the design, construction and operation of the channel will require the provision of artificial geotextile membrane sheeting or rock armour, on the side and base of the temporary channel. This will minimise erosion and potential surface water runoff.

In an effort to reduce the number of culverts and loss of fisheries habitat the construction of new river channels running parallel to the road sections have been incorporated into the project design (e.g. Diversion of the tributary of the Scramoge River). The new channels shall be constructed in dry conditions. Channels shall also be constructed in a fish friendly manner following IFI best practice (Shannon Regional Fisheries Board (2009) Protection and Conservation of Fisheries Habitat with Particular Reference to Road Construction. Shannon Regional Fisheries Board, Clonmel and Guidelines on protection of fisheries during construction works in and adjacent to waters, IFI 2016).

Newly created channels shall incorporate instream structures, features and meanders that will give rise to flow type variation as found in fish bearing waters. The channel base widths have been designed to match the width of the diverted channels.

Watercourse diversions will be subject to channel stabilization works, which consist of lining the new channel with rounded washed gravel to a maximum depth of 300mm below finished bed level and bank scour protection in the form of rock armour, along the channel. These works will be undertaken in consultation with IFI.

The riparian zone along river channels is very important and IFI have provided input into the Landscape Master Plan and their requirements were incorporated (Figure 11.26 to 11.50 in Volume 3) along newly created channels. All the planting along

these channels will be with native deciduous trees. There will be no planting within 5m of the channel. The reasons for this are as follows,

(i) To provide bank stability and prevent excessive erosion.

(ii) Will provide shade to stream in summer which will help to keep the stream cool.

(iii) Will lose leaf in the winter allowing light into the stream.

(iv) The fallen decaying leaf litter will be a food source to the macro-invertebrates in the stream, which in turn are a food source for fish.

(v) The mix of tree species will supply leaf litter to the stream right through the winter.

All instream works in watercourses identified as being of fisheries value shall be undertaken in accordance with the IFI Guidelines 2016 which state: "*To minimise adverse impacts on the fisheries resource works in rivers, streams, watercourses, lakes, reservoirs and ponds should normally (except in exceptional circumstances with the agreement of IFI) be carried out during the period July-September."*

Pollution of Watercourses

This project has the potential to cause pollution of the surrounding environment in the absence of correct design and mitigation. Pollution could take a number of forms and occur during a number of the operations involved in the construction process. Listed below are the activities during which pollution may arise and the type of pollution that may occur along with prescribed mitigation measures.

Earthworks

Construction of the proposed road development will involve excavation of soil. This creates the potential for sediment and/or nutrient run-off, especially if soil is stored in an un-vegetated state for a period of time. Suspended solids could potentially enter downstream natural habitats, via existing drainage features. It is considered unlikely that this would happen to a significant degree.

A Construction Erosion and Sediment Control Plan (Appendix 10.1 of EIAR) has been prepared for the development and the measures outlined in the document shall be strictly adhered to during the construction. The principle avoidance and control measures in relation to earthworks are outlined in Section 5 of Appendix 10.1.

Hydrocarbon Usage (See also Chapter 9 and 10 of this EIAR)

The use of hydrocarbons during the construction process leads to the potential for pollution to enter the wider environment, including drainage ditches and watercourses. Leaks in poorly maintained plant and machinery could lead to hydrocarbon dispersal over works areas. Leaks in fuel storage tanks and spillages during refuelling operations could lead to larger releases of hydrocarbons into the environment.

The use of machinery carries the potential for accidental hydrocarbon contamination of works areas, by fuel spillages or oil leaks for example. The works will be carried out in accordance with the following measures to avoid such impacts:

- It is likely that all machinery will be refuelled from mobile tankers on the local / access / haul / site roads. No refuelling is to take place within 50m of any watercourse.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned.

- When not in use, all valves and fuel trigger guns from fuel storage containers will be locked.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained & competent personnel will carry out refuelling operations. Plant refuelling will take place as far as practicable from watercourses and not within 50m in any case. A spill kit and drip tray shall be on site at all times and available for all refuelling operations. Equipment shall not be left unattended during refuelling. All pipework from containers to pump nozzles will have anti siphon valves fitted.
- Strict procedures for plant inspection, maintenance and repairs shall be detailed in the contractor's method statements and machinery shall be checked for leaks before arrival on site.
- All site plant will be inspected at the beginning of each day prior to use. Defective plant shall not be used until the defect is satisfactorily fixed.
- All major repair and maintenance operations will take place off site.
- Care will be taken at all times to avoid contamination of the environment with contaminants other than hydrocarbons, such as uncured concrete or other chemicals.

Hydrologically Sensitive Habitats

The proposed road passes within close proximity to a number of hydrologically sensitive habitats that are included as KERs and where potential indirect impacts were identified. These areas include:

- KERs 1a(N), 1b(C), 4(C) & 5(N) in the vicinity of Annex I Habitat 'Molinia Meadows on Calcareous, Peaty or clayey silt laden soils 6410'.
- KERs 6a(N), 6b(N), 6b(C), 6b(LH), 6c(N), 6c(LH) and 6c (LL) in the vicinity of Annex I Habitat 'Degraded Raised Bog Still Capable of Natural Regeneration 7120' and potentially 'Depressions on peat substrates of the Rhynchosporion 7150'
- KER 15a (LH), 15b(LL) and 15c(N) in the vicinity of Annex I Habitat Alkaline Fen (7230)
- KER 16(N) in the vicinity of the Annex I priority habitat 'Turlough' [3180]

In each of these areas, direct impacts have been avoided but the potential for indirect impacts on the hydrology of these habitats was identified. Through consultation with the hydrology team on the project, it has been possible to prescribe mitigation to maintain a drainage neutral situation in these areas thereby not altering the existing hydrological situation. Full details of the measures to be included are provided in Chapter 9 Hydrology and Chapter 10 Hydrogeology of this EIAR. The measures have effectively removed the potential for significant hydrological or hydrogeological effects on Key Ecological Receptors outside the footprint of the proposed road development.

Broadleaved Woodlands

The proposed road has been designed to avoid areas of broadleaved woodland where possible. However, the development will result in the loss mainly of Birch dominated woodland that is regenerating on the edge of dry cutover bog. None of the woodland corresponds to Annex I Habitat Bog Woodland (91D0). This woodland type is recorded at KERs 7a(N), 7b(LH), 9(LH), 10(LH), 11(LH) and 17(LH) with Wet Willow Alder Ash Woodland (Non Annex I) recorded at KER18(LH) and Mixed Broadleaved Woodland recorded at KER 20(LH). In total, the loss of Broadleaved

Woodland will amount to 5.8 hectares. The proposed landscaping plan includes planting of Native woodland along with Hedgerow and tree line to ensure that there is no net loss of broadleaved woodland, Hedgerow and tree line habitats. Exact figures for woodland replacement are provided in the landscape plan.

Badger

Badgers were recorded at several locations along the proposed route and were included within KERs 7a(N), 7b(LH), 9(LH), 10(LH) and 11(LH) as well as in the area to the east of the Scramoge River. Direct impacts are limited to the loss of two disused setts in woodland KER 7(LH) and KER 10(LH) and potentially an active subsidiary sett at the land acquisition boundary in the townland of Scramoge. Indirect impacts that may occur in all areas include habitat fragmentation, barrier effect, disturbance and potential collision and road deaths.

Mitigation measures that are in place to minimise the potential for these impacts follow (TII/NRA, 2006) and are described in the following sub-sections below.

Pre-construction Badger Survey

Prior to any works being carried out, a pre-construction Badger survey will be undertaken to ensure badger has not taken up residence within or close to the road footprint. This survey will also confirm whether the disused main and outlier setts that were identified during the dedicated surveys undertaken are still disused or have become active in the intervening period between planning and construction.

Exclusion of Badgers

Should any active setts be recorded within the development footprint during the pre-construction survey, the procedure outlined below will be followed.

Exclusion of Badgers from currently active setts will only be carried out in the period July to November inclusive to avoid the Badger breeding season. Exclusion of Badgers from disused or currently inactive setts may be completed throughout the year.

Disused setts (Main and Outlier) have been identified within the footprint of the proposed road development. These setts, at the time of surveying, were considered to be unused by Badgers although one sett was being used by Fox and further survey work will be required to ensure the setts are inactive at the time of construction. In the case of disused setts, initial exclusion involves lightly blocking entrances with vegetation and a light application of soil (i.e. soft blocking). Soft blocking confirms the absence or presence of Badgers. If all entrances remain undisturbed for five days, setts should be destroyed immediately under licence from National Parks and Wildlife Service (NPWS). If it is not possible to destroy the sett immediately, the entrance should be hardblocked using buried fencing material and compacted soil and destroyed as soon as possible. In addition, an active subsidiary Sett was encountered at Scramoge. This was located at the very edge of the land acquisition boundary. Should this sett remain active or further active setts be encountered prior to construction, the TII/NRA guidelines (2006) will be followed for the exclusion of active setts.

The zone of influence for impacts on Badger Setts as a result of construction works is 150m where pile driving may occur or, where there is no requirement for pile driving, within 50m of an active sett during breeding season or within 30m outside of breeding season (TII/NRA, 2006). Active Badger setts have been identified at 60, 80 and 90m from the proposed road development footprint. As a result, it may be

essential to temporarily exclude Badgers in these areas should pile driving be required during construction. Exclusion of Badgers from active setts is best avoided during the breeding season as cubs may remain underground after all adults have been excluded. Inactive sett entrances should be soft-blocked then hard-blocked and the sett destroyed as soon as possible, under the supervision of a licensee (TII/NRA, 2006). One-way gates should be installed on active entrances to allow badgers to exit but not re-enter. These gates should be tied open for three days prior to being set. Once gates have been installed, they should be left in place whilst works are conducted within the zone of influence. If the gates are left in place for long periods of time Badgers may attempt to dig around them or to create new entrances. Therefore, the gates should be in place for the minimum time necessary and should be inspected regularly for signs of disturbance.

Mammal - Resistant Fencing

Fencing is required to prevent Badgers from crossing road points other than at underpasses. The fencing must extend sufficient distance to ensure that Badgers will not find an easy way around. Underpass entrances should be recessed in fence lines, thereby guiding animals to them.

The extent of fencing has been determined by the locations at which Badgers are likely to encounter it and the frequency with which they may attempt to cross the proposed road development. It will be installed in all areas where Badger signs were recorded and will extend to cover the foraging habitats surrounding the recorded signs. Badger-proof fencing will not be installed asymmetrically and will be installed in parallel on both sides of the road and care will be taken to avoid any gaps or weaknesses even at awkward features such as undulating ground or streams in accordance with CC-SCD-00319. The locations of these fences, based on recent surveys, are shown on the mitigation Maps Figures 7.2-7.26.

The Badger fencing shall be constructed in accordance with CC-SCD-00319.

Otter

Otter were recorded at various locations within the study area but suitable habitat was recorded throughout the main watercourses (as listed in Table 7.11) along the proposed route and on some of the larger drainage ditches. No holts were recorded. The guidance followed in the summary of mitigation measures for Otter is

- '*Guidelines for the treatment of otters prior to the construction of National Road Schemes'* (TII/NRA, 2006)
- '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (TII/NRA, 2005)

The following mitigation measures form part of the proposed road development and are in accordance with the above guidance documents:

Pre-construction Otter Survey

Prior to any works being carried out, a pre-construction Otter survey will be undertaken to ensure that Otter have not taken up residence within or close to the road footprint.

Exclusion

It is not anticipated that any Otter holts will require to be excluded as part of this proposed road project based on the findings of the Otter surveys undertaken.

However, should any holt be encountered during the pre-construction surveys, it will be subject to exclusion procedures as outlined in the TII/NRA guidelines (2006).

Maintenance of Riparian Cover

Construction works will result in the loss of at least some riparian vegetation at crossing points. Avoidance of disturbance or loss of as much of this vegetation as possible is desirable and has been considered in the design of the proposed road development. Where possible, riparian cover will be restored using the same native species as soon as practicable following construction works. Access to ledges and underpasses will be provided by appropriate levelling to ensure use of such structures by animals. Planting will not obstruct wildlife underpasses or walkways in the short or long-term.

Post-Construction Monitoring and Mitigation (TII/NRA 2006)

As per TII/NRA guidelines (2006), post-construction maintenance of Otter underpasses and monitoring of mitigation measures will be conducted at quarterly intervals over a period of a year following construction. Any deficiencies in the measures implemented should be reported to relevant authorities and corrected where possible.

Bats

The Townlands with highest bat activity were; Mantua, Lurgan, Tullyloyd, Lugboy, Strokestown, Bumlin & Scramoge along with the watercourses along the study corridor. A number of bat roosts were identified in buildings surrounding the study corridor. A Bat roosting site was identified in a decaying Oak tree located to the east of the Scramoge River on the boundary of the proposed N5 land take. The tree will be retained. In addition, areas with mature Treelines with potential to support roosting Bats were identified.

The guidance followed in the summary of mitigation measures for Bats is

- '*Guidelines for the treatment of bats during the construction of National Road Schemes'* (TII/NRA, 2006)
- *'Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes'* (TII/NRA 2005)
- *'Irish Wildlife Manual No. 25 published by NPWS 'Bats Mitigation Guidelines for Ireland'* (Kelleher & Marnell, 2006).

Tree-felling and Hedgerow Removal

Vegetated cover will be lost in order to facilitate earthworks and road construction. This will include mature Hedgerows and Treelines composed of native tree and shrub species. These habitats are important for commuting and foraging Bat species and key areas have been avoided as much as possible as part of the iterative design process. Hedgerows and Treelines to be lost during construction will largely be replaced as part of the landscaping plan. In areas that have been identified as being of particular significance for Bat species such as at Mantua, Corry West, Corry East, from Lurgan through Tullyloyd to Lugboy and Bumlin and Scramoge were identified as good Bat foraging and commuting habitat. In these areas, not only did the tree-lines provide good potential for foraging and commuting but many of the individual trees were considered to have definite bat potential for smaller roosts (single Bats). The proposed road development involves specific prescriptions for tree planting to ensure that habitat connectivity is not severed by the proposed road. Proposals include:

- Tree planting to provide commuting habitat along the proposed road and to guide Bats to other linking tree lines/hedges, woodland, bridges, culverts or underpasses that may be used to cross the road. A network of vegetation will be created around the proposed road that in many sections of the study corridor will provide additional biodiversity within the landscape. Details of planting are provided in the landscape plan (see Figures 11.26 – 11.50).
- Planting of riparian trees to allow continued use of river corridors
- Planting of tall (semi mature) trees on opposite sides of the road at particular locations where connectivity is severed to provide Bat flyovers (or hop overs). This planting is done in association with strong guiding tree lines on both sides of the road to provide a safe crossing point for bats. These will be provided at Mantua, where the proposed road development severs tree lines and is in cut (Ch.18+250 – Ch. 20+000).
- Planting will utilize native species as these have a greater range of insects associated with them that provide an additional source of food for bat species.

Whilst few trees were positively identified as having very high potential to support significant Bat roosts, pre-construction Bat surveys will be required by suitably qualified Bat ecologists prior to any felling being undertaken, in the vicinity of Corry West, Corry East, Tullyloyd, Bumlin and Scramoge where particularly well developed networks of tree lines were recorded. In addition, the proposed road passes close to known and identified roost sites at Scramoge and surveys of mature trees in this area will also be undertaken. If the presence of roosting Bats in a tree is suspected, a close up inspection by a suitably trained ecologist is required prior to felling. No tree roosting Bats were recorded during field surveys however, resurveying is required prior to tree felling works. Should any tree roosts be identified, a derogation licence from NPWS will be required to fell these trees.

When felling mature trees in areas that have been identified as having higher potential for roosting bats within trees (i.e. Corry West and Corry East and Tullyloyd, Bumlin and Scramoge), the following TII/NRA (2006b) will be followed:

- Immediately prior to felling, mature trees with high potential to support roosting bats should be inspected for the presence of Bats and/or other Bat activity by a suitably qualified Bat ecologist during daylight hours and night-time using a bat detector. This survey should be carried out from dusk through the night until dawn to ensure bats do not re-enter the tree;
- Where examination of the tree has shown that Bats have not emerged or returned to a tree, felling may proceed the following day. Should a delay of one day or greater in felling be encountered, resurveying is required;
- Felling of mature broadleaved trees during winter months (November – March) should be avoided as this increases risk to hibernating Bats. If there is a requirement to fell trees in these sensitive areas during this period, any trees with significant roosting features will be subject to a detailed inspection undertaken by a suitably qualified professional.

Buildings

Identified roosting sites will not be directly impacted upon by the proposed road development. The building to be demolished at Corry East does not currently support roosting Bats. This building should be subject to pre-construction survey (as per TII/NRA, 2005b) prior to demolition to ensure Bats have not taken up residence. If bats are found to be present, exclusion measures will be followed under licence from the NPWS.

Birds

Breeding Birds

Breeding birds were not identified as KERs of this road development since there are no significant populations recorded as likely to be impacted by the proposed works. However, the proposed road will result in the loss of habitat for breeding birds in the form of woodlands, tree lines, hedges and scrub. The protection of bird breeding habitats during the breeding season (1st March to 31st August, inclusive), are set out in the Wildlife Acts, 1976-2012. Exemptions in this legislation for road construction are acknowledged. The proposed development will results in the loss of 19.4km of hedgerow, 15.3km of treelines, 76.7ha of conifer plantation, 3.7ha of scrub/immature woodland and 5.8ha of broadleaved woodland. The landscaping plan involves the planting of hedgerow, tree line and woodland habitat, which will mitigate the loss of nesting bird habitat and has the potential to result in a positive impact in some areas along the study corridor.

Wintering Birds

Whooper Swan were identified as a KER where a flock of County importance occurs at Cregga Turlough. Deep cut excavation is proposed in the area to the north-east and east of Cregga Turlough to facilitate the construction of the proposed road development. Also an embankment (up to 12m) and approximately 400m in length is proposed to the north of the Turlough (Ch. 36+500-36+900).

Potential Impacts of the proposed road development were identified as:

- Loss of identified foraging habitat in the form of improved pastureland to the north-east of Cregga Turlough.
- Potential disturbance related impacts during the construction and operational phase of the development.
- Potential fragmentation of flight lines and displacement.

While the habitat loss is significant in a local context, it should be noted that Whooper Swan are a mobile species that commute daily between roosting sites and foraging areas. They do not show strict fidelity to foraging areas and move around based on availability and quality of forage. Given that there is an abundance of suitable foraging habitat in the wider area the permanent loss of a small area consisting of 4ha is not considered significant and no mitigation is proposed.

There is potential for disturbance/displacement related impacts during the construction and operational phase of the development. Where deep cut excavation is proposed, the natural topographic barrier arising from the deep excavations will act as visual/sound buffer reducing the potential for significant disturbance/displacement related impacts. Whooper Swans were not recorded foraging in the area to the north of the Turlough where the high embankment is proposed. A previous study on wintering birds undertaken as part of a separate road scheme (A6 Toome Bypass) in the Toome area in Northern Ireland identified Whooper Swans utilising fields adjacent to the existing road (operational phase) with recorded high peaks in adjacent grassland pasture (McElwaine & Spouncer, 2006). As part of the survey work undertaken for the road scheme, the distance of birds foraging in fields adjacent to the existing road was recorded. It was found that, on all but two occasions, birds when present, were located a greater distance than 60m from the existing road however, Whooper Swans were also recorded utilising improved grassland fields less than 10m and 30m from the road on two other occasions (McElwaine & Spouncer, 2006). Birds exhibited greater caution and alarm when counters/surveyors were observed on foot as opposed to road traffic. There were no observations of Whooper

Swans taking flight as a result of road traffic on the A6 (McElwaine & Spouncer, 2006).

A study undertaken by Rees (2005) in relation to Whooper Swan behavioural responses to human activity suggests that swans become less sensitive to disturbance if the frequency of daily disturbance is high. It was found that pedestrians altered Whooper Swan behaviour for longer periods than vehicles or aircraft (Rees, 2005).

Rees *et al*. (2006) conducted a study at Black Cart Special SPA near Glasgow in relation to Whooper Swan behavioural and disturbance responses to different types of human activity. The study was undertaken over three winters (from 1997/98 to 1999/00) at agricultural lands used by Whooper Swan for grazing. The study found that activities relating to cars, tractors, bicycles, farm workers on foot and cattle (livestock) exhibited the least disturbance to grazing Whooper Swan flocks (within 100m disturbance distance bands) while bird scaring techniques (airport), helicopters and aircraft resulted in the highest form of disturbance (ranging from 600m to 1500m) (Rees *et al*., 2006).

Whooper Swans in the area are likely to habituate to the proposed road over time and significant disturbance impacts are not anticipated.

The dominant flight lines identified during the survey periods were located to the east of the turlough and were utilised by birds moving from the turlough/turlough edge to improved pasture to the north-east. Whooper Swan in this area were recorded flying at a mean height of 8m-15m. Therefore, significant fragmentation/disruption to flight lines is not anticipated as Whooper Swan are likely to follow the natural contours of the landscape and fly over the proposed road development unhindered.

Invasive Species

Due to the legislative requirements to control the spread of noxious weeds and non-native invasive plant species, it is important that any activities associated with the planning, construction and operation of national road schemes comply with the requirements of the Wildlife Acts, 1976-2012. Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011), as amended, include legislative measures to deal with the dispersal and introduction of Invasive Alien Species (IAS), which are listed in the Third Schedule of the regulations.

The non-native invasive species Japanese Knotweed (*Fallopia japonica*) was recorded on the proposed road development at one location in the townland of Vesnoy (Ch 51+250).

An IAS Management Plan will be prepared in relation to the treatment of the identified stand of Knotweed. The management plan shall follow the guidance outlined in the following documents:

- National Roads Authority TII/NRA (2010). Guidelines on management of noxious weeds and non-native invasive plant species on national roads.
- Environment Agency (UK) (2013). The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013).

The introduction and/or spread of invasive species such as Himalayan Balsam, Giant Rhubarb or Rhododendron for example, could result in the establishment of invasive alien species and this may have negative impacts on the surrounding environs.

Pre-construction Invasive Species Survey

Prior to any works being carried out, a pre-construction Invasive species survey will be undertaken to ensure that additional Invasive have not been introduced to areas within or close to the road footprint.

Control Measures for the Management of Invasive Species

The following measures address potential impacts associated with the construction phase of the project:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g. Himalayan Balsam, Japanese Knotweed etc.) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species
- All washing must be undertaken in areas with no potential to result in the spread of invasive species. This process will be detailed in the contractor's method statement.
- Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- All planting and landscaping associated with the proposed development shall avoid the use on invasive shrubs such as Rhododendron.

Operational Phase

Emissions

Specific measures to offset potential impacts relating to surface water runoff, during the operation of the road, have been incorporated into the design of the proposed road development. These include the use of penstocks and attenuation systems.

It is noted that the proposed road development will convey a significant amount of traffic diverted off the existing N5 road and, given the pollution prevention measures incorporated into the project design will result in a far greater level of ecological protection in relation to water pollution from such traffic during the operational phase of the development.

Hydrologically Sensitive Habitats

The proposed road passes within close proximity to a number of hydrologically sensitive habitats that are included as KERs and where potential indirect impacts were identified. Through consultation with the hydrology team on the project, it has been possible to prescribe mitigation to maintain a drainage neutral situation in these areas thereby not altering the existing hydrological situation. Full details of the measures to be included are provided in Chapter 9 Hydrology and Chapter 10 Hydrogeology of this EIAR. The measures have effectively removed the potential for significant hydrological or hydrogeological effects on Key Ecological Receptors outside the footprint of the proposed road development during the operational phase.

Habitat Fragmentation and Disturbance

Badger Underpasses

Badger underpasses significantly reduce the number of Badger casualties and mortalities associated with road developments and should be installed where Badger

pathways cross a proposed road development. A number of trails and latrines have been recorded within the footprint of the proposed development and Badger underpasses are included in areas of identified badger activity. The underpasses will reduce impacts on Badger communities in the area as a result of the operational phase of the proposed road development. The locations of underpasses are shown on the mitigation maps Figures 7.2-7.26 and in table 7.17 below.

Badger underpasses are usually constructed of 600mm concrete pipes but may form part of a watercourse culvert or bridge, where appropriate. Regard should be had to TII Standard Construction Detail (SCD) CC-SCD-02504 and CC-SCD-02505. Badgers must be guided into the underpass by mesh fencing. This will also prevent Badgers and other fauna from entering the road carriageway. The fencing design should have regard to CC-SCD-00319. The fencing used should be installed in such a manner as to prevent Badgers and other animals from digging under the fence. Underpasses should be sited as close as possible to existing Badger paths and should follow existing wildlife corridors such as hedgerows. The underpasses and fencing should be installed at the earliest stage possible during the construction phase so as to encourage Badger use. Where it is unfeasible to create a Badger underpass due to engineering constraints, it will be moved to a more suitable location not more than 250m from the original location and guide planting and fencing will be provided. Having regard to SCDs the following measures, as per TII/NRA (2006) will be adhered to when constructing the prescribed Badger underpasses:

- Exit and Entrance to tunnels will be flush with badger-proof fencing;
- Drainage will be adequate to prevent waterlogging at entrances and within the underpass;
- Where stream culverts are being installed, structures greater than one metre diameter will be fitted with a raised mammal ledge. The ledge will be elevated above normal flood levels. Alternatively, a separate pipe culvert (600mm) can be set above flood level adjacent to stream culvert; and,
- The entrances to the underpass will be planted with appropriate hedgerow planting to encourage Badger use though this will not obscure the entrances.

Treatment of Otters at Watercourse crossings

The welfare of Otters will be ensured primarily through the provision of continued safe access for Otters to their ranges and foraging habitats. Adequate provision for Otters at affected watercourse crossings is required to allow the species to retain continued access to their foraging areas. Spanning large watercourses typically results in limited disruption to Otter activity. Smaller watercourse crossings require greater attention.

Ledges or underpasses will be required at watercourse crossings 01-09 and a number of the larger drainage ditches on the proposed road development as listed in Table 7.18. In the context of the proposed road development, it is likely that Otter (a widely distributed species) utilize all watercourses where crossings are proposed at least on occasion. Therefore, ledges or underpasses will be required at all watercourse crossings. Where ledges cannot be installed, provisions for commuting Otter in the form of underpasses which may be utilised by other species including Badgers must be provided. Where Badger-resistant fencing has been recommended to restrict movement of Badgers across roads, this will also prevent Otter movement across the road carriageway. Mitigation measures at smaller water crossings may include the provision of box culverts with ledges rather than pipe culverts. The locations of these features are shown in Table 7.17 and on the mitigation Maps Figures 7.2-7.26.

Table 7.17 Locations of Mammal Underpasses*

Number	Chainage
1	10+130
2	11+700
3	12+700
4	14+150
5	14+540
6	14+600
7	15+210
8	17+250
9	17+400
10	21+325
11	30+750
12	51+110
13	52+830
14	52+900

Note: Details of mammal underpasses at watercourse crossings are provided in Table 10.25 contained in Chapter 10. All other mammal underpasses will comprise a 600mm diameter concrete pipe. Refer to Figures 7.2 – 7.26 for locations of same.

Ledges are essentially walkways which provide crossing points under road developments for fauna at water crossings where there is inadequate provision for dry-ground passage at bridges and culverts. Ledges must be at least 500mm wide and constructed above the 1 in 5 year flood event and allow at least 600mm headroom (TII/NRA, 2006). Such ledges are typically constructed of solid concrete on one or both sides of a bridge or culvert but may be constructed of wood or metal bolted to the structures sides.

Adequate access to ledges from the banks of the watercourse will be ensured. Additionally, ledges will be provided traversing waterbodies to allow animals to cross from either side to facilitate use of a single ledge culvert. Ledges should be linked to other wildlife corridors so as to ensure their functionality and use by faunal species.

Otters are disinclined to use water-filled culverts without dry pathways (TII/NRA, 2006). Where it is not possible to provide a ledge or larger culvert, an underpass next to the watercourse may be provided. Such underpasses are similar to those described for Badger. Underpasses, where constructed, will be composed of 600mm minimum diameter concrete pipes. Ramps will be provided to ensure accessibility, if required. Underpasses should be as short as possible and daylight should be visible through the tunnel. Drainage will prevent waterlogging at entrances and throughout the underpass. The tunnels will be sited as close as possible to watercourses and guiding features such as mammal-proof fencing, walls or natural features such as hedgerows will be installed to guide Otters and other fauna towards the underpass.

Otters may cross roads some distance from watercourses.

Mammal-resistant fencing (as per CC-SCD-00319) has been incorporated in parallel on either side of all water crossings. This fencing will extend to greater than 50m.

Bats and Lighting

It is proposed to provide external lighting installations at the five proposed roundabout locations. None of these locations were considered to be of significance for bat species. The proposed lighting will involve the following elements:

- The external lighting is designed to approved Standards that minimise light spillage and minimise impacts on bats that are known to forage in the area. Design measures that have been incorporated into the project design to achieve these aims include:
- The lighting has been designed to minimise light spillage and thus reduced the impact on areas outside and on the boundaries of the development footprint, and consequently on bats. The luminaries will be horizontally mounted and will be fitted with double asymmetric flat glass luminaries of the full cut off type that prevent upward spillage of light and minimise horizontal spillage away from the intended lands.

No artificial lighting is proposed within or adjacent to habitats of significance for Bat species. However, to avoid the potential for any such impact it will be ensured that no lighting is focused onto areas of ecological sensitivity such as tree lines or watercourses and that lighting design provides for low levels of lateral light spillage to avoid unwanted areas of illumination.

Disturbance to Wintering Birds at Cregga Turlough

To offset any potential impacts at the embankment location, the landscape plan incorporates a tree line of semi-mature trees along the south of the proposed embankment. The treeline will encourage birds to increase their flight height and fly over the road thus reducing the potential for collision. In addition, the treeline would act as a visual barrier thus reducing potential disturbance/displacement related impacts during the operation phase of the development.

Fisheries

The watercourse diversions have been designed to avoid the loss of fisheries habitat and to retain adequate passage for fisheries. No adverse impacts in this regard are anticipated during the operation phase of the development.

7.7 Residual Impacts on KERs

Table 7.18 Assessment of the Residual Impacts Scale and Significance; Based on the EPA (2002) and TII/NRA (2009)

Key Ecological Receptor	Pre Mitigation Impacts	Ecological Significance Following Mitigation
KERs 1a(N) and 1b(C) (4+000 - 4+250)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale.
KERs 2a(LH) and 2b(N) (5+000-5+500)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale.
KER 3(LH) (10+125 – 1-+150)	It is considered that the road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.	No significant residual impact on this KER at National, County or Local scale.
KER 4(C) (10+750 – 10+900)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale.
KER 5(N) (11+450 – 11+950)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale.
KERs 6a(N), 6b(N), 6b(C), 6b(LH), 6c(N), 6c(LH), 6c (LL) (10+900 – 12+350)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale.
KERs 7a(N) and 7b(LH) (13+950 – 14+450)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The road development has the potential to result in significant impacts at the local level.	With mitigation in place this impact is not considered significant as the loss of woodland will be compensated for with replanting of native woodland, tree lines and hedgerows in the local area.

Key Ecological Receptor	Pre Mitigation Impacts	Ecological Significance Following Mitigation
KER 8(LH) (14+450 – 14+800)	It is considered that the road development does not have the potential to result in significant impacts on this KER either at the National or County level. The road development does have the potential to result in significant impacts at the Local level.	No significant residual impact on this KER at National, County or Local scale
KER 9(LH) (14+500 14+650)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.	With mitigation in place this impact is not considered significant, at National, County or Local scale, as the loss of woodland will be compensated for with replanting of native woodland, tree lines and hedgerows in the local area.
KER 10(LH) (15+150 15+300)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.	With mitigation in place this impact is not considered significant, at National, County or Local scale, as the loss of woodland will be compensated for with replanting of native woodland, tree lines and hedgerows in the local area.
KER 11(LH) (16+700 17+200)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.	With mitigation in place this impact is not considered significant, at National, County or Local scale, as the loss of woodland will be compensated for with replanting of native woodland, tree lines and hedgerows in the local area.
KER 12(LH) (18+250 20+250)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.	No significant residual impact on this KER at National, County or Local scale
KER 13(LH) (30+550 31+950)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.	No significant residual impact on this KER at National, County or Local scale
KER 14(LH) (32+900 – 34+450)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale

Key Ecological Receptor	Pre Mitigation Impacts	Ecological Significance Following Mitigation
KERs 15a(LH), 15b(LL), 15c(N), (33+350 – 34+350)	It is considered that the proposed road development has the potential to result in significant impacts on this KER at the National level.	No significant residual impact on this KER at National, County or Local scale
KERS 15d(C), 15e(C) (36+650 – 37+950)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the National, County or Local level.	No significant residual impact on this KER at National, County or Local scale
KER 16(N) (36+650- 37+950)	It is considered that the proposed road development has the potential to result in significant impacts on this KER at the National level.	No significant residual impact on this KER at National, County or Local scale
KER 17(LH) (50+850 51+800)	It is considered that the proposed road development has the potential to result in significant impacts on this KER at the Local level. Impacts are not considered significant at the National of County level.	With mitigation in place this impact is not considered significant, at National, County or Local scale, as the loss of woodland will be replaced with replanting of native woodland, tree lines and hedgerows in the local area. No significant residual impact on the river is anticipated.
KER 18(LH) (52+150 52+650)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER at the Local level.	With mitigation in place this impact is not considered significant, at National, County or Local scale, as the loss of woodland will be replaced with replanting of native woodland, tree lines and hedgerows in the local area.
KER 19 (LH (52+850 - 53+250)	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The road development does have the potential to result in significant impacts at the Local level.	No significant residual impact on this KER at National, County or Local scale

Key Ecological Receptor	Pre Mitigation Impacts	Ecological Significance Following Mitigation
KER 20(LH) (53+300 53+950)	It is considered that the proposed road development does have the potential to result in significant impacts on this KER at the Local level.	With mitigation in place this impact is not considered significant, at National, County or Local scale, as the loss of woodland will be replaced with replanting of native woodland, tree lines and hedgerows in the local area.
Badger	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.	No significant residual impact on this KER at National, County or Local scale
Otter	It is considered that the proposed road development does not have the potential to result in significant impacts on this KER either at the National or County level. The proposed road development does have the potential to result in significant impacts at the Local level.	No significant residual impact on this KER at National, County or Local scale
Bats	Significant impacts on Bats are not anticipated at the National, County or Local Level	No significant residual impact on this KER at National, County or Local scale
Whooper Swan (includes foraging habitat identified at Ker 16a(C) (Ch.36+600-38+050))	Significant impacts on Whooper Swans are not anticipated at the National, County or Local level.	The impact resulting from habitat loss remains a Permanent Moderate Negative Impact at the local level but is not considered to be significant. With regard to Fragmentation/disturbance and barrier effect during construction and operation – this is considered to be a Permanent Minor Negative Impact at the local scale.
Designated Sites, KERS A-F	It is considered that the proposed road development does not have the potential to result in significant impacts on the designated site KERs at the International, National, County or Local level.	No significant residual impact on the KERs are anticipated.

7.7.1 Assessment of Cumulative Impacts

A search in relation to plans and projects that may have the potential to result in cumulative impacts on the environment was carried out. Data sources included the following:

- Roscommon County Council Website (Planning and roads sections)
- An Bord Pleanála Website (Planning Searches)
- Web search of Windfarm projects in Co. Roscommon
- Web Search for major infrastructure projects in Co. Roscommon
- Roscommon County Development Plan 2014 – 2020

A synopses of the search results is provided in Table 7.19. In additional to the plans and projects listed in Table 7.19 a number of small scale developments i.e. dwelling houses/extension were identified from the wider area surrounding the proposed road development.

Table 7.19 Other Plans and Projects

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence	Potential Impact on European Sites
	Land Use and Spatial Plans	
Roscommon County Development Plan 2014-2020	**Policy for Designated Sites** **Policy 7.1** Protect proposed and designated Natural Heritage Areas, Special Protection Areas and Special Areas of Conservation. **Policy 7.2** Protect geological Natural Heritage Areas as they become proposed, designated and notified to Roscommon County Council during the lifetime of this plan. **Policy 7.3** Protect any additional areas that may be proposed or designated during the lifetime of the plan in accordance with Policy above **Policy 7. 4** Promote development in these areas, for recreational and educational purposes, where it would not conflict with the preservation and protection of these sites. **Policy 7.5** It is Council policy to implement the mitigation measures as set out in Section 11.3 of the Environmental Report accompanying the Development Plan, which are envisaged to prevent, reduce and, as fully as possible, offset any significant adverse impacts on the environment of implementing the County Development Plan. These mitigation measures refer to biodiversity, human health, geology and soils, water quality, flooding, air, climatic factors, transport infrastructure, wastewater treatment, waste management, cultural assets and landscape as referred to in Table 48 of the Environmental report	**Potential Positive Impact**

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence	Potential Impact on European Sites
	Objectives for Designated Sites **Objective 7.1** Maintain or restore the favourable conservation condition of a designated or proposed designated site under the control of the Planning Authority. **Objective 7.2** Ensure Appropriate Assessment Screening, and, where required, Appropriate Assessment, is carried out for any plan or project which, individually, or in combination with other plans and projects is likely to have a significant direct or indirect impact on any Natura 2000 site or sites; in accordance with best practice guidance as issued by the National Parks & Wildlife Service of the Department of Arts, Heritage & the Gaeltacht and/or the Department of Environment, Community & Local Government. **Objectives for Nature Conservation** **Objective 7. 5** Protect and promote the conservation of biodiversity y outside of designated areas, while allowing for appropriate development, access and re creational activity. **Objective 7.6** Continue to carry out habitat mapping for the count y to identify significant local habitats in the county. Mapping of habitats should prioritise: Habitats listed in Annex 2 of the EU Habitats Directive; Species listed in Annex 2 of the EU Habitats Directive; and Species listed in Annex 1 of the Birds Directive. **Objective 7.7** Co - operate with statutory and other relevant agencies to identify, protect and conserve a representative sample of the county's wildlife habitats of local or regional importance, not otherwise protected by legislation. **Objective 7. 8** Identify, protect and conserve, in co - operation with the relevant statutory authorities and other groups, vulnerable, rare and threatened species or wild flora and fauna and their habitats. These include plant and animal species afforded protection under the Wildlife Acts and the EU Habitats & Birds Directives. **Objective 7.9** Retain where feasible and enhance important landscape features, such as lakes, rivers, wetlands, stonewalls, hedgerows etc, which form wildlife corridors and link habitats, where they provide, stepping stones necessary for wildlife to flourish. **Objective 7.10** Integrate biodiversity considerations into all Roscommon County Council activities **Objective 7.11** Ensure that the conservation and management of biodiversity is a key priority in water resource management. **Objective 7.12** Require that floodlighting proposals for historic structures are accompanied by a Bat Survey, carried out at the appropriate time of year by a suitably qualified person, so as to identify bat species present on the site and to specify mitigation measures required to ensure minimal disturbance to bats, if any, on the site.	

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence	Potential Impact on European Sites
	Objective 7.13 Seek to minimize light intrusion by having regard to impacts of floodlighting and public lighting in public/open spaces in or close to designated areas. **Objective 7.14** Have regard to the recommendations of any national guidelines, which may come about during the lifetime of this plan, with respect to potential impacts on nature conservation, when considering development applications relating to activities; such as use of jet-ski's and power boats on sites of nature conservation importance. **Objective 7.15** Ensure that any development, which impacts on a townland boundary, roadside hedgerows or hedgerows which form links with other habitats and form wildlife corridors; should first seek to retain, translocate or replace with native species of local provenance, these hedges. The overall goal should be to have no net loss of the hedgerow resource. **Objective 7.16** The retention, re - location, or re - establishment of hedgerow s in planning consents shall be an aim of the Planning Authority for those seeking Planning Permission where feasible. **Objective 7.17** Carry out a tree survey of the county to identify trees suitable for Tree Preservation Orders. **Objective 7. 18** Commit to using native species where ever possible in its landscaping work and on Roscommon County Council property **Objective 7.19** Assess applications for quarrying activity in proximity to eskers, having regard to the designated status of the esker and conserve them from inappropriate development. **Objective 7.20** Seek hydrological reports for significant developments within and close to peatlands so as to assess impacts on the integrity of peatland ecosystems. **Objective 7.21** Support projects which plan for future re - use of industrial cutaway bogs as sites for habitat creation, amenity use and economic use. **Objective 7.22** Seek hydrological reports for significant developments within and close to turloughs so as to assess impacts on the integrity of the turlough system and associated groundwater levels. **Objective 7.23** Support the work of the National Wetlands Wilderness Park committee. **Objective 7.24** Promote awareness and educational opportunities relating to wetlands in the county **Objective 7.25** Ensure that the County's wetlands are retained for their biodiversity and flood protection values. **Objective 7.26** Ensure that where flood alleviation works take place the natural heritage and landscape character of rivers, streams and watercourses are protected and enhanced to the greatest extent possible.	

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence	Potential Impact on European Sites
	Objective 7.27 Encourage sensitive development, which does not lead to a loss of, or cause damage to, the character, the principal components of, or the setting of parks, gardens and demesnes of special historic interest and which are protected. **Objective 7.28** In order to facilitate development, a condition of planning permission may include seed or cutting collection from rare plants surviving in a heritage garden or park, in order to facilitate survival of a rare species. **Objective 7.29** To co - operate with the Department of Arts, Heritage & the Gaeltacht and other interested groups to facilitate the protection, pro motion and enhancement of heritage gardens and parks in the county. **Objectives for Alien Invasive Species** **Objective 7.33** Support initiatives, which reduce the risk s of invasions, help control and manage new and established invasive species, monitor impacts, raise public awareness, improve legislation and address international obligations. **Objective 7.34** Implement conditions as appropriate, as part of a grant of a planning permission or a waste permit, to prevent spread of invasive species. **Objective 7.35** Encourage the use of native species in amenity plan ting and stocking and related community actions to reduce the introduction and spread of non-native species. **Objective 7.36** Investigate the development of a local authority staff code of practice (COP) in relation to invasive species where resources permit	
Strokestown Local Area Plan 2010-2016	The local area plan was considers as part of the assessment. Policy numbers 77-93 and Objectives 77-89 relate to Natural Heritage. Objectives 90-92 relate to Hedgerows, Objectives 93-96 relate to Trees and Woodland and Objectives 97-99 relate to non-native Alien species.	**Potential Positive Impact**
	Conservation and Management Plans	
Shannon River Basin District Management Plan	The Shannon International RBD Management Plan sets out a number of objectives and measures for all water bodies in the western catchment. The following is applicable in relation to European Sites: **Core Objectives** • prevent deterioration; • restore good status; • reduce chemical pollution; • achieve water related protected areas objectives Chapter 5 of the Plan outlines the programme of measures for the RBD.	**Potential Positive Impact**

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence	Potential Impact on European Sites
	Conservation and Management Plans	
Inland Fisheries Ireland (IFI) **Corporate Plan 2011-2015**	**Goals:** • To improve the protection and conservation of the resource. • To develop and improve wild fish populations. • To increase the number of anglers. • To generate a better return for Ireland from the resource	**Potential Positive Impact**
	Forestry Plans	
Coillte **Mid West BAU 4 Strategic Plans 2016-2020**	**Objectives** **1.** Adopt an organization wide system for managing environmental issues. The Director of Stewardship and Public Goods has responsibility for managing the implementation of this policy and our environmental management system (EMS). **2.** Manage our business in full compliance with all applicable laws, directives and regulations, as well as voluntary external accredited schemes to which we subscribe e.g. the Forest Stewardship Council ® 2 (FSC ®) and the Programme for the Endorsement of Forest Certification (PEFC™). **3.** Prevent negative environmental impacts through a system of operational controls that include communication, written instructions and appropriate training **4.** Continually improving environmental performance by setting and reviewing objectives & targets related to significant environmental risks and putting into effect programmes to reduce those risks. **5.** Communicate, as appropriate, our Environmental Policy to Coillte staff and stakeholders, contractors and their employees and the communities within which we operate.	**Potential Positive Impact**
	Waste Licensing & Permitting (Environmental Protection Agency)	
Active Waste Licence Details (Source www.epa.ie 30/06/2016)	**Reg No**. W0059-03 **Applicant Name:** Roscommon County Council **Facility Name:** Ballaghaderreen Landfill **Location of Facility:** Aghalustia Townland, Ballaghaderreen, Co. Roscommon, **Type of Facility:** Landfill **Main Class of Activity:** 3.5 **Other Classes of Activity (more)** 3.1,3.4,3.13, **Application Date:** 18/06/2009 **Licence Status**: Licensed **Latest licence for this facility:** Reg No. W0059-03	**No potential for significant cumulative impact**

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence		Potential Impact on European Sites
	Reg No.	W0073-01	
	Applicant Name:	Roscommon County Council	
	Facility Name:	Roscommon Landfill Facility	
	Location of Facility:	Killarney Townland, Roscommon, Roscommon.	
	Type of Facility:	Landfill	
	Main Class of Activity:	3.1	
	Other Classes of Activity (more)	3.4,3.6,3.7,3.11,3.12,3.13,4.2,4.3,4.4,4.13,	
	Application Date:	30/09/1998	
	Licence Status:	Licensed	
	Latest licence for this facility:	Reg No. W0073-01	
	Reg No.	W0163-01	
	Applicant Name:	Bruscar Bhearna Teoranta	
	Facility Name:	Bruscar Bhearna Teoranta (Ballaghaderreen)	
	Location of Facility:	Ballaghaderreen Industrial Estate, Ballaghadereen, County Roscommon, Roscommon.	
	Type of Facility:	Waste Transfer Station	
	Main Class of Activity:	3.11	
	Other Classes of Activity (more)	3.12,3.13,4.2,4.3,4.4,4.11,4.13,	
	Application Date:	5/09/2001	
	Licence Status:	Licensed	
	Latest licence for this facility:	Reg No. W0163-01	

Plans and Projects	Key Policies/Issues/Objectives Directly Related To The Zone of Influence	Potential Impact on European Sites
	Projects Identified Within 10km of the Proposed Road Development	
Proposed Projects	The search identified three large-scale developments within 10km of the proposed route road development: • Slieve Bawn Wind Farm (Pl Ref: 10/507 Granted), 20 turbines, located 4km south of the proposed road development • Runnaboll Wind Turbine (Pl Ref: 13/36 Granted) single turbine; located 7km north of the proposed road development. • N61 Ratallen & Treanagry Road Improvement 7.3km north of the proposed road development. • N5 Ballaghaderreen Bypass • N5 Bumlin to Scramoge and Scramoge to Cloonmore Irish Water Wastewater Discharge Licences and Certificates: A283-01, A0285-01, A0286-01, D0123-01, C0228-01, D0230-01, D0376-01, D0408-01.	**No potential for significant cumulative impacts**
Completed projects	The search identified a number of completed developments within 10km of the proposed route alignment: • N5 Ballaghaderreen Bypass Road Project, this scheme comprised 13.6km of standard single carriageway and provided a bypass to the north of Ballaghaderreen town. The project included realignment/bridging of local roads and a major grade separated junction between the N5 and R293 to provide access to the town. An Bord Pleanála approved the scheme in 2008. Works commenced on November 2, 2012, and the road opened on September 2, 2014. • N5 Scramoge to Cloonmore Road Project. This scheme comprised an 8.3km stretch of standard single carriageway between Strokestown and Longford. The project which opened in May 2004 included two river bridges, one rail bridge, 500m of culverts and 600,000 cubic metres of earthworks - including excavation of 350,000 cubic metres of peat. Road Pavement Overlays/resurfacing works on the N5 during the 2000s. N5 Longford Bypass, which involved construction of 2.6km of single carriageway and 6 structures. The project was completed in August 2012.	**No potential for significant cumulative impacts**

Conclusion of Cumulative Impact Assessment

It is considered that the design of the proposed road, the scale of the works and the implementation of effective mitigation and best practice will ensure that the proposed development, when considered on its own, will avoid all significant impacts on the Environment.

The proposed road has been considered also, in combination with a number of plans and projects of varying scales. The potential for the proposed road to result in significant cumulative impacts at the local, county, national and international level has been assessed.

Following a detailed assessment of the receiving environment within the ZOI of the proposed road, a number of KERs were identified and assigned an ecological significance at a particular geographic scale. These KERs are fully described in the preceding sections along with an assessment of the likely impacts of the road thereon.

Following this, the potential for any further impact when considered in combination with any or all of the above plans and projects was also considered on each individual KER. It was found that there was no potential for significant cumulative impact on any KER as a result of the proposed works. The proposed road has been designed specifically to avoid, reduce or remedy any potential significant impacts on any KERS. The proposed road project will not result in significant cumulative impacts when considered in combination with other plans and projects for the following reasons:

- It has fully avoided all impacts on KERs of National or International importance.
- It has minimised impacts on KERs of County importance to the point where there is no potential for significant impact.
- Where impacts have been identified on KERs of Local Importance, they have been effectively mitigated to ensure that there will be no significant residual impacts.
- Effective measures are in place to ensure that the proposed development will not result in significant impacts on surface or ground water quality during either construction or operation of the proposed road.
- The proposed road will minimise any disturbance impacts through informed design, effective screening and habitat creation.
- The proposed road design and mitigation ensures that wildlife habitats surrounding the development will be retained where possible and that any losses will be adequately compensated.
- The road design ensures that there is adequate provision for the safe movement of wildlife across the road with no significant fragmentation of wildlife habitats or commuting routes.

Based on the above, it can be objectively concluded in view of best scientific knowledge, on the basis of objective information that the proposed road development, individually or in combination with other plans and projects, will not have a significant adverse effect on the habitats, flora and fauna of the existing Environment.

7.8 Conclusions

Following consideration of the residual impacts (post mitigation) it is noted that the proposed road development will not result in any significant impacts on any of the identified KERs. In relation to KERs 1a(N), 1b(C), 2a(LH), 2b(N), 4(C), 5(N), 15a(LH), 15b(LL) and 15c(N) ,the potential for impacts was eliminated altogether through the use of appropriate and robust design and mitigation. No potential for impacts on receptors of International Importance were identified following mitigation. No impacts on receptors of National Importance were identified following mitigation.

A further 18 of the KERs were considered to be subject to very minor changes following mitigation with no significant adverse impacts anticipated. These minor residual impacts were associated with receptors of Local Importance (Higher Value).

One receptor of County importance will be affected by the proposed road. This is a population of Whooper Swan at Cregga Turlough (and surrounding fields). Impacts on this receptor include foraging habitat loss, which has been concluded to be a moderate impact but could not be considered to be Significant as this field only constitutes a very small fraction of their potential (and actual) foraging habitat in the wider area and in addition they do not show strict fidelity to foraging areas and move around based on availability and quality of forage. Given that there is an abundance of suitable foraging habitat in the wider area the permanent loss of a small area consisting of 4ha is not considered significant. Other impacts on this receptor are potential disturbance, displacement and fragmentation during construction and operation of the proposed road. Following mitigation Whooper Swans in the area are considered likely to habituate to the proposed road development over time and significant disturbance/displacement or fragmentation impacts are not anticipated.

The potential for impacts on the European sites that were identified as KERs has been assessed in this chapter. In addition, impact assessment is fully described in the Natura Impact Statement that accompanies this application. The NIS 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, is not likely to have significant effects on the European Sites.

No NHAs or pNHAs were identified as KERs (other than those that were also designated as European Sites).

In conclusion, the proposed development is not anticipated to have a significant impact on the environment.

APPENDIX 7.1

Assessment of Annex I Habitats and Route Options at Turlaghnamaddy, Leggatinty and Derreen, Co. Roscommon

N5 Ballaghaderreen to Scramoge Road Project

Assessment of Annex I Habitats and Route Options at Turlaghnamaddy, Leggatinty and Derreen, Co. Roscommon

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

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1 INTRODUCTION

McCarthy Keville O'Sullivan Ltd. were commissioned to undertake a survey for Annex I habitats as part of the proposed N5 road alignment from Ballaghaderreen to Scramoge, Co. Roscommon. A targeted search was undertaken for habitats listed on Annex I of Directive 92/43/EEC (Habitats Directive) where the proposed road alignment occurs in close proximity to species-rich wet grassland and intact raised bog in the townlands of Turlaghnamaddy, Leggatinty and Derreen, Co. Roscommon (see Figure 1.1). This report provides details of the survey methodologies employed, results of field surveys and an evaluation of the habitats that occur within the study area.

1.1 Legislative Context

Regulation 27(4) of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No 477/2011) affords protection to habitats from pollution and deterioration by stating that:

Public authorities, in the exercise of their functions, insofar as the requirements of the Birds Directive and the Habitats Directive are relevant to those functions, shall —

(a) take the appropriate steps to avoid, in candidate special protection areas, pollution and deterioration of habitats and any disturbances affecting the birds insofar as these would be significant in relation to the objectives of Article 4 of the Birds Directive,

(b) outside those areas, strive to avoid pollution or deterioration of habitats.

Annex I habitats or species located outside of Special Areas of Conservation (SACs) or Special Protection Areas (SPAs) are not afforded any strict protection. The European Liability Directive (2004/35/EC) has been partially transposed into Irish law through the European Communities (Environmental Liability) Regulations 2008 (S.I. No 547/2008) and the Environmental Liability Act (tbc). One of the principle aims of the Regulations is to prevent or remedy damage to Annex I habitats or species. The Environmental Liability Regulations apply protection against damage to all species of birds, plant and animals listed in Annex I of the Birds Directive (74/09/EEC) or Annex I, II or IV of the Habitats Directive wherever they occur in Ireland regardless of whether they are within or outside a designated land parcel (EPA, 2011).

The Environmental Liability Directive applies to:

(a) environmental damage caused by any of the occupational activities listed in Annex III, and to any imminent threat of such damage occurring by reason of any of those activities;

(b) damage to protected species and natural habitats caused by any occupational activities other than those listed in Annex III, and to any imminent threat of such damage occurring by reason of any of those activities, whenever the operator has been at fault or negligent.

With regard to preventative action, Article 5(1) of the Environmental Liability Directive states that:

Where environmental damage has not yet occurred but there is an imminent threat of such damage occurring, the operator shall, without delay, take the necessary preventive measures.

The guidance document *Ecological Guidance for Local Authorities and Developers* (Dublin Local Authorities, 2013) provides basic information for local authority staff and developers on the legal requirements and national policies governing habitats and protected species

and provides best practice advice on addressing ecological constraints at an early stage in the planning process and in the development of local authority projects.

1.2 Guidance Documents and Relevant Literature

A number of guidance documents and literature sources including the EU Interpretation Manual of European Habitats (DG Environment, 2007) were consulted in order to determine the presence of Annex I habitats within the survey area. The following is a list of documents reviewed as part of the overall assessment:

- National Raised Bog SAC Management Plan http://www.npws.ie/sites/default/files/general/National%20Raised%20Bog%20SAC%20Management%20Plan%20Proposed%20Approach.pdf. Last Accessed: 07/08/2015
- European Commission (2008) Management of Natura 2000 habitats Northern Atlantic wet heaths with *Erica tetralix* 4010. Directive 92/42/EEC on the conservation of natural habitats and wild fauna and flora. Technical Report 2008 08/24
- European Commission (2008) Management of Natura 2000 habitats Depressions on peat substrates of the *Rynchosporion* 7150. Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. Technical Report 2008 19/24
- European Commission (2007) Interpretation Manual of European Union Habitats – EU27. http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf Last accessed: 07/08/2015
- Fernandez, F., Connolly, K., Crowley, W., Denyer, J., Duff, K. & Smith, G. (2014) Raised Bog Monitoring and Assessment Survey 2013. Irish Wildlife Manuals, No. 81. National Parks and Wildlife Services, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland
- NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- O' Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012, Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

1.3 Objectives

The key objectives of this assessment include:

- Identify potential areas considered to support Annex I wet grassland and peatland habitats within the study area of Turlaghnamaddy, Leggatinty and Derreen;
- Undertake field surveys (quadrats and walkover surveys) to confirm the presence of Annex I habitats within the study area; and
- Evaluate the conservation status of habitats surveyed in the context of ecology.

1.4 Background

1.4.1 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)

The Annex I habitat *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (6410) occurs primarily on moist, moderately base-rich peats and peaty gley soils. They often occur as wet pasture and form mosaics with dry grassland, heath, peatland and scrub communities. Key plant species associated with this habitat include Flea Sedge (*Carex pulicaris*), Whorled Caraway (*Carum verticillatum*), Meadow Thistle (*Cirsium dissectum*), Marsh Hawk's-beard (*Crepis paludosa*), Fen Bedstraw (*Galium uliginosum*), Compact Rush

(*Juncus conglomeratus*), Marsh Pea (*Lathyrus palustris*), Adder's-tongue (*Ophioglossum vulgatum*) and the Red Data Book species Fen Violet (*Viola persicifolia*) and Great Burnet (*Sanguisorba officinalis*). This habitat type occurs on wet, nutrient-poor soils and is associated with farming practices such as low stocking densities and late-season mowing.

1.4.2 Degraded raised bogs still capable of natural regeneration (7120)

The Annex I habitat Degraded Raised Bog still capable of natural regeneration (7120) occurs where there has been previous disturbance to the structure and function of the peatland. Such disturbance can refer to altered hydrology, changes in vegetation or changes to the physical structure of the bog. Peat deposition is not actively occurring in this habitat type but the habitat must be considered capable of regeneration to be considered within this category. Sites considered to be still capable of natural regeneration include those areas where hydrology can be repaired and there is a reasonable expectation of establishing peat-forming species within 30 years, following appropriate rehabilitation. The vegetation composition is similar to Active raised bogs (7110) although abundance and distribution of species varies. Typical species include Ling Heather (*Calluna vulgaris*), Bog Asphodel (*Narthecium ossifragum*), Carnation Sedge (*Carex panicea*), Cottongrasses (*Eriophorum* spp.), Deergrass (*Scirpus cespitosus*), Sundews (*Drosera* spp.) and bog mosses (*Sphagnum* spp.).

1.4.3 Northern Atlantic wet heath with *Erica tetralix* (4010)

The Annex I habitat Northern Atlantic wet heath with *Erica tetralix* (4010) occurs on humid, peaty or semi-peaty soils and is typically associated with farming practices such as turf cutting and grazing. Wet heath has a water table that is at ground level for at least some of the year. The Annex I habitat is dominated by dwarf shrub species and usually occurs on acidic, nutrient-poor substrates. The vegetation community associated with this habitat includes mixtures of Cross-leaved heath (*Erica tetralix*), Deer grass (*Trichophorum cespitosus*), Ling Heater (*Calluna vulgaris*) and Purple Moor-grass (*Molinia caerulea*). In some instances, a well-developed moss layer may be present including carpets of *Sphagnum* species.

1.5 Site Description

The study area comprises four subsites in the townlands of Turlaghnamaddy, Leggatinty and Derreen, Co. Roscommon. The targeted survey areas at Leggatinty and Derreen are located approximately 2.6 km northwest of Bellanagare. The Turlaghnamaddy targeted survey area is located approximately 2 km northwest of Frenchpark. The targeted survey areas are comprised of wet grassland and peatland complexes. The north-western boundary of the Leggatinty and Derreen sites are located in close proximity to Bellanagare Bog SAC, SPA and Natural Heritage Areas (NHA). Commercial conifer forestry and improved agricultural grassland occurs within the study area. The locations of targeted survey areas in relation to the road alignment are shown in Figure 1.1. The wet grassland and part of the peatland complex is currently used for agricultural grazing with some mowing also being carried out within the wet grassland site. Parts of the peatland complex, outside the boundaries of the SAC, are actively used for peat extraction.

2 METHODOLOGY AND LIMITATIONS

2.1 Methods

Targeted surveys were undertaken on the 29th, 30th and 31st of July and the 5th of August 2015 by Mr John Hynes (BSc MSc GradCIEEM), Mr Barry O'Loughlin (BSc MSc MCIEEM) and Dr Pamela Boyle (BSc MSc PhD) to identify and assess potential Annex I habitats adjacent to the proposed road alignment in the townlands of Turlaghnamaddy, Leggatinty and Derreen, Co. Roscommon. A vegetation and habitat assessment was undertaken at those locations identified as supporting potential Annex I habitats with the aid of orthographic basemaps (aerial photography) and previous field survey work.

The cover of plant species present within quadrats was estimated according to the Domin scale of cover/abundance outlined in Table 2.1. Within wet grasslands, a 2 m × 2 m quadrat was used to estimate cover/abundance of plant species present. A similar method using 4 m × 4 m quadrats was used within raised bog areas. A photographic record of each quadrat was also made. The methodology follows a similar approach adopted by Conaghan (2008) for undertaking surveys to assess abundance/vegetation cover. Plant nomenclature for vascular plants follows *New Flora of the British Isles* (Stace, 2010), whilst that of mosses and liverworts follows *Mosses and Liverworts of Britain and Ireland – a field guide* (British Bryological Society, 2010). The distribution of survey areas and quadrats sampled as part of this assessment are presented in Figure 2.1.

Table 2.1 The Domin scale of cover/abundance.

+ = < 1% cover, single individual.
1 = < 4%, few individuals
2 = < 4%, several individuals
3 = < 4%, many individuals
4 = cover between 4% and 10%
5 = cover between 11% and 25%
6 = cover between 26% and 33%
7 = cover between 34% and 50%
8 = cover between 51% and 75%
9 = cover between 76% and 90%
10 = cover between 91% and 100%

In addition, the following parameters were noted for each quadrat:

- Grid reference and altitude as measured using Garmin GPS (Montana 650 series)
- Percentage cover and height of the different vegetation layers (shrub, herb and moss layer)
- Soil type, stability and peat depth
- Height of water table (in metres) in relation to soil surface
- Slope and aspect
- Management regime within the quadrat and surrounding land use/potential impacts (grazing, drainage, conifer forestry *etc*.)
- General description/comments

2.1.1 *Molinia* Meadows

Previous walkover surveys identified that three areas adjacent to the proposed road alignment may potentially support the Annex I habitat *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (Molinion caeruleae) (6410). Assessment of this Annex I habitat type follows the methodology developed by O'Neill *et al*. (2013) for the assessment of Annex I grassland habitats. The assessment consists of 12 criteria which must be met to achieve favourable status of the Annex I grassland type (see Appendix 1). Standardised 2 m × 2 m quadrats were used during field survey work to assess plant species composition and abundance using the Domin scale.

2.1.2 Peatlands

A review of orthographic basemaps identified the presence of raised bogs south of the proposed road alignment. Active and degraded raised bogs are divided into community complexes that are characterised by vegetation communities and are grouped into five different ecotope types: face-bank, marginal, sub-marginal, sub-central and central. Ecotope community complexes were determined by following the *Ecotopes and active peat forming community complexes key* outlined in Appendix 2 of the Raised Bog Monitoring and Assessment Project 2013 (Fernandez *et al*., 2014).

Quadrat and ecotope surveys undertaken on areas of raised bog follows methodology developed by Fernandez *et al*. (2014). 4 m × 4 m quadrats were used for both active (if encountered) and degraded raised bogs. Survey guidelines for wet heath followed Perrin *et al.* (2014). 2m x 2m quadrats were used for areas of wet heath. Photographic records were made for each quadrat surveyed and physical characteristics were noted. Plant species cover/abundance was recorded using the Domin scale.

The walkover surveys took into consideration the presence of positive plant indicator species for Annex I habitats during field surveys. Field surveys were conducted within the recognised optimum period for vegetation surveys/habitat mapping, *i.e*. April to September (The Heritage Council, 2010).

3 RESULTS

The field survey assessment sheets are presented in Appendix 2 of this report. Field survey results for quadrats are presented in Quadrat Codes 001-018 while walkover surveys are presented in Survey Area Codes 019-033. The results are tabulated for each quadrat/survey area assessed together with photographic records. In all, three Annex I habitat types were recorded within the study area, namely Northern Atlantic wet heaths with *Erica tetralix* (4010), Degraded raised bogs still capable of natural regeneration (7120) and *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410). No plant species listed on the Flora Protection Order or Red Data Book of plant species were recorded during field surveys.

3.1 *Molinia* meadows

The wet grassland areas which were surveyed for this assessment and which, in some areas, supported the Annex I habitat '*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410), were managed under low-intensity grazing in open-gate field systems. The wet grasslands varied in term of vegetative structure and composition. Some areas were dominated by Soft Rush (*Juncus effusus*) with little species diversity and a homogenous sward structure with plant heights up to 80 centimetres. Other areas surveyed within wet grassland habitat displayed high species diversity within heterogeneous swards with plant height ranging from 5 to 40 centimetres. Species composition within these areas included grasses such as Crested Dogs-tail (*Cynosurus cristatus*), Purple Moor-grass (*Molinia caerulea*) and Sweet Vernal grass (*Anthoxanthum odoratum*), sedges including Common Sedge (*Carex nigra*), Blue Sedge (*Carex flacca*) and Star Sedge (*Carex echinata*). Common flowering plants recorded within the wet grasslands include Devil's Bit Scabious (*Succisa pratensis*), Lesser Spearwort (*Ranunculus flammula*), Tormentil (*Potentilla erecta*), Meadow Thistle (*Cirsium dissectum*) and Common Spotted Orchid (*Dactylorhiza fuchsii*).

Areas which were identified as the Annex I habitat '*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)' were categorised as Key Ecological Receptors (KER) and correspond to KERs 1, 4 and 5. These areas met all the Annex I criteria of vegetation composition, vegetation structure and physical structure as developed by O'Neil *et al.* (2013). This included the presence of at least one high quality positive indicator, presence of at least seven positive indicator species, less than 10% cover of negative indicator species individually and less than 20% cover of negative indicator species collectively within a 2m x 2m quadrat. High quality positive indicators recorded were Meadow Thistle (*Cirsium dissectum*) and Orchid species, the most frequently recorded positive indicators were Devil's Bit Scabious (*Succisa pratensis*), Lesser Spearwort (*Ranunculus flammula*) and Blue Sedge (*Carex flacca*). The most frequently encountered negative indicator species were White Clover (*Trifolium repens*) and Common Ragwort (*Senecio jacobaea*). The full criteria sheet is provided in Appendix 1.

Conservation scores, threat scores and future prospects were calculated for these KERs following O'Neil *et al.* (2013). The conservation and threat scores can be used to make a determination on the quality and importance of such Annex I sites for targeted conservation measures. The future prospects assessment relates to the likely development and maintenance of the Annex I grassland habitat in favourable condition for the foreseeable future. The results of these are given in Table 3.1. The relevant KERs are shown in Figure 3.1.

Table 3.1 Conservation and Threat assessment of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410) identified during targeted field surveys.

Key Ecological Receptor	Conservation score (%)	Threat score (%)	Future Prospects
KER 1	26.3	38.4	Unfavourable – Bad

KER 4	23.2	38.4	Unfavourable – Bad
KER 5	31.6	38.4	Unfavourable – Inadequate

The findings of 'Unfavourable' future prospects for all three KERs are as expected as the most recent Article 17 report has also assessed the overall future prospects of *Molinia* meadows within the Republic of Ireland as Bad, declining (NPWS, 2013).

3.2 Peatlands

The peatland areas which were surveyed for this assessment and which, in some areas, supported the Annex I habitats 'Northern Atlantic wet heath with *Erica tetralix'* (4010) and 'Degraded Raised Bog still capable of natural regeneration' (7120), displayed evidence of active use. Some areas of peatland, outside the boundaries of Bellnagare Bog SAC, were actively used for peat extraction and there was some evidence (dung) of grazing by cattle in other areas. The peatland habitats varied in terms of vegetative structure and composition. Some areas were dominated by cutover bog with large areas of bare peat with little species diversity. Other areas surveyed within peatland habitat displayed high species diversity and heterogeneous vegetation strucuture. Species composition within these areas included Ling Heather (*Calluna vulgaris*), Cross leaved heath (*Erica tertralix*), Purple Moor-grass (*Molinia caerulea*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), Bog Asphodel (*narthecium ossifragum*) and sedges including Common Sedge (*Carex nigra*), Star Sedge (*Carex echinata*) and Carnation Sedge (*Carex panicea*). Common mosses encountered within peatland areas include *Sphagnum capilifolium, Sphagnum papillosum, Sphagnum subnitens, Sphagnum imbricatum* and *Hypnum jutlandicum*.

Two types of Annex I habitat were identified within the study area: 'Northern Atlantic wet heath with *Erica tetralix'* (4010) and 'Degraded Raised Bog still capable of natural regeneration' (7120). Annex I habitats were categorised as KER 6. This KER comprises three land parcels. The three areas all contain mosaics of peatland and grassland habitats, in close vicinity to one another and under similar pressures and threats. Therefore, they are assigned to a single KER. Northern Atlantic wet heath with *Erica tetralix* were assessed according to Perrin *et al.* (2014) and passed all the required parameters for vegetation composition and vegetative and physical structure (See Appendix II for criteria sheet). Degraded Raised Bog still capable of natural regeneration was assessed according to Fernandez *et al.* (2014). These areas were identified based on ecotopes (see Table 3.2) and were identified following the key developed by Fernandez *et al.* (2005) (supplied as Appendix 2 in Fernandez *et al* 2014). An ecotope supports a particular vegetation community arising from vegetation succession developing under a characteristic hydrological regime (Regan *et al.* 2013). Degraded raised bog relates to face-bank, marginal and sub-marginal ecotopes. Annex I quality degraded raised bog conforms to these ecotopes and in addition must be considered to be capable of regeneration within 30 years (Fernandez *et al.* 2014).

Table 3.2 Biotic and abiotic characteristics of ecotopes (adapted from Regan *et al.* (2013)).

Ecotype	Characteristics
Facebank	*Abiotic:*No hummocks and hollws, acrotelm usually absent *Biotic:* Little or no peat forming plant communities, vegetation dominated by *Calluna vulgaris*.
Marginal	*Abiotic:* No hummocks and hollows, acrotelm usually absent or poorly developed (<0.05m) *Biotic*: Little or no peat forming plant communities, vegetation dominated by *Calluna vulgaris* and *Trichophurum cespitosum*
Sub-marginal	*Abiotic:* Some differentiation between humoccks and hollows, hollows inundated during small fraction of the year, acrotelm absent or thin (<0.05m) *Biotic:* Hollows dominated by *Narthecium ossifragum* and *Sphagnum tenellum*
Sub-central	*Abiotic:* A micro-topography of hummocks, hollows and lawns, but no pools. Lawns are dominant. Acrotelm depth variable from 0.01m up to locally well-developed 0.40m. *Biotic*: Lawns dominated by *Sphagnum magellanicum*
Central	*Abiotic*: A micro-topography of hummocks, hollows and pools. Acrotelm moderate to well developed, depth up to 0.5m. *Biotic*: Pools, and hollows dominated by *Sphagnum cuspidatum*
Soak/Active flush	*Abiotic:* Generally wet to extremely wet conditions, in the wettest parts lawns, in some parts pools and hollows and large flat hummocks. Acrotelm well-developed >0.4m. *Biotic*: *Sphagnum cuspidatum* and *Sphagnum recurvum* lawns with *Carex rostrata,* in dryer places *Myrica gale* and *Betula pubescens* scrub/woodland with *Sphagnum palustre. Molinia caerulea* tussocks in some areas.

The conservation status of Northern Atlantic wet heath with *Erica tetralix* was calculated following Perrin *et al* (2014).The overall conservation status is based on area, structure & function and future prospects assessments (detailed guidance for assessment calculation are available in Perrin *et al* (2014)). The final assessment for this habitat type identified within KER 6 is given in Table 3.3.

The overall conservation status for Degraded Raised bog still capable of natural regeneration followed Fernandez *et al* (2014). The final conservation assessment is based on range (national scale), area (national and site scale where possible), structure & function (site scale) and future prospects based on pressures and threats that are site specific (For detailed guidance on assessment calculations see Fernandez *et al* (2014)). The conservation scores for the areas of Degraded raised bog still capable of natural regeneration identified within KER 6 are given in Table 3.4.

Table 3.3 Conservation status assessment of Northern Atlantic wet heath with *Erica tetralix* (4010) identified during targeted field surveys.

Area*	Structure & Function	Future Prospects	Overall Conservation Status
Favourable	Favourable	Unfavourable - inadequate	Unfavourable - inadequate

*Note: Area is considered stable for the purposes of this study

Table 3.4 Conservation status assessment of Degraded raised bog still capable of natural regeneration (7120) identified during targeted field surveys.

Rang*e	Area*	Structure and Function	Future Prospects	Overall Assessment
Favourable	Favourable	Favourable	Unfavourable – Inadequate	Unfavourable - Inadequate

4 EVALUATION

Habitats in the townlands of Turlaghnamaddy, Leggatinty and Derreen were evaluated in accordance with the criteria developed by the National Roads Authority (NRA) -–outlined in *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009) which classifies sites in terms of their ecological importance, *i.e*. International Importance, National Importance, County Importance, Local Importance (Higher Value) or Local Importance (Lower Value). Figure 4.1 shows the distribution of habitats labelled according to their assigned ecological importance (as per NRA, 2009). The areas of grassland assessed as Annex I habitat within this section of the study area were categorised according to NRA (2009).

4.1 *Molinia* meadows

The wet grassland targeted survey area in Turlaghnamaddy was, at the time of survey, under extensive grazing. The area was subject to a detailed walkover survey and quadrat assessment. Quadrat samples were assessed following O'Neill *et al*. (2013) to determine Annex I status. In total, seven quadrats were sampled to determine the extent of *Molinia* meadows within this section of the study area. An area of *Molinia* meadow was identified to the south and a small area of the Annex I habitat was identified to the north of the proposed road alignment. The proposed road alignment avoids areas classified as Annex I habitat and is confined to areas of wet grassland that do not correspond to Annex I criteria due to habitat structure, lack of positive indicator species or presence of negative indicator (as per O'Neil *et al.* 2013). The areas of *Molinia* meadows within this study area correspond to Key Ecological Receptor (KER) 1. The future prospects of this site were assessed as Unfavouarble-Bad (O'Neill, 2013). Almost 78% of this habitat type surveyed within the Irish Semi-natural Grasslands Survey (O' Neil *et al.* 2013) were also assessed as Unfavourable – Bad.

An area of wet grassland to the south of the proposed road alignment has been assessed as Nationally Important. This assessment was made based on the presence of viable areas of the habitat type which is listed under Annex I of the Habitats Directive. Viable areas are defined as *areas of a habitat which are of sufficient size, shape and integrity (in terms of species composition, ecological processes and function) such that it will endure in the face of unpredictable change.* The section to the north of the proposed road alignment has been assessed as County Importance. This area is not considered viable, as defined by NRA (2009). This is due to the pressures including artificial planting on open ground (non-native species), forest and plantation management and use and agricultural intensification, as given in the Article 17 Report on the status of EU protected habitats and species in Ireland (NPWS, 2013) and fragmentation from other similar habitat as a result of commercial forestry.

The smaller of two targeted survey areas assessed in the townland of Leggatinty (Grid ref: E172916 N513211) is bounded to the north-east and south-west by commercial conifer plantations. This targeted survey area comprises a narrow band of *Molinia* meadow within a larger complex of species-poor, undermanaged wet grassland and improved agricultural grassland. Three survey stops were conducted within this narrow section of the study area. All three sections conformed to the Annex I criteria (O'Neill *et al*., 2013) and the future prospects of this section has been assessed as Unfavourable – Bad (O'Neil, 2013). This site was categorised as County Importance as, although the area supports habitat listed as Annex I under the Habitats Directive, it is not considered viable (NRA, 2009). This is due to the pressures and threats on the site, including abandonment of pastoral systems, lack of grazing, agricultural intensification, artificial planting on open ground (non-native trees) and forest and plantation management and use (O'Neill *et al*. 2013). The proposed road alignment occurs to the west of the Annex I grassland and land-take associated with the

proposed road alignment in this locality is confined to commercial coniferous plantation. The area of *Molinia* meadow corresponds to KER 4.

The second targeted study area at Leggatinty (Grid ref: E173577 N289575) was, at the time of surveying, grazed by a small number of cattle. A small area to the east of the site had been mown. Quadrats and walkover assessments were conducted at eight locations within this site. These areas contained high quality and other positive indicator species with little or no cover of negative indicator species. In addition, there was limited scrub cover with little or no bare soil and no significant signs of serious grazing or disturbance. Therefore, the majority of the site corresponded to *Molinia* meadow Annex I habitat. However, towards the south-west of the targeted survey area, soil conditions became wetter with rank grass cover and the dominance of *Juncus effusus* increased significantly. Additionally, the cover of negative indicator species exceeded 20% collectively including White Clover (*Trifolium repens*), whos cover exceeded 10% individually, and Common Ragwort (*Senecio jacobaea*) which results in a fail on two assessment criteria for *Molina* meadow (O'Neill *et al.*, 2013). This area is associated with *Juncus effusus – Rumex acetosa* grassland and does not conform to Annex I habitat (O'Neill *at al.*, 2013). The Annex I habitat within this study area was labelled KER 5.

The areas of intact *Molinia* meadow within this site have been assessed as having Unfavourable – Inadequate future prospects. Only 12.3% of Annex I *Molina* meadows surveyed during the Irish Semi-natural Grasslands Survey (ISGS) attained this assessment. Furthermore, this KER has been evaluated as Nationally Important, (NRA, 2009) and is shown in Figure 4.1. The proposed alignment avoids land-take associated with areas assessed as National importance and is confined to areas of wet grassland dominated by *Juncus* species accompanied by rank grasses and conifer plantation to the south-west of the study area.

4.2 Peatlands

The peatland complex can be considered as three separate parcels. At the time of surveying, the complex was used for peat extraction (outside SAC boundaries) with low intensity cattle grazing. The first parcel, to the east of KER 6, comprised a large area of degraded raised bog capable of regeneration in the east of the study area. This area supported a number of species associated with raised bogs but has been subjected to drainage and peat extraction in the past. The high bog area was surrounded by cutover bog, which had revegetated primarily with wet grassland and which is now overgrown and subject to encroachment by scrub. This area was assessed according to Fernandez *et al* (2014). The central high bog was found to primarily support sub-marginal ecotope vegetation communities but also contained facebank and marginal ecotope communities. There was no evidence of central or sub-central ecotope communities. This area was also considered, based on the presence of *Sphagnum* communities and low hummocks, to be capable of regeneration (within 30 years). Therefore, this area was classified as Annex I habitat 'Degraded raised bog still capable of natural regeneration (7120)'.

The high bog is surrounded by cutover bog. The cutover bog has revegetated throughout however the dominant species are Soft Rush (*Juncus effusus*), Yorkshire Fog (*Holcus lanatus*) and scrub species including Gorse (*Ulex europaeus*) and Bramble (*Rubus fruticosus* agg.). There are some *Sphagnum* mosses within the cutover bog however their cover does not exceed 10% and they do not form the micro-topography associated with raised bog habitat (hummocks and hollows). This land parcel is separated from the *Molinia* meadow grasslands by the proposed route alignment. The proposed route alignment in this area is confined to areas of cutover bog and conifer plantation that does not conform to any Annex I Habitat.

Moving west, a second large peatland complex was encountered. This area supports two Annex I habitats: Degraded raised bog still capable of natural regeneration (7120) and Northern Atlantic wet heath with *Erica tetralix* (4010). The area of degraded raised bog

occurs to the south and south-west of this land parcel and, although it falls outside the boundaries of Bellanagare Bog SAC, it is an extension of the raised bog for which the SAC is designated. This area was assessed according to Fernandez *et* al. (2014). The degraded raised bog primarily supports sub-marginal ecotope communities, which corresponds to degraded raised bog. *Sphagnum* cover within quadrats was on average 10% however the species diversity of *Sphagnum* was high, recording five species within a single quadrat. Based on the *Sphagnum* cover and diversity and the connectivity to the SAC, this area was considered to be capable of natural regeneration and therefore conforms to the Annex I habitat type.

A small area in the north-east of this land parcel was found to conform to the Annex I habitat Northern Atlantic wet heath with *Erica tetralix* (4010). This area was assessed following Perrin *et al.* (2014). The Annex I habitat passed all criteria relating to vegetation composition and vegetative and physical structure. The area of the Annex I habitat was limited in extent and is threatened by a number of external pressures including afforestation and drainage. The reaming area within this land parcel was categorised as cutover bog. Some areas were revegetated with species including Ling Heather (*Calluna vulgaris*) and Purple Moor-grass (*Molinia caerulea*) and areas of scrub including Gorse (*Ulex europeaus*) and Willow (*Salix* spp.) whilst some areas were actively used for peat extraction.

The final parcel is composed of raised bog. This is a small parcel which is surrounded by conifer plantation and agricultural grassland. This area supported similar species as those identified within the larger raised bog parcels and is under the same pressures and threats, including agricultural improvement such as drainage, peat extraction and commercial forestry. This parcel occurs to the west of the proposed road alignment.

Both the Degraded raised bog still capable of natural regeneration (7120) and Northern Atlantic wet heath with *Erica tetralix* (4010) were assessed for conservation status following relevant guidelines (Perrin *et al*. (2014) and Fernandez *et* al (2014)). Both habitat types were assessed as having an overall conservation status of Unfavourable – inadequate. This is largely due to the external pressures and threats on each site. Threats and pressures which these habitats are subject to are artificial planting of non-native species, inadequate grazing or burning (i.e. management) regimes and active peat extraction. The ecological evaluation of these habitats (NRA, 2009) assigned National Importance to the Degraded raised bog raised bogs still capable of natural regeneration (7120) due to its large area and direct connectivity to Bellanagare SAC. Northern Atlantic wet heath with *Erica tetralix* (4010) was assigned County Importance as it is limited in extent therby being more susceptible to external pressures and threats and in addition lacks connectivity to similar habitat. Sites deemed to be of Local Importance (Higher Value) include areas of cutover bog. Sites considered to be of Local Importance (Lower Value) were typically areas of coniferous plantations, species poor wet grasslands and improved agricultural grasslands.

The proposed route alignment avoids all areas Annex I habitat and all areas considered to be of National and County Importance. Land-take within this study area results in the loss of small areas of Locally Important (Higher Value) habitat, i.e. cutover bog, which occurs frequently in the wider landscape, and Locally Important (Lower Value) habitats such as conifer plantation and scrub, which is of limited value ecologically and are widespread in the region.

5 CONCLUSIONS

Following a detailed analysis of the results of the present study, key conclusions regarding the distribution within the study area of habitats listed on Annex I of the Habitats Directive are summarised below:

- Areas of *Molina* meadow in the townland of Turlaghnamaddy are avoided by the proposed road alignment. Areas of this habitat type within the study area have been assessed as having Unfavourable-Bad future prospects and have been classified Nationally Important and are assigned to KER 1.
- KER 4 supports a narrow band of *Molinia* meadow under significant pressure from changing land use. This area is categorised as being of County Importance and was assessed as having Unfavourable-Bad future prospects.
- The targeted survey area to the north of the proposed road alignment, KER 5, supports an area of *Molinia* meadow which is considered to be of National Importance due to its extent and adherence to Annex I favourable conservation status requirements. This KER was assessed as having Unfavourable-Inadequate future prospects.
- The study area to the south of the proposed road alignment comprises three parcels, collectively referred to as KER 6. These parcels support two Annex I habitats: Northern Atlantic wet heaths with *Erica tetralix* (4010) and Degraded raised bogs still capable of natural regeneration (7120). Northern Atlantic wet heaths with *Erica tetralix* has been assigned a conservation status of Unfavourable – Inadequate and an ecological valuation of County Importance. Degraded raised bogs still capable of natural regeneration has been assigned a conservation status of Unfavourable – Inadequate and has been assigned National Importance. The remaining habitats within these parcels are classified as Locally Important (Higher Value), *e.g.* revegetated cutover bog, or Locally Important (Lower Value), *e.g.* scrub.
- The proposed road alignment avoids all habitats evaluated as being of National or County Importance. Therefore, all land-take associated with the proposed road alignment is confined to areas evaluated as Locally Important (Higher Value) or Locally Important (Lower Value).

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Appendix I

Assessment Criteria for '*Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) (6410)'

***Molinia* meadows on calcareous, peaty or clayey-silt laden soils (Molinion caeruleae) (6410)**

NOTE: This Annex I habitat can occur in both grasslands and fens. This fen meadow community often contains some *Molinia caerulea* and *Cirsium dissectum* within it.

Criteria		Scale of assessment
Vegetation composition		
1	Total number of positive indicator species present ≥ 7	Relevé
2	Number of high quality species present ≥ 1	Relevé
3	Cover of non-native species ≤ 1%	Relevé
4	Cover of the following negative indicator species: *Cirsium arvense, Cirsium vulgare, Glyceria maxima, Lolium perenne, Phalaris arundinacea, Phragmites australis, Rumex crispus, Rumex obtusifolius, Senecio jacobaea, Trifolium repens, Urtica dioica,* individually ≤ 10%	Relevé
5	Cover of the above negative indicator species collectively ≤ 20%	Relevé
6	Cover of *Polytrichum* species ≤ 25%	Relevé
7	Cover of scrub, bracken and heath (woody species) ≤ 5%	Relevé
Vegetation structure		
8	Forb component of forb : graminoid ratio 40-90%	Relevé
9	Proportion of the sward between 10-80 cm tall ≥30%	Relevé
10	Litter cover ≤ 25%	Relevé
Physical structure		
11	Cover of bare soil ≤ 10%	Relevé
12	Area of the habitat showing signs of serious grazing or disturbance < 20 m²	Local vicinity

High Quality Positive Indicator Species	Positive Indicator Species
Carex pulicaris	*Achillea ptarmica*
Carum verticillatum	*Carex echinata*
Cirsium dissectum	*Carex flacca*
Crepis paludosa	*Carex nigra*
Galium uliginosum	*Carex panicea*
Juncus conglomeratus	*Carex viridula*
Lathyrus palustris	*Equisetum palustre*
Ophioglossum vulgatum	*Filipendula ulmaria*
Viola persicifolia	*Galium palustre*
Orchid species (count individual orchid species separately)	*Juncus acutiflorus/(J. articulatus)*
	Lotus pedunculatus
	Luzula multiflora
	Mentha aquatica
	Molinia caerulea
	Ranunculus flammula
	Potentilla anglica
	Potentilla erecta
	Succisa pratensis
	Viola palustris

Note the late leaf emergence for the indicator species *Molinia caerulea* (June onwards)

Appendix II

Assessment Criteria for 'Northern Atlantic Wet Heath with *Erica tetralix* (4010)'

North Atlantic wet heaths with *Erica tetralix* (4010)

	Criteria	Scale of assessment
Vegetation composition		
1	*Erica tetralix* present	20m radius
2	Cover of positive indicator species ≥ 50% (Appendix VI)	Relevé
3	Total cover of *Cladonia* species, *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses ≥ 10%	Relevé
4	Cover of ericoid species and *Empetrum nigrum* ≥ 15%	Relevé
5	Cover of dwarf shrub species < 75%	Relevé
6	Cover of the following negative indicator species: *Agrostis capillaris, Holcus lanatus, Phragmites australis, Ranunculus repens* collectively < 1%	Relevé
7	Cover of non-native species < 1%	Relevé
8	Cover of non-native species < 1%	Local vicinity
9	Cover of scattered native trees and scrub < 20%	Local vicinity
10	Cover of *Pteridium aquilinum* < 10%	Local vicinity
11	Cover of *Juncus effusus* < 10%	Local vicinity
Vegetation structure		
12	Crushed, broken and/or pulled up *Sphagnum* species < 10% of *Sphagnum* cover	Relevé
13	Last complete growing season's shoots of ericoids, *Empetrum nigrum* and *Myrica gale* showing signs of browsing collectively < 33% (Assess a minimum of 10 shoots distributed across the plot)	Relevé
14	No signs of burning into the moss, liverwort or lichen layer, or exposure of peat surface due to burning	Local vicinity
15	No signs of burning inside boundaries of sensitive areas†	Local vicinity
Physical structure		
16	Cover of disturbed bare ground < 10%	Relevé
17	Cover of disturbed bare ground < 10%	Local vicinity
18	Area showing signs of drainage resulting from heavy trampling or tracking or ditches < 10%	Local vicinity

†Sensitive areas
(a) Vegetation severely wind-clipped, mostly forming a mat less than 10 cm thick.
(b) Areas where soils are thin and less than 5 cm deep.
(c) Slopes greater than 1 in 3 (18°) and all the sides of gullies.
(d) Ground with abundant, and/or an almost continuous carpet of *Sphagnum*, liverworts and/or lichens.
(e) Pools, wet hollows, haggs and erosion gullies, and within 5 – 10 m of the edge of watercourses.
(f) Areas above 400 m in altitude.
(g) Areas within 50 m of functioning drains.

Appendix III

Results of Quadrat and Walkover Surveys

Molinia meadows

Date:29/07/2015	Surveyor: J Hynes/P Boyle	
Quadrat No: 013	Co-Ords: IM 71486 91688	
Criteria	Pass/Fail	
Vegetation Composition		
Total Number of positive indicator species present ≥ 7 (Relevé)	Pass	
Number of high quality species present ≥ 1 (Relevé)	Pass	
Cover of non-native species ≤ 1% (Relevé)	Pass	
Cover of negative indicator species individually ≤10% (Relevé)	Pass	
Cover of negative indicator species collectively ≤ 20% (Relevé)	Pass	
Cover of *Polytrichum* species ≤ 25% (Relevé)	Pass	
Cover of scrub, bracken and heath (woody species) ≤ 5% (Relevé)	Pass	
Vegetation Structure		
Forb component of Forb:Graminoid ratio 40-90% (Relevé)	Pass	
Proportion of the sward between 10-80cm tall ≥ 30% (Relevé)	Pass	
Litter cover ≤ 25% (Relevé)	Pass	
Physical Structure		
Cover of bare soil ≤ 10% (Relevé)	Pass	
Area of the habitat showing signs of serious grazing or disturbance < 20m^2 (Local vicinity)	Pass	
High Quality +ve Indicators	+ve Indicators	-ve Indicators
Carex pulicaris *Carum verticillatum* *Cirsium dissectum* (5) *Crepis paludosa* *Galium uliginosum* *Juncus conglomeratus* (3) *Lathyrus plaustris* *Ophioglossum vulgatum* *Viola persicifolia* Orchid species (count individual orchid spp separately)	*Achillea ptarmica* *Carex echinata*.....(4) *Carex flacca* *Carex nigra* *Carex panicea* (6) *Carex viridula* *Equisetum palustre* *Filipendula ulmaria* *Galium palustre* (3) *Juncus acutiflorus (J. articulatus)* (5) *Lotus pedunculatus* *Luzula multiflora* (3) *Mentha aquatic*..... (+) *Molinia caerulea* (5) *Ranunculus flammula*..... ...(5) *Potentilla anglica* *Potentilla erecta* (4) *Succisa pratensis* (5) *Viola palustris*	*Cirsium arvense* *Cirsium vulgare* *Glyceria maxima* *Lolium perenne* *Phalaris arundinacea* *Phragmites australis* *Rumex crispus* *Rumex obtusifolius* *Senecio jacobaea* *Trifolium repens* (+) *Urtica dioica*
Note the late leaf emergence of *Molinia caerulea* (June onwards)		

Species (Domin):	Notes: The main threats and pressures identified in this area include afforestation and undergrazing. Herb layer height is 30cm. Bryophyte cover is 70%.
Agrostis capillaris (3) *Anthoxanthum odoratum* (3) *Carex echinata* (4) *Carex panicea* (6) *Cerastium fontanum* (+) *Cirsium dissectum* (5) *Cynosurus cristatus* (+) *Galium palustre* (3) *Holcus lanatus* (3) *Juncus acutiflorus* (5) *Juncus conglomeratus* (3) *Luzula multiflora* (3) *Mentha aquatic* (+) *Moilinia caerulea* (5) *Potentilla erecta* (4) *Ranunculus flammula* (5) *Succisa pratensis* (5) *Trifolium repens* (+)	

Plate 13: Quadrat 13 - The quadrat was taken from an area of wet grassland. The habitat in this area corresponds to the Annex I habitat '(6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils'.

Date:29/07/2015	Surveyor: J Hynes/P Boyle	
Quadrat No: 014	Co-Ords: IM 71503 91684	
Criteria	Pass/Fail	
Vegetation Composition		
Total Number of positive indicator species present ≥ 7 (Relevé)	Pass	
Number of high quality species present ≥ 1 (Relevé)	Pass	
Cover of non-native species ≤ 1% (Relevé)	Pass	
Cover of negative indicator species individually ≤10% (Relevé)	Pass	
Cover of negative indicator species collectively ≤ 20% (Relevé)	Pass	
Cover of *Polytrichum* species ≤ 25% (Relevé)	Pass	
Cover of scrub, bracken and heath (woody species) ≤ 5% (Relevé)	Pass	
Vegetation Structure		
Forb component of Forb:Graminoid ratio 40-90% (Relevé)	Pass	
Proportion of the sward between 10-80cm tall ≥ 30% (Relevé)	Pass	
Litter cover ≤ 25% (Relevé)	Pass	
Physical Structure		
Cover of bare soil ≤ 10% (Relevé)	Pass	
Area of the habitat showing signs of serious grazing or disturbance < 20m² (Local vicinity)	Pass	
High Quality +ve Indicators	+ve Indicators	-ve Indicators
Carex pulicaris *Carum verticillatum* *Cirsium dissectum* (5) *Crepis paludosa* *Galium uliginosum* *Juncus conglomeratus* (3) *Lathyrus plaustris* *Ophioglossum vulgatum* *Viola persicifolia* Orchid species (count individual orchid spp separately)	*Achillea ptarmica* *Carex echinata*.....(4) *Carex flacca* *Carex nigra* *Carex panicea* (6) *Carex viridula* *Equisetum palustre* *Filipendula ulmaria* *Galium palustre* (3) *Juncus acutiflorus (J. articulatus)* (5) *Lotus pedunculatus* *Luzula multiflora* (3) *Mentha aquatic*..... (+) *Molinia caerulea* (5) *Ranunculus flammula*..... ...(5) *Potentilla anglica* *Potentilla erecta* (4) *Succisa pratensis* (5) *Viola palustris*	*Cirsium arvense* *Cirsium vulgare* *Glyceria maxima* *Lolium perenne* *Phalaris arundinacea* *Phragmites australis* *Rumex crispus* *Rumex obtusifolius* *Senecio jacobaea* *Trifolium repens* (+) *Urtica dioica*
Note the late leaf emergence of *Molinia caerulea* (June onwards)		
Species (Domin): *Agrostis capillaris* (3) *Anthoxanthum odoratum* (3) *Carex echinata* (4) *Carex panicea* (6) *Cerastium fontanum* (+) *Cirsium dissectum* (5) *Cynosurus cristatus* (+) *Galium palustre* (3) *Holcus lanatus* (3) *Juncus acutiflorus* (5) *Juncus conglomeratus* (3) *Luzula multiflora* (3) *Mentha aquatic* (+) *Moilinia caerulea* (5) *Potentilla erecta* (4) *Ranunculus flammula* (5)		Notes: The main threats and pressures identified in this area include afforestation and undergrazing. Herb layer height is 35cm. Bryophyte cover is 30%.

Succisa pratensis	(5)	*Trifolium repens*	(+)	

Plate 14: Quadrat 14 - The quadrat was taken from an area of wet grassland. The habitat in this area corresponds to the Annex I habitat '(6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils'.

Date:29/07/2015	Surveyor: J Hynes/P Boyle	
Quadrat No: 015	Co-Ords: IM 71538 91680	
Criteria	Pass/Fail	
Vegetation Composition		
Total Number of positive indicator species present ≥ 7 (Relevé)	Pass	
Number of high quality species present ≥ 1 (Relevé)	Pass	
Cover of non-native species ≤ 1% (Relevé)	Pass	
Cover of negative indicator species individually ≤10% (Relevé)	Pass	
Cover of negative indicator species collectively ≤ 20% (Relevé)	Pass	
Cover of *Polytrichum* species ≤ 25% (Relevé)	Pass	
Cover of scrub, bracken and heath (woody species) ≤ 5% (Relevé)	Pass	
Vegetation Structure		
Forb component of Forb:Graminoid ratio 40-90% (Relevé)	Pass	
Proportion of the sward between 10-80cm tall ≥ 30% (Relevé)	Pass	
Litter cover ≤ 25% (Relevé)	Pass	
Physical Structure		
Cover of bare soil ≤ 10% (Relevé)	Pass	
Area of the habitat showing signs of serious grazing or disturbance < 20m^2 (Local vicinity)	Pass	
High Quality +ve Indicators	+ve Indicators	-ve Indicators
Carex pulicaris *Carum verticillatum* *Cirsium dissectum* (2) *Crepis paludosa* *Galium uliginosum* *Juncus conglomeratus* (3) *Lathyrus plaustris* *Ophioglossum vulgatum* *Viola persicifolia* Orchid species (+) (count individual orchid spp separately)	*Achillea ptarmica* *Carex echinata* *Carex flacca* *Carex nigra* *Carex panicea* (4) *Carex viridula* *Equisetum palustre* (+) *Filipendula ulmaria* *Galium palustre* (2) *Juncus acutiflorus (J. articulatus)* (7) *Lotus pedunculatus* *Luzula multiflora* *Mentha aquatic* (5) *Molinia caerulea* *Ranunculus flammula* (4) *Potentilla anglica* *Potentilla erecta* (3) *Succisa pratensis* (4) *Viola palustris*	*Cirsium arvense* *Cirsium vulgare* *Glyceria maxima* *Lolium perenne* *Phalaris arundinacea* *Phragmites australis* *Rumex crispus* *Rumex obtusifolius* *Senecio jacobaea* *Trifolium repens* (4) *Urtica dioica*
Note the late leaf emergence of *Molinia caerulea* (June onwards)		
Species (Domin): *Agrostis capillaris* (3) *Angelica sylvestris* (3) *Anthoxanthum odoratum* (3) *Carex panicea* (4) *Cerastium fontanum* (+) *Cirsium dissectum* (2) *Cynosurus cristatus* (4) *Dactylorhiza fuchsia* (+) *Equisetum palustre* (+) *Galium palustre* (2) *Holcus lanatus* (4) *Juncus acutiflorus* (7) *Juncus conglomeratus* (3) *Juncus effusus* (3) *Lychnis flos-cuculi* (+) *Mentha aquatic* (5) *Plantago*		Notes: The main threats and pressures identified in this area include afforestation and undergrazing. Herb layer height is 50cm. Bryophyte cover is 25%.

lanceolata	(+)	*Potentilla anserina*	(+)		
Potentilla erecta	(3)	*Prunella vulgaris*	(2)		
Ranunculus acris	(3)	*Ranunculus flammula*	(4)		
Ranunculus repens	(3)	*Succisa pratensis*	(4)		
Senecio aquaticus	(3)	*Trifolium pratense*	(+)		
Trifolium repens	(4)	*Schedonorus arundinaceus*	(3)		

Plate 15: Quadrat 15 - The quadrat was taken from an area of wet grassland. The habitat in this area corresponds to the Annex I habitat '(6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils'.

Additional survey stops where 2 x 2 metre quadrats were not conducted were located at IM 71422, 91505; IM 71305, 91613 and IM 71569, 91844 and are numbered 34 to 36 respectively in Figure 2.1. Based on visual assessment and species composition and structure, all three of these stops were considered to meet the Annex I *Molinia* meadows criteria (O'Neil *et al*, 2013).

Date:29/07/2015	Surveyor: J Hynes/P Boyle	
Quadrat No: 016	Co-Ords: IM 72969 89869	
Criteria	Pass/Fail	
Vegetation Composition		
Total Number of positive indicator species present ≥ 7 (Relevé)	Pass	
Number of high quality species present ≥ 1 (Relevé)	Pass	
Cover of non-native species ≤ 1% (Relevé)	Pass	
Cover of negative indicator species individually ≤10% (Relevé)	Pass	
Cover of negative indicator species collectively ≤ 20% (Relevé)	Pass	
Cover of *Polytrichum* species ≤ 25% (Relevé)	Pass	
Cover of scrub, bracken and heath (woody species) ≤ 5% (Relevé)	Pass	
Vegetation Structure		
Forb component of Forb:Graminoid ratio 40-90% (Relevé)	Pass	
Proportion of the sward between 10-80cm tall ≥ 30% (Relevé)	Pass	
Litter cover ≤ 25% (Relevé)	Pass	
Physical Structure		
Cover of bare soil ≤ 10% (Relevé)	Pass	
Area of the habitat showing signs of serious grazing or disturbance < 20m^2 (Local vicinity)	Pass	
High Quality +ve Indicators	+ve Indicators	-ve Indicators
Carex pulicaris *Carum verticillatum* *Cirsium dissectum* (2) *Crepis paludosa* *Galium uliginosum* *Juncus conglomeratus* (5) *Lathyrus plaustris* *Ophioglossum vulgatum* *Viola persicifolia* Orchid species (count individual orchid spp separately)	*Achillea ptarmica* *Carex echinata* (+) *Carex flacca* (3) *Carex nigra* (+) *Carex panicea* (5) *Carex viridula* (3) *Equisetum palustre* (+) *Filipendula ulmaria* *Galium palustre* *Juncus acutiflorus (J. articulatus)* (3) *Lotus pedunculatus* *Luzula multiflora* (3) *Mentha aquatic* *Molinia caerulea* (7) *Ranunculus flammula* (3) *Potentilla anglica* *Potentilla erecta* (3) *Succisa pratensis* (4) *Viola palustris*	*Cirsium arvense* *Cirsium vulgare* *Glyceria maxima* *Lolium perenne* *Phalaris arundinacea* *Phragmites australis* *Rumex crispus* *Rumex obtusifolius* *Senecio jacobaea* *Trifolium repens* *Urtica dioica*
Note the late leaf emergence of *Molinia caerulea* (June onwards)		
Species (Domin): *Bellis perennis* (+) *Carex echinata* (+) *Carex flacca* (3) *Carex nigra* (+) *Carex panicea* (5) *Carex viridula* (3) *Cirsium dissectum* (2) *Cirsium palustre* (+) *Danthonia decumbens* (+) *Equisetum palustre* (+) *Holcus lanatus* (4) *Juncus acutiflorus* (3) *Juncus conglomeratus* (5) *Luzula multiflora* (3) *Molinia caerulea* (7) *Potentilla erecta* (3) *Prunella vulgaris* (3)		Notes: The main threats and pressures identified in this area include afforestation and undergrazing. Herb layer height is 30cm. Bryophyte cover is 20%.

Ranunculus flammula (3) *Succisa pratensis* (4) *Schedonorus arundinaceus* (3)	

Plate 16: Quadrat 16 - The quadrat was taken from an area of wet grassland. The habitat in this area corresponds to the Annex I habitat '(6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils'.

Additional survey stops where 2 x 2 metre quadrats were not conducted were located at IM 73077, 8988 and IM 72832, 89839 and are numbered 37 to 38 respectively in Figure 2.1. Based on visual assessment and species composition and structure these stops were considered to meet the Annex I *Molinia* meadows criteria (O'Neil *et al*, 2013).

Date:29/07/2015	Surveyor: J Hynes/P Boyle	
Quadrat No: 017	Co-Ords: IM 73409 89328	
Criteria	Pass/Fail	
Vegetation Composition		
Total Number of positive indicator species present ≥ 7 (Relevé)	Pass	
Number of high quality species present ≥ 1 (Relevé)	Pass	
Cover of non-native species ≤ 1% (Relevé)	Pass	
Cover of negative indicator species individually ≤10% (Relevé)	Pass	
Cover of negative indicator species collectively ≤ 20% (Relevé)	Pass	
Cover of *Polytrichum* species ≤ 25% (Relevé)	Pass	
Cover of scrub, bracken and heath (woody species) ≤ 5% (Relevé)	Pass	
Vegetation Structure		
Forb component of Forb:Graminoid ratio 40-90% (Relevé)	Pass	
Proportion of the sward between 10-80cm tall ≥ 30% (Relevé)	Pass	
Litter cover ≤ 25% (Relevé)	Pass	
Physical Structure		
Cover of bare soil ≤ 10% (Relevé)	Pass	
Area of the habitat showing signs of serious grazing or disturbance < 20m^2 (Local vicinity)	Pass	
High Quality +ve Indicators	+ve Indicators	-ve Indicators
Carex pulicaris *Carum verticillatum* *Cirsium dissectum* (4) *Crepis paludosa* *Galium uliginosum* *Juncus conglomeratus* (5) *Lathyrus plaustris* (3) *Ophioglossum vulgatum* *Viola persicifolia* Orchid species (2) (count individual orchid spp separately)	*Achillea ptarmica* *Carex echinata* (3) *Carex flacca* (+) *Carex nigra* *Carex panicea* (4) *Carex viridula* (3) *Equisetum palustre* (1) *Filipendula ulmaria* *Galium palustre* *Juncus acutiflorus (J. articulatus)* (4) *Lotus pedunculatus* *Luzula multiflora* (3) *Mentha aquatic* *Molinia caerulea* (7) *Ranunculus flammula* *Potentilla anglica* *Potentilla erecta* (3) *Succisa pratensis* (5) *Viola palustris*	*Cirsium arvense* *Cirsium vulgare* *Glyceria maxima* *Lolium perenne* *Phalaris arundinacea* *Phragmites australis* *Rumex crispus* *Rumex obtusifolius* *Senecio jacobaea* *Trifolium repens* (3) *Urtica dioica*
Note the late leaf emergence of *Molinia caerulea* (June onwards)		
Species (Domin): *Anthoxanthum odoratum* (5) *Carex echinata* (3) *Carex flacca* (+) *Carex panicea* (4) *Carex viridula* (3) *Cirsium dissectum* (4) *Cynosurus cristatus* (4) *Dactlorhiza fuschii* (2) *Equisetum palustre* (1) *Holcus lanatus* (3) *Juncus acutiflorus* (4) *Juncus conglomeratus* (5) *Lathyrus palustris* (3) *Luzula multiflora* (3) *Molinia caerulea* (7) *Potentilla erecta* (3) *Prunella*		Notes: The main threats and pressures identified in this area include afforestation and undergrazing. Herb layer height is 35cm. Bryophyte cover is 10%.

vulgaris (4) *Ranunculus acris* (3) *Senecio aquaticus* (3) *Succisa pratensis* (5) *Trifolium repens* (3)	

Plate 17: Quadrat 17 - The quadrat was taken from an area of wet grassland. The habitat in this area corresponds to the Annex I habitat '(6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils'.

Date:29/07/2015	Surveyor: J Hynes/P Boyle	
Quadrat No: 018	Co-Ords: IM 73597 89619	
Criteria	Pass/Fail	
Vegetation Composition		
Total Number of positive indicator species present ≥ 7 (Relevé)	Pass	
Number of high quality species present ≥ 1 (Relevé)	Pass	
Cover of non-native species ≤ 1% (Relevé)	Pass	
Cover of negative indicator species individually ≤10% (Relevé)	Pass	
Cover of negative indicator species collectively ≤ 20% (Relevé)	Pass	
Cover of *Polytrichum* species ≤ 25% (Relevé)	Pass	
Cover of scrub, bracken and heath (woody species) ≤ 5% (Relevé)	Pass	
Vegetation Structure		
Forb component of Forb:Graminoid ratio 40-90% (Relevé)	Pass	
Proportion of the sward between 10-80cm tall ≥ 30% (Relevé)	Pass	
Litter cover ≤ 25% (Relevé)	Pass	
Physical Structure		
Cover of bare soil ≤ 10% (Relevé)	Pass	
Area of the habitat showing signs of serious grazing or disturbance < 20m^2 (Local vicinity)	Pass	
High Quality +ve Indicators	+ve Indicators	-ve Indicators
Carex pulicaris *Carum verticillatum* *Cirsium dissectum* (4) *Crepis paludosa* *Galium uliginosum* *Juncus conglomeratus* *Lathyrus plaustris* (+) *Ophioglossum vulgatum* *Viola persicifolia* Orchid species (count individual orchid spp separately)	*Achillea ptarmica* *Carex echinata* (3) *Carex flacca* (3) *Carex nigra* *Carex panicea* (4) *Carex viridula* *Equisetum palustre* *Filipendula ulmaria* *Galium palustre* *Juncus acutiflorus (J. articulatus)* (3) *Lotus pedunculatus* *Luzula multiflora* (3) *Mentha aquatic* (2) *Molinia caerulea* (5) *Ranunculus flammula* (4) *Potentilla anglica* *Potentilla erecta* (3) *Succisa pratensis* (5) *Viola palustris*	*Cirsium arvense* *Cirsium vulgare* *Glyceria maxima* *Lolium perenne* *Phalaris arundinacea* *Phragmites australis* *Rumex crispus* *Rumex obtusifolius* *Senecio jacobaea* *Trifolium repens* (+) *Urtica dioica*
Note the late leaf emergence of *Molinia caerulea* (June onwards)		
Species (Domin): *Anthoxanthum odoratum* (4) *Carex echinata* (3) *Carex flacca* (3) *Carex panicea* (4) *Cirsium dissectum* (4) *Cynosurus cristatus* (3) *Holcus lanatus* (3) *Juncus acutiflorus* (3) *Lathyrus palustris* (+) *Luzula multiflora* (3) *Mentha aquatic* (2) *Molinia caerulea* (5) *Nardus stricta* (3)		Notes: The main threats and pressures identified in this area include afforestation and undergrazing. Herb layer height is 45cm. Bryophyte cover is 10%.

Potentilla erecta (3) *Prunella vulgaris* (3) *Ranunculus acris* (3) *Ranunculus flammula* (4) *Succisa pratensis* (5) *Trifolium pratense* (+) *Trifolium repens* (+)	

Plate 18: Quadrat 18 - The quadrat was taken from an area of wet grassland. The habitat in this area corresponds to the Annex I habitat '(6410) *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils'.

Additional survey stops where 2 x 2 metre quadrats were not conducted were located at IM 73500, 89256, IM 73709, 89321, IM 73672, 89401, IM 73619, 89489 and IM 73656, 89589 and are numbered 39 to 43 respectively in Figure 2.1. Based on visual assessment and species composition and structure, stop 39 did not conform to the Annex I habitat type whilst the remaining stops were considered to meet the Annex I *Molinia* meadows criteria (O'Neil *et al*, 2013).

Northern Atlantic wet heath with *Erica tetralix*

Co-Ords: IM 73189 89226	Date: 05/08/2015	Surveyor: B O'Loughlin
Quadrat 001	Habitat: Wet Heath	
Criteria		Pass/Fail
Vegetation Composition		
Erica tetralix present (in 20m radius)		Pass
Cover of positive indicator species ≥ 50% (Relevé)		Pass
Total cover of *Cladonia* species, *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses ≥10% (Relevé)		Pass
Cover of ericoid species and *Empetrum nigrum* ≥15% (Relevé)		Pass
Cover of dwarf shrub species < 75% (Relevé)		Pass
Cover of the following negative indicator species *Agrostis capillaris, Holcus lanatus, Phragmites australis, Ranunculus repens* collectively <1% (Relevé)		Pass
Cover of non-native species <1% (Relevé)		Pass
Cover of non-native species <1% (Local vicinity)		Pass
Cover of scattered native trees and scrub <20% (Local vicinity)		Pass
Cover of *Pteridium aquiliunum* <10% (Local vicinity)		Pass
Cover of *Juncus effusus* <10% (Local vicinity)		Pass
Vegetation Structure		
Crushed, broken and/or pulled up *Sphagnum* species <10% of *Sphagnum* c over (Relevé)		Pass
Last complete growing season's shoots of ericoids, *Empetrum nigrum* and *Myrica gale* showing signs of browsing collectively <33% (Assess a minimum of 10 shoots distributed across the plot) (Relevé)		Pass
No signs of burning into the moss, liverwort or lichen layer, or exposure of peat surface due to burning (Local vicinity)		Pass
No signs of burning inside the boundaries of sensitive areas* (Local vicinity)		Pass
Physical Structure		
Cover of disturbed bare soil < 10% (Relevé)		Pass
Cover of disturbed bare soil < 10% (Local vicinity)		Pass
Area showing signs of drainage resulting from heavy trampling or tracking or ditches <10% (Local vicinity)		Pass
*Sensitive areas: (a) Vegetation severely wind-clipped, mostly forming a mat less than 10cm thick (b) Areas where soils are thin and less than 5cm deep (c) Slopes greater than 1 in 3 (18°) and all the sides of gullies (d) Ground with abundant, and/or an almost continuous carpet of *Sphagnum,* liverworts and/or lichens (e) Pools, wet hollows, haggs and erosion gullies, and within 5 -10m of the edge of watercourses (f) Areas above 400m in altitude (g) Areas within 50m of functioning drains		
Species (Domin) *Calluna vulgaris* (7) *Eriophorum vaginatum* (4) *Hypnum jutlandicum* (4) *Molinia caerulea* (6) *Narthecium ossifragum* (3) *Odontoschisma sphagni* (2) *Sphagnum capillifolium* (7)	Notes: Regeneraed from cutover bog. Main threats and pressures identified in this general area include drainage, afforestation and spreading of catotelm peat (associated with nearby mechanical peat extraction). Height of shrub layer 50-60cm, height of herb layer 40cm. Bryophyte cover 60%. Bare peat 0%	

Plate 1 Quadrat 1 – Wet heath has regenerated in an area of cutover bog and conforms to the EU Annex I habitat Northern Atlantic wet heaths with *Erica tetralix* (4010). The habitat is deemed to be of county importance.

Degraded rasied bog still capable of natural regeneration

Co-Ords: IM 73023 89019	Date: 05/08/2015	Surveyor: B O'Loughlin
Quadrat 004	Habitat: Raised Bog	
Key steps		
1. Western indicators *Racomitrium lanuginosum*, *Campylopus atrovirens* and large pools with frequent open water all present *OR* 2. Western indicators *racomitrium langunosum*, *Campylopus atrovirens* and large pools with frequent open water absent		3 7
7. – *Sphagnum* cover <10% – *Sphagnum* cover 10 - 30% – *Sphagnum* cover 30 – 40 % – *Sphagnum* cover > 40%		8 9 10 11
10. – Pools cover <15 % or absent – Pools cover >15%		12 13
12. – *Narthecium ossifragum* <30%, ground soft to very soft, hummocks-hollows and sometimes pools (*Sphagnum* cover close to 40%) – *Narthecium ossifragum* <30%, ground soft to very soft, hummocks-hollows and sometimes pools (*Sphagnum* cover close to 30%) – *Narthecium ossifragum* >30%, ground firm to soft, hummocks-hollows and pools <5% (*Sphagnum* cover close to 30%) – *Narthecium ossifragum* >30%, at least one western indicator present and pool cover 10 – 15%		14 Sub-marginal Ecotope Sub-marginal Ecotope Sub-central Ecotope

Species (Domin)

Calluna vulgaris	(7)	*Carex panicea*	(4)
Cladonia portentosa	(6)	*Drosera rotundifolia*	(4)
Erica tetralix	(5)	*Eriophorum vaginatum*	(6)
Eriophorum angustifolium	(4)	*Hypnum jutlandicum*	(3)
Molinia caerulea	(3)	*Narthecium ossifragum*	(2)
Odontoschisma sphagni	(3)	*Sphagnum capilifolium*	(7)
Sphagnum papillosum	(4)	*Sphagnum subnitens*	(2)

Notes:

This habitat type comprises raised bog that includes 30–40% *Sphagnum* moss cover. The habitat type conforms to the Annex I habitat Degraded raised bogs still capable of natural regeneration (7120). It should be noted that the high bog extends further to the west and a section of the high bog occurs within the boundary of Bellanagare Bog SAC [000592]. The SAC is designated for three Annex I habitats; Active raised bogs (7110), Degraded raised bogs still capable of natural regeneration (7120) and Depressions on peat substrates of the Rhynchosporion (7150). The SAC is deemed to be of international importance and supports active raised bog, a priority Annex I habitat listed on the Habitats Directive.

The main threats and pressures identified on the high bog include mechanical peat extraction, drainage and afforestation. Peat extraction is widely practiced along the northern boundary of the high bog, outside the boundaries of the SAC. There is some evidence of slumping and cracking along the northern margins of the high bog due to subsidence associated with peat extraction to the north.

Plate 4 Quadrat 4 – The quadrat was taken from an area on the high bog and corresponds to sub-marginal ecotope complex. The high bog corresponds to the Annex I habitat Degraded raised bogs still capable of natural regeneration (7120).

Co-Ords: IM 73109 89029	Date: 05/08/2015	Surveyor: B O'Loughlin
Quadrat 005	Habitat: Raised Bog	
Key steps		
1. Western indicators *Racomitrium lanuginosum*, *Campylopus atrovirens* and large pools with frequent open water all present *OR* 2. Western indicators *racomitrium langunosum*, *Campylopus atrovirens* and large pools with frequent open water absent		3 7
7. – *Sphagnum* cover <10% – *Sphagnum* cover 10 - 30% – *Sphagnum* cover 30 – 40 % – *Sphagnum* cover > 40%		8 9 10 11
9. – Pools cover <15% - Pools cover >15% and *Sphagnum* cover 10 -20% - Pools cover >15% and *Sphagnum* cover 20 -30 % (40 -50% in the pools). At least one western indicator species present. Healthy *Sphagnum* hummocks (*S. papillosum*, occasionally *S. austinii* and *S. fuscum)* - Pools cover >15% and *Sphagnum* cover 20-30% (40 – 50% in the pools). No western indicator present.		Sub-marginal Ecotope Sub-marginal Ecotope Sub – central Ecotope Sub – marginal Ecotope

Species (Domin)

Calluna vulgaris	(9)	*Carex panicea*	(4)
Drosera rotundifolia	(4)	*Erica tetralix*	(6)
Eriophorum vaginatum	(7)	*Hypnum jutlandicum*	(3)
Molinia caerulea	(4)	*Narthecium ossifragum*	(6)
Odontoschisma sphagni	(2)	*Sphagnum capilifolium*	(5)
Sphagnum imbricatum	(2)	*Sphagnum papillosum*	(3)
Sphagnum subnitens	(3)		

Notes:

This habitat type comprises raised bog (see Plate 5) of *c.* 10% *Sphagnum* moss cover. The habitat type conforms to the Annex I habitat Degraded raised bogs still capable of natural regeneration (7120). It should be noted that the high bog extends further to the west and a section of the high bog occurs within the boundary of Bellanagare Bog SAC [000592]. The SAC is designated for three Annex I habitats, namely Active raised bogs (7110), Degraded raised bogs still capable of natural regeneration (7120) and Depressions on peat substrates of the Rhynchosporion (7150). The SAC is deemed to be of international importance and supports active raised bog, a priority Annex I habitat listed on the Habitats Directive. In general, face-bank, marginal and sub-marginal ecotope community complexes are present in the southern and eastern extent of the high bog, as identified during field surveys.

The main threats and pressures identified on the high bog include mechanical peat extraction, drainage and afforestation. Peat extraction is widely practiced along the northern boundary of the high bog. There is some evidence of slumping and cracking along the northern margins of the high bog due to subsidence associated with peat extraction to the north.

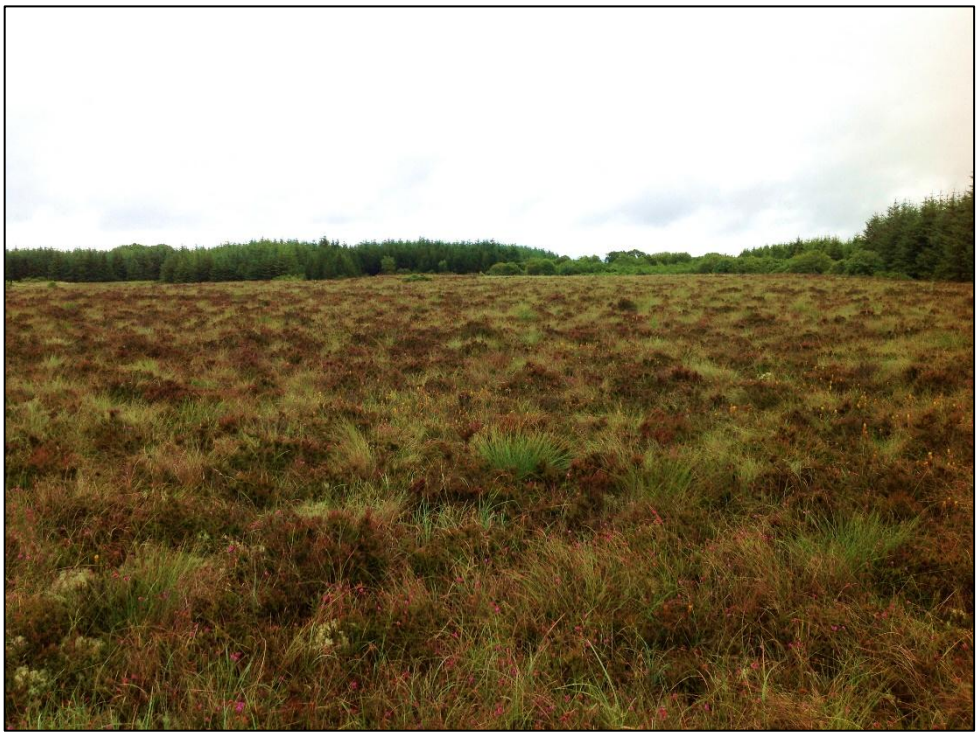


Plate 5 Quadrat 5 – The quadrat was taken from an area on the high bog and corresponds to sub-marginal ecotope complex. The high bog corresponds to the Annex I habitat Degraded raised bogs still capable of natural regeneration (7120).

Co-Ords: IM 73246 89079	Date: 05/08/2015	Surveyor: B O'Loughlin
Quadrat 006	Habitat: Raised Bog	
Key steps		
1. Western indicators *Racomitrium lanuginosum*, *Campylopus atrovirens* and large pools with frequent open water all present *OR* 2. Western indicators *racomitrium langunosum*, *Campylopus atrovirens* and large pools with frequent open water absent		3 7
7. – *Sphagnum* cover <10% – *Sphagnum* cover 10 - 30% – *Sphagnum* cover 30 – 40 % – *Sphagnum* cover > 40%		8 9 10 11
8. – Tall robust *Calluna vulgaris* (>0.4m/>50% cover) and firm ground, at the edges of the high bog - *Calluna vulgaris* not so tall and robust (ca 0.3m) or if so not occurring at >50% cover		Face-bank Ecotope Marginal Ecotope

Species (Domin)			
Calluna vulgaris	(9)	Cladonia portentosa	(7)
Cladonia uncialis	(3)	*Drosera rotundifolia*	(3)
Erica tetralix	(6)	*Eriophorum vaginatum*	(7)
H*ypnum jutlandicum*	(3)	*Molinia caerulea*	(5)
Narthecium ossifragum	(7)	*Odontoschisma sphagni*	(2)
Potentilla erecta	(2)	*Sphagnum capilifolium*	(4)
Sphagnum papillosum	(3)	*Sphagnum subnitens*	(4)

Notes:

This habitat type comprises raised bog (see Plate 6) that comprises less than 10% *Sphagnum* moss cover. The habitat type conforms to the Annex I habitat '7120 Degraded raised bogs still capable of natural regeneration'. It should be noted that the high bog extends further to the west and a section of the high bog occurs within the boundary of Bellanagare Bog SAC (NPWS Site Code:000592). The SAC is designated for three Annex I habitats including Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120] and Depressions on peat substrates of the *Rhynchosporion* [7150]. The SAC is deemed to be of international importance and supports active raised bog, a priority Annex I habitat listed on the EU Habitats Directive. In general, facebank, marginal and sub-marginal ecotope communities complexes are present in the southern and eastern extent of the high bog as identified during field surveys.

The main threats and pressures identified on the high bog include mechanical peat extraction activities, drainage and afforestation. Peat extraction is widely practiced along the northern boundary of the high bog. There is some evidence of slumping and cracking along the northern margins of the high bog due to subsidence associated with peat extraction activities to the north.

Plate 6: Quadrat 6 -The quadrat was taken from an area on the high bog and corresponds to sub-marginal ecotope complex. The high bog corresponds to the Annex I habitat '7120 Degraded raised bogs still capable of natural regeneration'.

Co-Ords: IM 73109 89029	Date: 05/08/2015	Surveyor: B O'Loughlin
Quadrat 005	Habitat: Raised Bog	
Key steps		
3. Western indicators *Racomitrium lanuginosum*, *Campylopus atrovirens* and large pools with frequent open water all present *OR* 4. Western indicators *racomitrium langunosum*, *Campylopus atrovirens* and large pools with frequent open water absent		3 7
7. – *Sphagnum* cover <10% – *Sphagnum* cover 10 - 30% – *Sphagnum* cover 30 – 40 % – *Sphagnum* cover > 40%		8 9 10 11
9. – Pools cover <15% - Pools cover >15% and *Sphagnum* cover 10 -20% - Pools cover >15% and *Sphagnum* cover 20 -30 % (40 -50% in the pools). At least one western indicator species present. Healthy *Sphagnum* hummocks (*S. papillosum*, occasionally *S. austinii* and *S. fuscum)* - Pools cover >15% and *Sphagnum* cover 20-30% (40 – 50% in the pools). No western indicator present.		Sub-marginal Ecotope Sub-marginal Ecotope Sub – central Ecotope Sub – marginal Ecotope
Species *Calluna vulgaris* *Cladonia portentosa* *Eriophorum vaginatum* *Narthecium ossifragum* *Sphagnum capilifolium* *Sphagnum subnitens* *Trichophorum cespitosum* *Carex panicea* *Erica tetralix* *Hypnum jutlandicum* *Polygala serphylifolia* *Sphagnum papillosum* *Sphagnum tenellum*		
Notes: A walkover survey was undertaken in this general area. The habitat is classified as Raised Bog (PB1) and conforms to the Annex I habitat "Degraded Raised Bog still capable of natural regeneration (7110)" (see Plate 21). The bog comprises hummock and hollow topography however this is not particularly well developed. Facebank, marginal and sub-marginal ecotope communities complexes are present but no central or sub-central ecotope communities were recorded to indicate the presence of active areas (active raised bog). *Sphagnum* moss cover ranges from 10 – 20%. The main threats and pressures associated with the site include drainage, peat extraction operations, enrichment and afforestation. It should be noted that peat extraction operations have not been undertaken on the high bog for some time.		

Plate 21: Survey Area 21 - The area was classified as raised bog which corresponds to the Annex I habitat '(7120) Degraded raised bogs still capable of natural regeneration'

Non-Annex habitat vegetation survey data

Quadrat code: 002	Details
Survey date	05/08/2015
GPS co-ordinates	IM 73236; 89200
Aspect	Flat
Water table height (cm)	-10
Substrate	Peat
Substrate depth (cm)	100–150
Stability	Firm
Management regime/land use	Peat spreading/extraction
Habitat	Cutover bog (PB4)
No. plant spp. in quadrat	7
Total vegetation cover (%)	95
% trees	0
% shrub	0
% herb/grass/sedge	95
% bryophytes	10
% litter	0
% bare peat/soil	5
% bare rock	0
% alga	0
% open water	0
Height of shrub layer (cm)	0
Height of herb layer (cm)	50
Species	Cover/abundance (Domin scale)
Carex panicea	7
Erica tetralix	3
Eriophorum vaginatum	5
Juncus effusus	2
Molinia caerulea	8
Potentilla erecta	3
Sphagnum capillifolium	4
Comments: This habitat type comprises cutover bog (see Plate 2) that includes both dry and wet (*Sphagnum* mosses) bog plant communities. The habitat type does not conform to the Annex I habitat Depressions on peat substrates of the Rhynchosporion (7150), based on the absence of key indicator plant species including *Rhynchospora alba*, *R. fusca*, *Drosera rotundifolia* and *Lycopodiella inundata*.	

Plate 2 Quadrat 2 – The quadrat was taken from an area of cutover bog not found to have any links with Annex I habitats.

Quadrat code: 003	Details
Survey date	05/08/2015
GPS co-ordinates	IM 73244; 89175
Aspect	Flat
Water table height (cm)	-10 to -20
Substrate	Peat
Substrate depth (cm)	> 100
Stability	Firm
Management regime/land use	Peat spreading
Habitat	Cutover bog (PB4)
No. plant spp. in quadrat	9
Total vegetation cover (%)	75
% trees	0
% shrub	10
% herb/grass/sedge	75
% bryophytes	55
% litter	0
% bare peat/soil	25
% bare rock	0
% alga	0
% open water	20
Height of shrub layer (cm)	30
Height of herb layer (cm)	35
Species	Cover/abundance (Domin scale)
Calluna vulgaris	7
Carex panicea	3
Erica tetralix	3
Eriophorum vaginatum	4
Hylocomium splendens	3
Molinia caerulea	7
Odontoschisma sphagni	2
Sphagnum capillifolium	6
Sphagnum papillosum	2
Comments: This habitat type comprises cutover bog (see Plate 3) that includes both dry and wet (*Sphagnum* mosses) bog plant communities. The habitat type does not conform to the Annex I habitat Depressions on peat substrates of the Rhynchosporion (7150), based on an absence of key indicator plant species including *Rhynchospora alba, R. fusca, Drosera rotundifolia* and *Lycopodiella inundata.* Much of the cutover bog in the wider area to the east is heavily disturbed due to active peat cutting and disturbance associated with heavy machinery. A number of drainage ditches traverse this area.	

Plate 3 Quadrat 3 – The quadrat was taken from an area of cutover bog not found to have any links with Annex I habitats. Turf spreading was recorded in this habitat type.

Quadrat Code: 007	Details
Survey Date	05/08/2015
GPS Co-ordinates	IM 73063; 89257
Aspect	Flat
Water table height (cm)	-20cm below surface
Substrate	Peat
Substrate depth (cm)	>1m
Stability	Firm
Management regime / Landuse	None
Habitat	Wet Heath (HH3) / Cutover bog (PB4)
No. plant spp. in quadrat	5
Total vegetation cover %	100
% Trees	0
% Shrub	10
% Herb/Grass/Sedge	90
% Bryophytes	0
% Litter	0
% Bare Peat/Soil	0
% Bare Rock	0
% Algal	0
% Open Water	20
Height Shrub layer (cm)	60cm
Height Herb layer (cm)	100cm
Species Name	Domin Scale
Calluna vulgaris	4
Erica tetralix	3
Juncus effusus	3
Molinia caerulea	9
Potentilla erecta	3
Comments: This habitat type comprises wet heath and cutover bog mosaic (see Plate 7). The habitat type does not conform to any EU listed Annex I habitats. Much of the cutover bog in the wider area to the east and south is heavily disturbed due to active peat cutting and disturbance associated with heavy machinery. A number of drainage ditches traverse this area.	

Plate 7: Quadrat 7 -The quadrat was taken from an area of cutover bog and wet heath mosaic. The habitat in this area does not correspond to any Annex I habitats listed on the EU Habitats Directive.

Survey Area: 019	Details
Survey Date	30/07/2015
GPS Co-ordinates	IM 73607; 89187
Substrate	Peat
Substrate depth	>1m
Stability	Soft
Water Table Height	-5cm below surface
Management regime / Landuse	Agricultural grazing
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	0
% Herb/Grass/Sedge	95
% Bryophytes	70
% Litter	3
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	0
Height Herb layer (cm)	45
Species Name	
Calluna vulgaris	
Carex nigra	
Erica tetralix	
Eriophroum vaginatum	
Juncus conglomeratus	
Juncus squarrosus	
Molinia caerulea	
Narthecium ossifragum	
Polygala serphylifolia	
Potentilla erecta	
Sphagnum capillifolium	
Sphagnum palustre	
Sphagnum papilosum	
Sphagnum subnitens	
Vaccinium oxycoccos	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) and hosts a range of regenerating wet (*Sphagnum* mosses) and dry bog plant communities (see Plate 19). Substrate conditions are wet underfoot while Sphagnum moss cover was >50%. The habitat is deemed to be of local importance (higher value). The habitat does not however, conform to the Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'* based on an absence of key indicator plant species including *Rhynchospora alba and R. fusca.* Peat extraction operations has not been practiced in recent times.	

Plate 19: Survey Area 19 - The area was classified as cutover bog and deemed to be of local value (higher importance). The habitat was not found to have any links with the Annex I habitat type 'Depressions on peat substrates of the Rhynchosporion (7150)'.

Survey Area: 020	Details
Survey Date	30/07/2015
GPS Co-ordinates	IM 73658; 89173
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water Table Height	-20cm below surface
Management regime / Landuse	Agricultural grazing
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	5
% Herb/Grass/Sedge	95
% Bryophytes	55
% Litter	0
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	60
Height Herb layer (cm)	35
Species Name	
Anthoxanthum odoratum	
Calluna vulgaris	
Erica tetralix	
Eriophroum vaginatum	
Holcus lanatus	
Hylocomium splendens	
Juncus conglomeratus	
Juncus effusus	
Luzula multiflora	
Molinia caerulea	
Poa spp	
Polytrichum commune	
Potentilla erecta	
Ranunculus repens	
Rhytidadelphus loreus	
Rubus fruticosus agg.	
Sphagnum papilosum	
Sphagnum subnitens	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4). There is a change in quality from survey area 019. *Sphagnum* moss cover is less than 10% and scrub and broadleaf grass cover increases. The area is managed for grazing livestock (cattle). Scrub encroachment of bramble and tussocks of *Juncus effusus* was noted in this area (see Plate 20).	

Plate 20: Survey Area 20 - The area was classified as cutover bog and was not found to have any links with the Annex I habitat type 'Depressions on peat substrates of the Rhynchosporion (7150)'.

Survey Area: 022	Details
Survey Date	30/07/2015
GPS Co-ordinates	IM 73524; 88921
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Agricultural grazing
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	5
% Herb/Grass/Sedge	95
% Bryophytes	40
% Litter	3
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	100
Height Herb layer (cm)	70
Species Name	
Calluna vulgaris	
Hylocomium splendens	
Juncus effusus	
Molinia caerulea	
Poa spp	
Polytrichum commune	
Potentilla erecta	
Sphagnum palustre	
Vaccinium oxycoccos	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) (Plate 22). Vegetation in this area is largely overgrown and rank dominated by *Juncus effusus* and other broadleaf grass species which grows to a height of ca. 1m. The habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'.* Scrub encroachment is the main threat to this area, evident from the presence of *Salix* sp. and *Rubus fruticosus* agg.	

Plate 22: Survey Area 22 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'.*

Survey Area: 023	Details
Survey Date	30/07/2015
GPS Co-ordinates	IM 73473; 88921
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Agricultural grazing
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	5
% Herb/Grass/Sedge	95
% Bryophytes	50
% Litter	3
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	150
Height Herb layer (cm)	70
Species Name	
Anthoxanthum odoratum	
Calluna vulgaris	
Hylocomium splendens	
Juncus effusus	
Molinia caerulea	
Poa spp	
Polytrichum commune	
Potentilla erecta	
Pseudoscleropodium purum	
Pteridium aquilinum	
Rubus fruticosus agg	
Salix spp	
Sphagnum capilifolium	
Sphagnum palustre	
Sphagnum subnitens	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) (Plate 23). Vegetation in this area is largely overgrown and rank dominated by *Juncus effusus* and other broadleaf grass species which grows to a height of ca. 1m. The habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'.* Scrub encroachment is the main threat to this area, evident from the presence of *Salix* sp. and *Rubus fruticosus* agg.	

Plate 23: Survey Area 23 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.

Survey Area: 024	Details
Survey Date	30/07/2015
GPS Co-ordinates	IM 73456; 88976
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Agricultural grazing
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	5
% Herb/Grass/Sedge	95
% Bryophytes	60
% Litter	3
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	120
Height Herb layer (cm)	70
Species Name	
Anthoxanthum odoratum	
Calluna vulgaris	
Juncus effusus	
Luzula multiflora	
Molinia caerulea	
Polytrichum commune	
Potentilla erecta	
Rubus fruticosus agg	
Sphagnum palustre	
Ulex europeaus	

Comments:
A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) (Plate 24). Vegetation in this area is largely overgrown and rank dominated by *Juncus effusus* and other broadleaf grass species which grows to a height of ca. 1m. Hummocks of *Sphagnum* mosses, primarily composed of *Sphagnum palustre*, occur occasionally within this area. The habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'.* Scrub encroachment is the main threat to this area, evident from the presence of *Salix* sp. and *Rubus fruticosus* agg.

Plate 24: Survey Area 24 -T he area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'.*

Survey Area: 025	Details
Survey Date	30/07/2015
GPS Co-ordinates	IM 73403; 89046
Substrate	Peat
Management regime / Landuse	Agricultural grazing
Habitat	Wet Grassland (GS4)
Total vegetation cover %	100
% Trees	0
% Shrub	10
% Herb/Grass/Sedge	95
% Bryophytes	20
% Litter	5
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	150
Height Herb layer (cm)	85
Species Name	
Anthoxanthum odoratum	
Arrhenatherum elatius	
Holcus lanatus	
Juncus conglomeratus	
Juncus effusus	
Lythrum salicaria	
Molinia caerulea	
Poa spp	
Potentilla erecta	
Rubus fruticosus agg	
Rumex spp	
Salix sp	
Comments: A walkover survey was conducted in this area and the habitat was classified as wet grassland and scrub mosaic (see Plate 25). The habitat type does not conform to any Annex I habitats listed on the EU Habitats Directive. Much of the grassland component of the site is rank and dominated by dense stands of *Juncus effusus*. The dominant scrub species are *Salix* sp. and *Rubus fruticosus* agg.	

Plate 25: Survey Area 25 - The quadrat was taken from an area of wet grassland (GS4) and scrub (WS1) mosaic and is dominated by dense stands of Juncus effusus with Salix sp, and Rubus fruticosus agg. The habitat in this area does not correspond to any Annex I habitats listed on the EU Habitats Directive.

Survey Area: 026	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72921; 89462
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Unknown
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	2
% Herb/Grass/Sedge	90
% Bryophytes	30
% Litter	2
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	75
Height Herb layer (cm)	35
Species Name	
Calluna vulgaris	
Carex panicea	
Erica tetralix	
Eriophorum angustifolium	
Juncus conglomeratus	
Juncus effusus	
Molinia caerulea	
Narthecium ossifragum	
Phalaris arundinacea	
Potentilla erecta	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) and hosts a range of regenerating wet (*Sphagnum* mosses) and dry bog plant communities (Plate 26). The habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'*. *Sphagnum* cover is ca. 20% and the peat is firm underfoot. The main pressures and threats to this area are scrub encroachment and drainage.	

Plate 26: Survey Area 26 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.

Survey Area: 027	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72906; 89476
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Unknown
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	1
% Herb/Grass/Sedge	95
% Bryophytes	40
% Litter	3
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	85
Height Herb layer (cm)	35
Species Name	
Calluna vulgaris	
Carex nigra	
Carex panicea	
Drosera rotundifolia	
Erica tetralix	
Eriophorum angustifolium	
Juncus acutiflorus	
Narthecium ossifragum	
Sphagnum spp	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) and hosts a range of regenerating wet (*Sphagnum* mosses) and dry bog plant communities (Plate 27). There are some areas of standing water on bare peat adjacent to an access track. However, the habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'* based on an absence of key indicator plant species including *Rhynchospora alba and R. fusca. Sphagnum* cover is ca. 20% and the peat is firm underfoot. The main pressures and threats to this area are scrub encroachment and drainage.	

Plate 27: Survey Area 27 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.

Survey Area: 028	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72915; 89571
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Unknown
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	2
% Herb/Grass/Sedge	95
% Bryophytes	40
% Litter	3
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	60
Height Herb layer (cm)	30
Species Name	
Calluna vulgaris	
Carex nigra	
Carex panicea	
Erica tetralix	
Eriophorum vaginatum	
Molinia caerulea	
Narthecium ossifragum	
Potentilla erecta	
Rubus fruticosus agg	
Salix sp	
Sorbus aucuparia	
Sphagnum spp	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) and hosts a range of regenerating wet (*Sphagnum* mosses) and dry bog plant communities (Plate 28). The habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'. Sphagnum* cover is ca. 35% and the peat is firm underfoot. The main pressures and threats to this area are scrub encroachment and drainage.	

Plate 28: Survey Area 28 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.

Survey Area: 029	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72827; 89601
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Unknown
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	3
% Herb/Grass/Sedge	95
% Bryophytes	70
% Litter	5
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	0
Height Herb layer (cm)	20
Species Name	
Agrostis capillaris	
Anthoxanthum odoratum	
Calluna vulgaris	
Carex panicea	
Cynosurus cristatus	
Drosera rotundifolia	
Erica tetralix	
Eriophorum vaginatum	
Juncus effuses	
Luzula multiflora	
Molinia caerulea	
Narthecium ossifragum	
Pedicularis palustris	
Poa spp	
Polygala serpyllifolia	
Potentilla erecta	
Succisa pratensis	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) and hosts a range of regenerating wet (*Sphagnum* mosses) and dry bog plant communities (Plate 29). The habitat does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'.* The site comprises low growing stands of *Calluna vulgaris* and an increasing cover of broadleaf grasses which is likely attributed to livestock grazing undertaken at the site. There is evidence of poaching in this area that has led to some localised disturbance in cutover areas. The main threats and pressures on this area are drainage and grazing activity.	

Plate 29: Survey Area 29 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.

Survey Area: 030	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72845; 89682
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Agricultural grazing
Habitat	Wet Grassland (GS4)
Total vegetation cover %	100
% Trees	0
% Shrub	3
% Herb/Grass/Sedge	95
% Bryophytes	20
% Litter	5
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	150
Height Herb layer (cm)	80
Species Name	
Agrostis canina	
Arrhenatherum elatius	
Bellis perennis	
Carex echinata	
Carex panicea	
Centaurea nigra	
Cirsium palustre	
Dactylorhiza fuchsii	
Equisetum palustre	
Filipendula ulmaria	
Rubus fruticosus agg	
Holcus lanatus	
Juncus effusus	
Molinia caerulea	
Plantago lanceolata	
Poa spp	
Potentilla anserine	
Prunella vulgaris	
Ranunculus flammula	
Rumex spp	
Salix sp	
Senecio jacobaea	
Triglochin palustris	
Viola palustris	
Comments: A walkover survey was undertaken in this general area. The habitat type comprises wet grassland (see Plate 30). The habitat type does not conform to any Annex I habitats listed on the EU Habitats Directive. Much of the grassland component of the site is rank and dominated by dense stands of *Juncus effusus* and tall grasses. The main threats and pressures on this area are scrub encroachment,	

undergrazing and afforestation.

Plate 30: Survey Area 30 - The area was classified as wet grassland (GS4) and is dominated by dense stands of Juncus effusus. The habitat in this area does not correspond to any Annex I habitats listed on the EU Habitats Directive.

Survey Area: 031	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72870; 89586
Substrate	Peat
Substrate depth	>1m
Stability	Soft
Water table height	-20cm below surface
Management regime / Landuse	Unknown
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	0
% Herb/Grass/Sedge	80
% Bryophytes	75
% Litter	0
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	0
Height Herb layer (cm)	20
Species Name	
Drosera rotundifolia	
Erica tetralix	
Eriophorum vaginatum	
Menyanthes trifoliata	
Molina caerulea	
Narthecium ossifragum	
Sphagnum capillifolium	
Sphagnum magellanicum	
Trichophorum cespitosum	
Comments: A walkover survey was undertaken in this general area. This habitat is classified as Cutover Bog (PB4) and hosts a range of regenerating wet (*Sphagnum* mosses) and dry bog plant communities (Plate 31). This area supports a small community of *Meneyanthes trifoliata.* However, it does not conform to the E.U. Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'* based on an absence of key indicator plant species including *Rhynchospora alba and R. fusca.* The main threats and pressures on this area are drainage and grazing activity.	

Plate 31: Survey Area 31 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitats

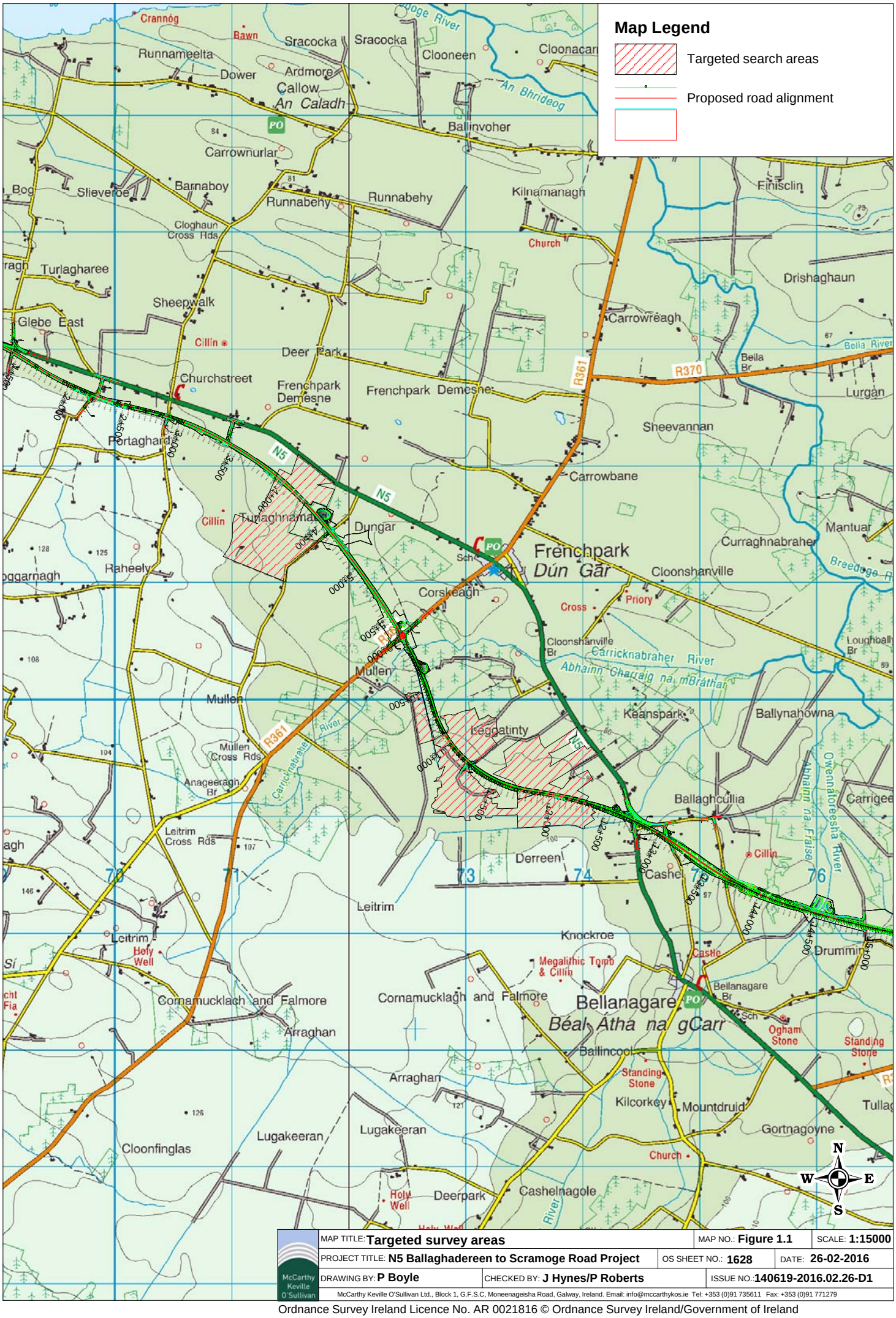
Survey Area: 032	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72758; 89605
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Turbary
Habitat	Cutover Bog (PB4)
Total vegetation cover %	100
% Trees	0
% Shrub	5
% Herb/Grass/Sedge	95
% Bryophytes	50
% Litter	5
% Bare Peat/Soil	0
% Bare Rock	0
Height Shrub layer (cm)	0
Height Herb layer (cm)	20-100
Species Name	
Anthhoxanthum odoratum	
Calluna vulgaris	
Carex panicea	
Erica tetralix	
Eriophorum vaginatum	
Holcus lanatus	
Juncus conglomeratus	
Juncus effusus	
Molinia caerulea	
Myrica gale	
Narthecium ossifragum	
Potentilla erecta	
Salix sp	
Sorbus aucuparia	
Sphagnum spp	
Comments: This area is a large complex of cutover bog (Plate 32) that comprises dry and wet (Sphagnum mosses) bog plant communities. The habitat type does not conform to the Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'* based on an absence of key indicator plant species including *Rhynchospora alba, R. fusca, Drosera rotundifolia* and *Lycopodiella inundata.* The main threats and pressures to this area are scrub encroachment, active turbary and drainage. Scrub encroachment, primarily of *Salix* sp. and *Sorbus aucuparia*, occurs in the north whist active peat extraction occurs in the south of this area.	

Plate 32: Survey Area 32 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.

Area notes: 033	Details
Survey Date	31/07/2015
GPS Co-ordinates	IM 72882; 89396
Substrate	Peat
Substrate depth	>1m
Stability	Firm
Water table height	-20cm below surface
Management regime / Landuse	Turbary
Habitat	Cutover Bog (PB4)
Total vegetation cover %	30
% Trees	0
% Shrub	3
% Herb/Grass/Sedge	15
% Bryophytes	10
% Litter	0
% Bare Peat/Soil	70
% Bare Rock	0
Height Shrub layer (cm)	0
Height Herb layer (cm)	20
Species Name	
Calluna vulgaris	
Juncus effusus	
Molinia caerulea	

Comments:
This habitat type comprises cutover bog (see Plate 3) that comprises dry and wet (*Sphagnum* mosses) bog plant communities. The habitat type does not conform to the Annex I habitat '7150 *Depressions on peat substrates of the Rhynchosporion'* based on an absence of key indicator plant species including *Rhynchospora alba*, *R. fusca*, *Drosera rotundifolia* and *Lycopodiella inundata*. Much of the cutover bog is heavily disturbed due to active peat cutting and disturbance associated with heavy machinery. A number of drainage ditches traverse this area.

Plate 33: Survey Area 33 - The area was classified as cutover bog and was not found to have any links with EU Annex I habitat type '7150 *Depressions on peat substrates of the Rhynchosporion'*.



MAP TITLE: **Targeted survey areas**		MAP NO.: **Figure 1.1**	SCALE: **1:15000**
PROJECT TITLE: **N5 Ballaghadereen to Scramoge Road Project**		OS SHEET NO.: **1628**	DATE: **26-02-2016**
DRAWING BY: **P Boyle**	CHECKED BY: **J Hynes/P Roberts**		ISSUE NO.: **140619-2016.02.26-D1**

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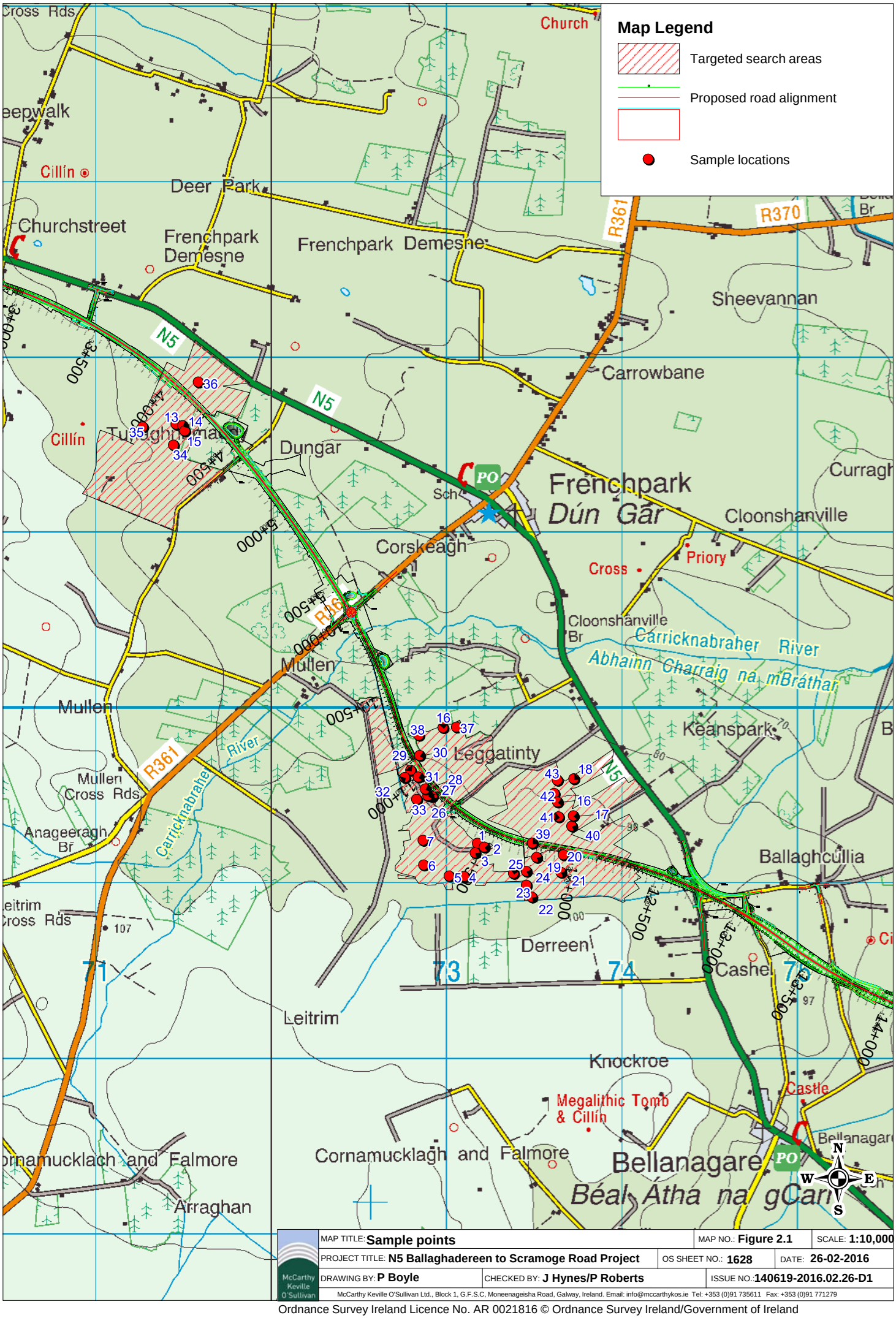

MAP TITLE: **Sample points**		MAP NO.: **Figure 2.1**	SCALE: **1:10,000**
PROJECT TITLE: **N5 Ballaghadereen to Scramoge Road Project**		OS SHEET NO.: **1628**	DATE: **26-02-2016**
DRAWING BY: **P Boyle**	CHECKED BY: **J Hynes/P Roberts**		ISSUE NO.: **140619-2016.02.26-D1**

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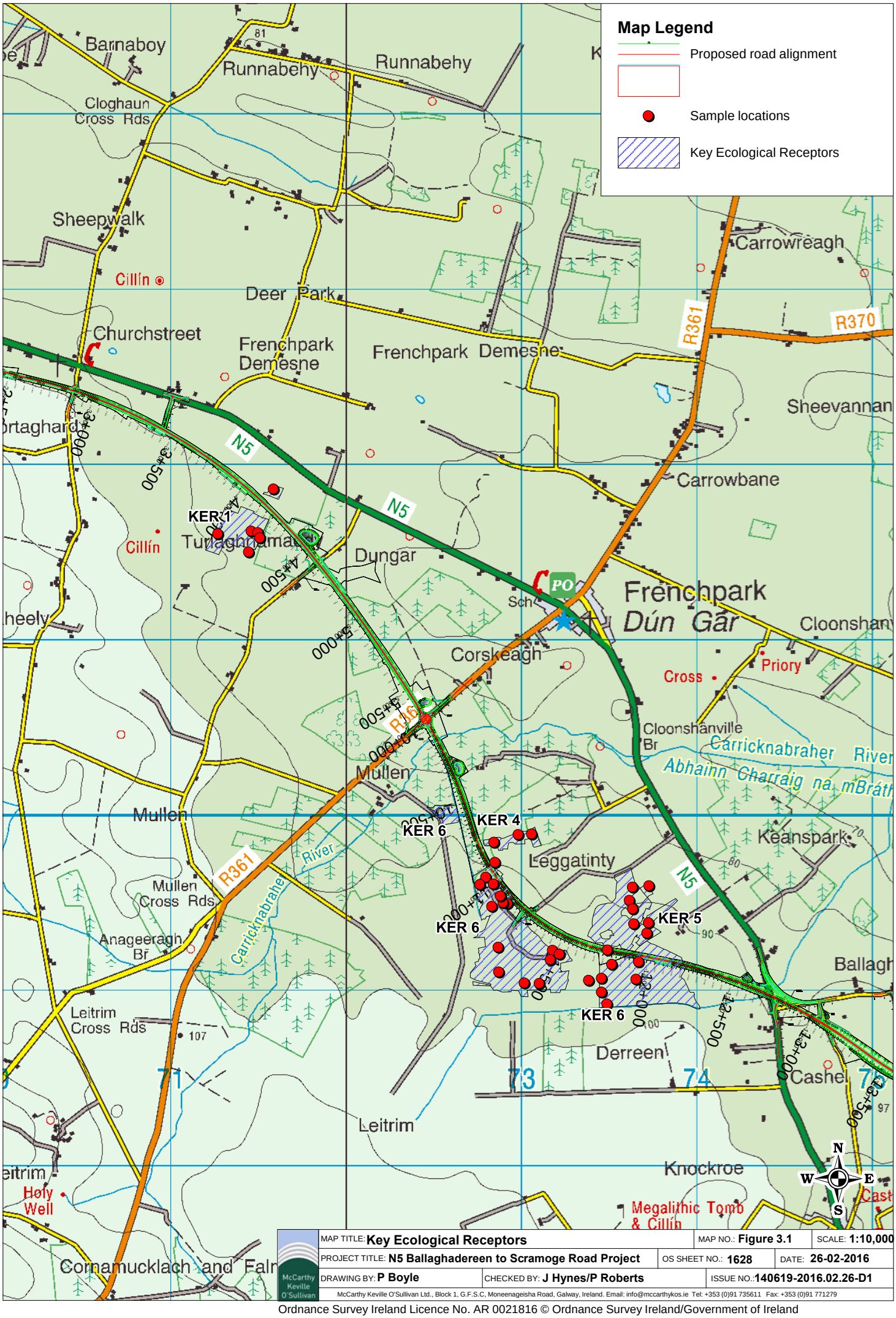

MAP TITLE: **Key Ecological Receptors**		MAP NO.: **Figure 3.1**	SCALE: **1:10,000**
PROJECT TITLE: **N5 Ballaghadereen to Scramoge Road Project**		OS SHEET NO.: **1628**	DATE: **26-02-2016**
DRAWING BY: **P Boyle**	CHECKED BY: **J Hynes/P Roberts**		ISSUE NO.: **140619-2016.02.26-D1**

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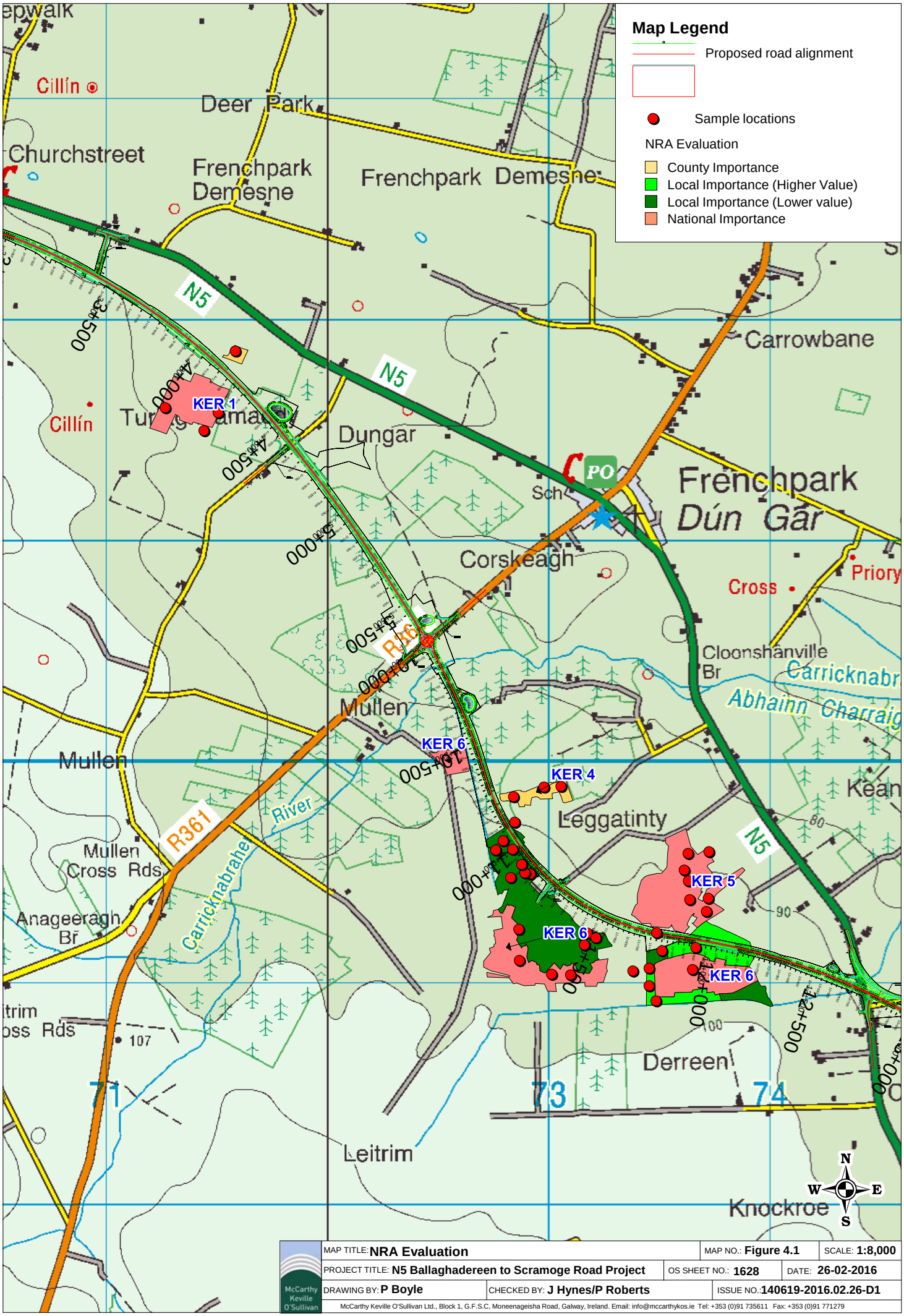

MAP TITLE: **NRA Evaluation**		MAP NO.: **Figure 4.1**	SCALE: **1:8,000**
PROJECT TITLE: **N5 Ballaghadereen to Scramoge Road Project**		OS SHEET NO.: **1628**	DATE: **26-02-2016**
DRAWING BY: **P Boyle**	CHECKED BY: **J Hynes/P Roberts**		ISSUE NO.: **140619-2016.02.26-D1**

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APPENDIX 7.2

Assessment of Alkaline Fen at Tullyloyd and Tullycartron, Co. Roscommon

N5 Ballaghadereen to Scramoge Road Project

Assessment of Alkaline Fen at Tullyloyd and Tullycartron, Co. Roscommon

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

DOCUMENT DETAILS

Client:	Roughan O'Donovan
Project title:	N5 Ballaghadereen to Scramoge Road Project
Project Number:	140619
Document Title:	Assessment of Alkaline Fen at Tullyloyd and Tullycartron, Co. Roscommon
Doc. File Name:	140619 - N5 Ballaghadereen to Scramoge – 2016.02.23-D2
Prepared By:	McCarthy Keville O'Sullivan Ltd. Planning & Environmental Consultants Block 1, G.F.S.C. Moneenageisha Road, Galway

Document Issue:

Rev	Status	Issue Date	Document File Name	Author(s)	Approved By:
001	Draft	20.08.2015	140619 - N5 Ballaghadereen to Scramoge – 2015.08.20-D1	BOL	PR
002	Draft	23.02.2016	140619 - N5 Ballaghadereen to Scramoge – 2016.02.23-D2	BOL	PR

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1 INTRODUCTION

McCarthy Keville O'Sullivan Ltd. were commissioned to undertake a survey for Annex I habitats as part of the proposed N5 road alignment from Ballaghadereen to Scramoge, Co. Roscommon. A targeted search was undertaken for Annex I habitats where the proposed road alignment occurs north of an alkaline fen complex in the townlands of Tullyloyd and Tullycartron, Co. Roscommon (see Figure 1.1). This report provides details of the survey methodologies employed, results of field surveys and an evaluation of the fen habitats that occur within the study area at this location.

1.1 Legislative Context

Annex I habitats located outside of SACs are not afforded any strict protection. The Environmental Liabilities Regulations may apply if an Annex I habitat is accidentally damaged or damaged by non-permitted works or where there is an imminent threat or damage. EU Directive 2004/35/EC on environmental liability with regards to the prevention and remedying of environmental damage affords protection to habitats and species listed in the EU Habitats Directive.

Article 3 of Council Directive 2004/35/CE (Environmental Liability Directive) applies where:

1. (b) *damage to protected species and natural habitats caused by any occupational activities other than those listed in Annex III, and to any imminent threat of such damage occurring by reason of any of those activities, whenever the operator has been at fault or negligent*.

Article 5 of Council Directive 2004/35/CE applies where:

1. *Where environmental damage has not yet occurred but there is an imminent threat of such damage occurring, the operator shall, without delay, take the necessary preventive measures.*

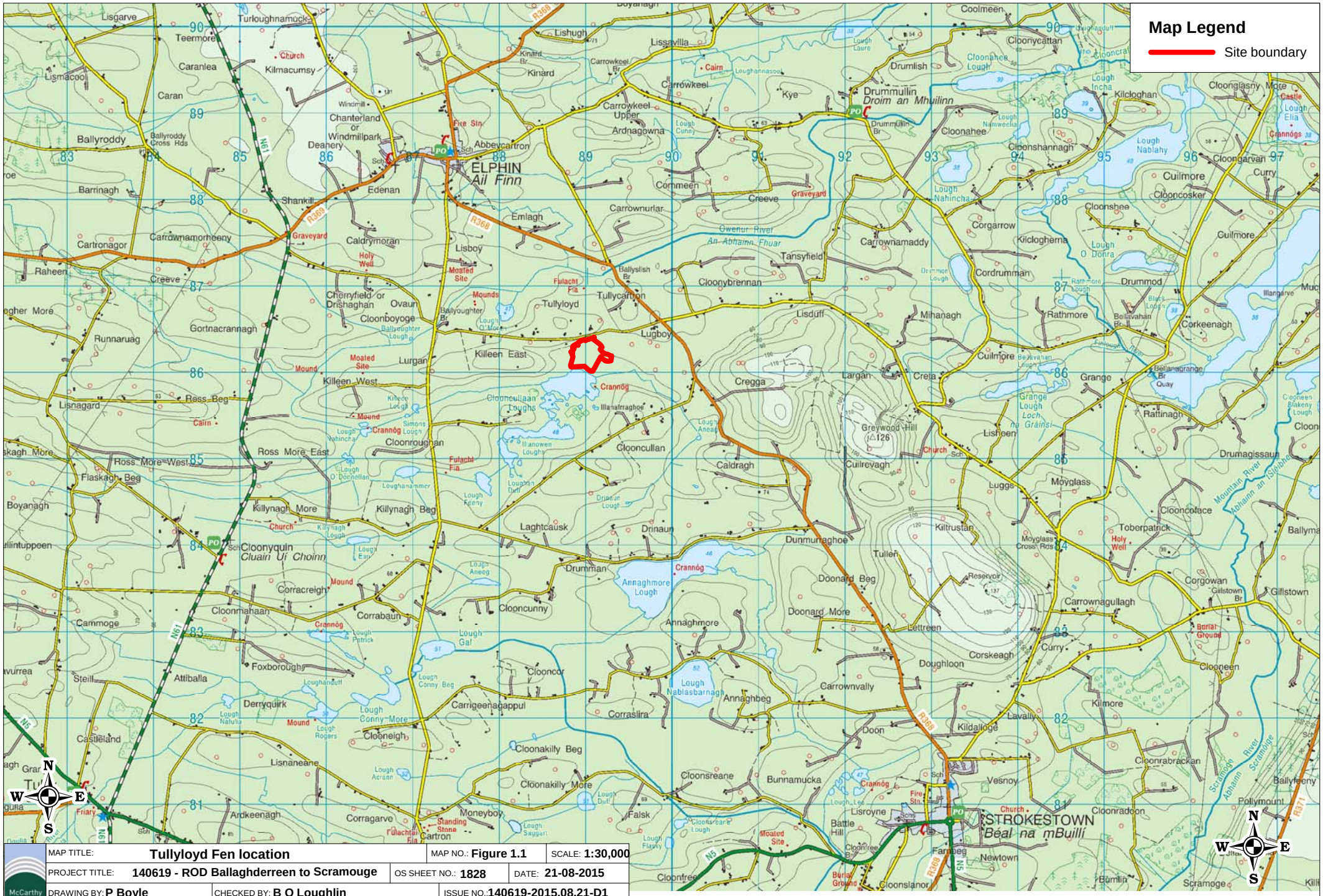
Part 4 of the S.I. No. 477/2011 – (European Communities (Birds and Natural Habitats) Regulations 2011) affords protection to habitats from pollution and deterioration:

27 (4). *Public authorities, in the exercise of their functions, insofar as the requirements of the Birds Directive and the Habitats Directive are relevant to those functions, shall:*

(a) *take the appropriate steps to avoid, in candidate special protection areas, pollution and deterioration of habitats and any disturbances affecting the birds insofar as these would be significant in relation to the objectives of Article 4 of the Birds Directive*,

(b) *outside those areas, strive to avoid pollution or deterioration of habitats*.

The guidance document - *Ecological Guidance for Local Authorities and Developers* (Dublin Heritage, 2013) provides basic information for local authority staff and developers on the legal requirements and national policies governing habitats and protected species and provide best practice advice on addressing ecological constraints at an early stage in the planning process or the development of local authority projects.



MAP TITLE:	**Tullyloyd Fen location**	MAP NO.: **Figure 1.1**	SCALE: **1:30,000**	
PROJECT TITLE:	**140619 - ROD Ballaghderreen to Scramouge**	OS SHEET NO.: **1828**	DATE: **21-08-2015**	
DRAWING BY: **P Boyle**	CHECKED BY: **B O Loughlin**	ISSUE NO.: **140619-2015.08.21-D1**		

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1.2 Objectives

The key objectives of this assessment include:

- Identify potential areas considered to support Annex I fen habitats within the study area of Tullyloyd and Tullycartron;
- Undertake field surveys (relevé and walkover surveys) to confirm the presence of Annex I habitats within the study area; and
- Evaluate the conservation status of habitats surveyed in the context of ecology and evaluate the ecological importance of habitats in line with the NRA (2009).

1.3 Background

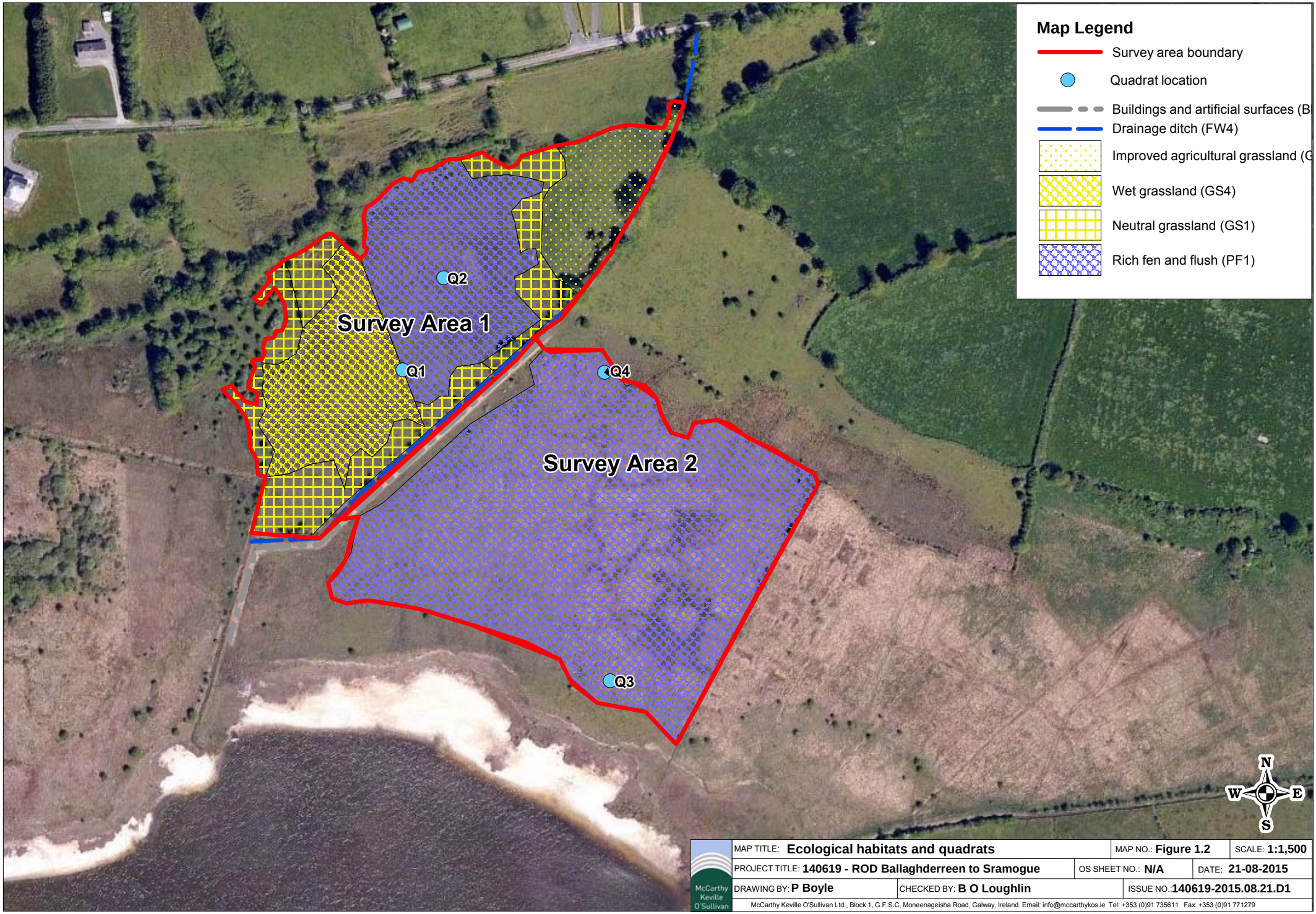
1.3.1 Alkaline Fen (7230)

Alkaline Fens (7230) are defined as wetlands mostly or largely occupied by peat or tufa-producing small sedge and brown moss communities developed on soils permanently waterlogged, with a soligenous or topogenous base rich, often calcareous water supply, and with the water table at, or slightly above or below, the substratum (European Commission, 2007; Foss & Crushell (2008)). An ecological interpretation of this habitat type is available from published documents issued by the European Commission (European Commission, 2013). The main results of the surveillance for Alkaline Fen (7230) under Article 17 in an Irish context are available from the National Parks and Wildlife Service (NPWS, 2013). Alkaline fens of this this habitat type support a carpet of brown mosses including but not limited to the following species: C*ampylium stellatum*, *Drepanocladus intermedius*, *Drepanocladus revolvens*, *Cratoneuron commutatum*, *Acrocladium cuspidatum*, *Ctenidium molluscum*, *Fissidens adianthoides* and *Bryum pseudotriquetrum.* Key plant species comprise *Schoenus nigricans, Homalothecium nitens, Carex viridula, Carex nigra, Carex dioica, Carex panicea, Juncus subnodulosus, Molinia caerulea, Hydrocotyle vulgaris, Ranunculus flammula, Mentha aquatica, Galium palustre, Parnassia palustris and Pinguicula vulgaris.*

Rich fens receive a significant groundwater component that is rich in base cations but poor in nutrients. Groundwater levels in undisturbed fens are usually high and occur close to the mire surface, sometimes seeping out and filling small depressions and ponds (Foss & Crushell, 2008).

1.4 Site Description

The site occurs approximately 2.4km south-east of Elphin, Co. Roscommon and south of a third class public road in the townlands of Tullyloyd and Tullycartron. The site occurs adjacent to Lough Clooncullaan that supports a complex of wetland habitats. The wetland interest is an undesignated site considered to be of conservation interest. Lough Clooncullaan occurs in a natural depression and is fringed by wetlands such as alkaline fen and reed swamp (FS1). The wetland interest to the south of the proposed road alignment is currently managed for agricultural practices (livestock (cattle) grazing). A large drainage ditch (see Figure 1.2 – Habitat Map) occurs to the south of the area under consideration and is managed as part of a maintained drainage scheme and the associated outflow to Lough Clooncullaan. The lake and surrounding wetlands form part of the drainage district. The site is surrounded by agricultural grassland managed for livestock grazing and silage crop production.



MAP TITLE: **Ecological habitats and quadrats**		MAP NO.: **Figure 1.2**	SCALE: **1:1,500**
PROJECT TITLE: **140619 - ROD Ballaghderreen to Sramogue**		OS SHEET NO.: **N/A**	DATE: **21-08-2015**
DRAWING BY: **P Boyle**	CHECKED BY: **B O Loughlin**	ISSUE NO.: **140619-2015.08.21.D1**	

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2 METHODOLOGY AND LIMITATIONS

2.1 Field Survey

A site visit was undertaken on the 18th of May 2015 by Mr. Barry O'Loughlin (B.Sc, M.Sc, MCIEEM) and Mr. John Hynes (B.Sc, M.Sc) to identify and assess a small area of Rich fen and flush (PF1) (Survey Area 1) considered to have potential links with Annex I fen habitats along south of the proposed road alignment in the townlands of Tullyloyd and Tullycartron, Co. Roscommon. An additional site visit was undertaken by Mr. Barry O'Loughlin on the 11th of September 2015. A vegetation and habitat assessment was undertaken at those site locations identified as supporting potential Annex I habitats with the aid of ortho-base maps (aerial photography) and previous field surveys.

Survey methods follow methodology developed by Foss & Crushell (2008). A relevé measuring 2m x 2m was devised at each sampling location to estimate cover abundance of plant species present within each relevé. A minimum of two relevés were recorded at the site as per guidelines outlines by Foss & Crushell (2008). Plant species data were recorded in Relevé Cards similar to the National Survey if Ireland Releveé Card outlined in Appendix 7 of Foss & Crushell (2008) and attached as Appendix 1 to this report. Habitats were initially classified in accordance with Fossitt (2000).

An additional survey area (Survey Area 2) was assessed to obtain a representative sample of fen habitat that occurs south of the maintained drainage ditch and where this habitat may have links to Annex I habitats. Survey Area 2 is currently unmanaged with no livestock grazing reported from this area and occurs outside the main study area of interest (Survey Area 1) (see Figure 1.2).

Plant nomenclature for vascular plants follows New Flora of the British Isles (Stace, 2010), whilst mosses and liverworts follows *Mosses and Liverworts of Britain and Ireland - a field guide* (British Bryological Society, 2010). The distribution of relevés and survey areas undertaken as part of this assessment are presented in Figure 1.2.

Plant species data were recorded in Relevé Cards similar to the National Survey of Ireland Releve Card outlined in Appendix 7 of Foss & Crushell (2008) and attached as Appendix 1 to this report.

The cover of plant species present within relevés was estimated according to the Domin scale of cover / abundance outlined in Table 2.1.

Table 2.1: The Domin scale of cover / abundance.

+ = <1% cover, single individual. 1 = <4%, few individuals
2 = <4%, several individuals
3 = <4%, many individuals
4 = Cover between 4 and 10%
5 = Cover between 11 and 25%
6 = Cover between 26 and 33%
7 = Cover between 34 and 50%
8 = Cover between 51 and 75%
9 = Cover between 76 and 90%
10 = Cover between 91 and 100%

A number of guidance documents and literature sources were consulted in order to determine the presence of Annex I habitats within the survey area. The following is a list of documents (in addition to those already referenced) reviewed as part of the overall assessment:

- Foss, P.J. & Crushell, P. 2007 Title: *Monaghan Fen Survey II 2008. Report for Monaghan County Council & The Heritage Council, Ireland*. Volumes 1-3.
- European Commission (2008) Management of Natura 2000 habitats *Alkaline fens* 7230. Directive 92/42/EEC on the conservation of natural habitats and wild fauna and flora. Technical Report 2008 20/24.
- European Commission (2013) *Interpretation Manual of European Union Habitats* – EU27. http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf Last accessed: 07/08/2015
- NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

2.1.1 Conservation and Ecological Evaluation Methodology

2.1.1.1 Conservation Status (Foss & Crushell, 2008)

The survey methods outlined by Foss & Crushell (2008) for determining the conservation value of sites have been applied to the fen assessment undertaken at Tullyloyd and Tullycartron. The methods employ a ranking scheme and a conservation value score system to determine conservation value for each site. Conservation scores are assessed (scores ranked 0 to 5 for each category) under the following categories: Naturalness, Non-recreatability, Potential Value, Typicality, Education Value, Size, Diversity, Fen Value, Rarity of Species, Rarity of Habitats, Viability, Recorded History, Management Needs, Intrinsic Appeal and Expert Opinion. An example of the conservation value score system is presented in Table 2.2. Site rating is based on the ecological and site evaluation criteria presented in Table 2.3. This is a modified version of the ecological evaluation criteria developed by the NRA (NRA, 2009).

Table 2.2: The Conservation value score system and ranking scheme applied to sites by Foss & Crushell (2008).

Site Conservation Status	Score Value	Ranking Code
International value	40 - 75	A
National value	30 - 75	B
County Value	25 - 29	C+
High local value	20 - 24	C
Moderate local value	11 - 19	D
Low local value	0 - 10	E

Table 2.3: Site ranking criteria used by Foss & Crushell (2008) (National Fen Survey of Ireland).

Ranking	Ecological Valuation: Examples
A	**International Important** - Sites designated (or qualifying for designation) as SAC* or SPA* under the EU Habitats or Birds Directives. - Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. - Major salmon river fisheries. - Major salmonid (salmon, trout or char) lake fisheries.
B	**National Important** - Sites or waters designated or proposed as an NHA* or statutory Nature Reserves. - Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). - Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. - Major trout river fisheries. - Water bodies with major amenity fishery value. - Commercially important coarse fisheries.
C+	**County Value** - Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or significant populations of species which are rare in the county. - Small water bodies with known salmonid populations or with good potential salmonid habitat. - Sites containing resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive. - Large water bodies with some coarse fisheries value.
C	**High Value, local important** - Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. - Small water bodies with known salmonid populations or with good potential salmonid habitat. - Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive.

Ranking	Ecological Valuation: Examples
	- Large water bodies with some coarse fisheries value.
D	**Moderate value, locally important** - Sites containing some semi-natural habitat or locally important for wildlife. - Small water bodies with some coarse fisheries value or some potential salmonid habitat. - Any water body with unpolluted water (Q-value rating 4-5).
E	**Low value, locally important** - Sites containing some remnant semi-natural habitat or locally important for wildlife, but where disturbance has significantly altered habitat and/or continues to threaten future survival of the site.

2.1.1.2 Ecological Evaluation (NRA, 2009)

An evaluation of the ecological importance at an international, national, county and local scale was assessed for the habitats onsite in accordance with methodology developed by the National Roads Authority - 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (NRA, 2009). Table 2.4 outlines criteria developed by the NRA used for conducting ecological evaluation of habitats.

Table 2.4 Guidelines for conducting ecological valuation of habitats (NRA 2009)

Ecological Valuation: Examples
International Importance: ▪ 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. ▪ Proposed Special Protection Area (pSPA). ▪ Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). ▪ Features essential to maintaining the coherence of the Natura 2000 Network. ▪ Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. ▪ Resident or regularly occurring populations (assessed to be important at the national level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. - Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). - World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). - Biosphere Reserve (UNESCO Man & The Biosphere Programme). - Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). - Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). - Biogenetic Reserve under the Council of Europe. - European Diploma Site under the Council of Europe. - Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).

Ecological Valuation: Examples

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level) of the following:
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list
  - Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.

County Importance:

- Area of Special Amenity.
- Area subject to a Tree Preservation Order
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level) of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)[12] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

3 RESULTS

The results field survey data sheets are presented in Appendix 2 and an indication of the presence of Annex I habitats is provided. Conservation value scores for Survey Areas 1 and Survey Area 2 have been calculated following methodology outlined in Section 2.1.1.1.

In summary, it was found that the area under consideration (Survey Area 1) (see Figure 1.2) supports a degraded section of Rich fen and flush (PF1), Wet grassland (GS4), Improved agricultural grassland (GA1) and neutral grassland (GS2) and does not correspond to the Annex I habitat type 'alkaline fens (7230)' or 'calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)'. Relevé 3 and 4 were undertaken in an area south of the maintained drainage feature (Survey Area 2) and found to correspond with the EU Annex I habitat 'alkaline fens (7230)'. No protected plant species listed on the Flora Protection Order or Red Data Book plant species were recorded during field surveys. A description of the floristic composition and coverage for Relevés 1, 2, 3 and 4 are described in the following paragraphs below.

3.1 Relevé Survey

Survey Area 1

Relevé 1

The vegetation recorded from Relevé 1 and 2 is characterised by an encroachment of grassland species and broadleaved herbs. Grassland species recorded within Relevé 1 (refer to Appendix 2 for species composition) include Sweet Vernal Grass (*Anthoxanthum odoratum*) (11-25% cover), Meadow grasses (*Poa* sp.) (6-10%) and Yorkshire Fog (*Holcus lanatus*) (11-25% cover). Broadleaved herbs associated with semi-natural grassland habitats include Daisy (*Bellis perrennis*) and Meadow Buttercup (*Ranunculus acris*). The aforementioned listed grassland species and broadleaved herbs are typically associated with grassland habitats and the establishment of grassland communities is indicative that hydrological conditions are considered unfavourable to support viable fen habitat in the long term. In addition, the relevé supports high coverage of Carnation Sedge (*Carex panicea*) (51-75% cover). Dense stands of Soft Rush (*Juncus effusus*) were recorded in the immediate environs to the west of Relevé 1. The relevé was characterised by a notable absence of brown moss indicator species typically associated with 'alkaline fens (7230)'. Based on the plant species composition recorded from the relevé, it is apparent that the habitat is transitioning from an area of Rich fen and Flush (PF1) to semi-natural grassland habitats (Dry Humid and acid grassland (GS3) and Wet grassland (GS4)) and this is likely attributed to activities associated with drainage, nutrient enrichment and poaching associated with agricultural activities (livestock grazing). Ground conditions were very firm underfoot with surface stranding water absent. Based on the unfavourable conditions of the site together with the plant species composition recorded within the relevé, no links to the EU Annex I habitat 'alkaline fens (7230)' or 'calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)'.

Relevé 2

Relevé 2 comprises an abundance of *Schoenus nigricans* in small tussock formations. The relevé was taken from an area of Rich fen and flush (PF1) (considered to be the wettest part of Survey Area 1). There is a notable absence of brown moss indicator plant species typically associated with EU Annex I habitats. Similar to Relevé 1, the area is heavily poached due to livestock grazing (as indicated by areas of bare soil) and consequently suffers from nutrient enrichment as a result. The severity of habitat degradation is reflective of the plant species composition recorded within Relevé 2

(refer to Appendix 2) which included a number of plant species typically associated with semi-natural grassland habitat such as Sweet Vernal Grass (11-25% cover), Soft Rush (*Juncus effusus*) (1-5% cover), Yorkshire Fog (6-10%) and the heath moss *Hylocomium splendens* (6-10% cover). Broadleaved grassland herbs included Daisy (*Bellis perrennis*) and Meadow Buttercup (*Ranunculus acris*) (refer to Appendix 2). Ground conditions were firm underfoot with surface stranding water absent. Based on the unfavourable conditions of the site together with the plant species composition recorded within the relevé, no links to the EU Annex I habitat 'alkaline fens (7230)' or 'calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)'.

Survey Area 2

Relevé 3

The relevé location is characterised by open pools and surface standing water. Substrate conditions are soft to quaking underfoot. The relevé supports a number of indicator brown mosses typically associated with the Annex I habitat type 'alkaline fens (7230)' and Rich fen and Flush (PF1) including *Scorpidium scorpioides* (ca. 1% cover), *Calliergon giganteum* (6-10% cover) and *Drepanocladus intermedius* (recorded nearby) (refer to Appendix 2). Other mosses recorded include *Calliergonella cuspidata* (1-5% cover). Plant species typically associated with this habitat type included Purple Moor-grass (*Molinia caerulea*) (51-75% cover), Black Bog-rush (*Schoenus nigricans*) (34-50% cover), Bogbean (*Menyanthes trifoliata*) (1-5% cover), Tormentil (*Potentilla erecta*), Blunt-flowered Rush (*Juncus subnodulosus*) (6-10% cover) and sedges such as Carnation Sedge (26-33% cover), Long-stalked Yellow-sedge (*Carex viridula*) (<1% cover) and Common Sedge (*Carex nigra*) (1-5% cover). Hydrological conditions are considered favourable to support Rich fen and flush habitat (PF1). Areas which were identified as 'alkaline fens (7230)' met the vegetation composition, vegetation structure and physical structure as outlined by Foss & Crushell (2008). Based on the plant species composition recorded from Relevé 3, the habitat conforms to the Annex I habitat type 'alkaline fens (7230)'. No obvious threats and pressures such as poaching, nutrient enrichment and drainage ditches were recorded in the vicinity of Relevé 3.

Relevé 4

The relevé comprises some areas of surface standing water. The substrate condition was soft underfoot. A number of indicator moss species typically associated with the Annex I habitat type 'alkaline fens (7230)' and Rich fen and Flush (PF1) included *Calliergon giganteum* (6-10% cover) (refer to Appendix 2). Other mosses such as *Calliergonella cuspidata* (11-25% cover) were also recorded. Plant species typically associated with this habitat type included Purple Moor-grass (6-10% cover), Black Bog-rush (34-50% cover), Grass of Parnassus (*Parnassia palustris*) (11-25% cover), Water Mint (*Mentha aquatica*) (26-33% cover), Devil's Bit Scabious (*Succisa pratensis*) (11-25% cover), Blunt-flowered Rush (1-5% cover), Marsh Pennywort (*Hydrocotyle vulgaris*) (1-5% cover), Marsh Cinquefoil (6-10% cover), etc. Sedges included Carnation Sedge and Bottle Sedge (*Carex rostrata*). Hydrological conditions are deemed favourable to support Rich fen and flush habitat (PF1). Areas which were identified as 'alkaline fens (7230)' met the vegetation composition, vegetation structure and physical structure as outlined by Foss & Crushell (2008). Based on the plant species composition recorded from Relevé 4, the habitat conforms to the Annex I habitat type 'alkaline fens (7230)'. A maintained drainage ditch occurs to the north of Relevé 4. No threats and pressures associated with agricultural activities such as poaching and nutrient enrichment were observed.

3.2 Site Conservation Status (Foss & Crushell (2008))

Conservation value scores and ranking system to determine conservation value of Survey Area 1 and Survey Area 2 have been assessed (scores ranked 0 to 5 for each category) in line with methods outlined in Section 2.1.1.1. The results of these are presented in Table 3.1.

Table 3.1 Conservation value scores and ranking scheme applied to Survey Area 1 and Survey Area 2 at Tullyloyd and Tullycartron, Co. Roscommon.

Site Conservation Status	Score Value	Ranking Code
Survey Area 1	20-24 (score of 24)	C
Survey Area 2	30-75 (score of 64)	B

Applying the conservation value score system and ranking scheme used by Foss & Crushell (2008), Survey Area 1 has a site conservation status that corresponds to category **C: high value, locally important** (refer to Table 2.3) while Survey Area 2 has a site conservation status that corresponds to category **B: national importance**.

4 EVALUATION

This section provides an evaluation of the conservation status of habitats identified within the survey area in line with methods outlined by Foss & Crushell (2008) and classified in terms of their ecological importance following evaluation criteria developed by the NRA (2009) (refer to Table 2.4).

Habitats deemed to be of Local Importance (higher value) within Survey Area 1 include the habitats Rich fen and flush (PF1) and wet grassland (GS4) (Figure 4.1). These areas were included in this category based on the criterion '*Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value*' (NRA, 2009) (refer to Table 2.4). Habitats deemed to be of Local Importance (lower value) includes the habitats Improved agricultural grassland (GA1) and Neutral grassland (GS1). These areas were included in this category based on the criterion '*Sites containing small areas of semi-natural habitat that are of some local importance for wildlife*' and '*Sites or features containing non-native species that are of some importance in maintaining habitat links'* (NRA, 2009). Figure 4.1 shows the distribution of habitats ranked in accordance with ecological valuation criteria devised by the NRA. Similarly, the site conservation status for Survey Area 1 is deemed to be locally important, higher value based on the conservation value scores calculated for this site. The site does not support the Annex I habitat 'alkaline fens (7230)' and conforms to the criterion – '*Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species*' (refer to Table 2.3).

Surface standing water was absent from Survey Area 1 (see Plate 1) and ground conditions were characterised as firm to very firm underfoot. The area is heavily degraded due to livestock grazing with much of the Rich fen and flush (PF1) component of the site affected by poaching and consequently nutrient enrichment. The relevé data (Relevé 1) recorded for Survey Area 1 indicates a transition in the vegetation community from Rich fen and flush (PF1) to Wet grassland (GS4), Improved agricultural grassland (GA1) and Neutral Grassland (GS1). The vegetation recorded from Relevé 1 and 2 is characterised by an encroachment of grassland species and broadleaved herbs (Sweet Vernal Grass, Meadow grasses and Yorkshire Fog) as described in Section 3.1.

Other agricultural related activities (noted from previous survey visits) include the application of supplementary feed stock to over-wintering cattle. The hydrology of the site has been significantly altered due to drainage activities and agricultural practices as indicated by the encroachment of broadleaved herbs and grasses and where the site has reverted to wet grassland to the west (see Figure 1.2). The absence of rare brown mosses (typical indicator species of Alkaline fens) and areas of bare soil located between *Schoenus* tussock stands together with a low water table is indicative that Survey Area 1 does not conform to the Annex I habitat type 'alkaline fens (7230)'. There were rare occurrences of the moss *Calliergonella cuspidate,* however, this was only recorded at nearby drainage ditches (surface water ingress recorded within drainage features). The habitat likely supported 'alkaline fens (7230)' in the past. Given the correct restoration management measures (i.e. drain blocking, exclusion of livestock grazing, etc.), it is considered that the site has the potential to 're-wet' and could potentially be restored to the annexed status 'alkaline fens (7230)'. The drainage ditch which bisects the study area is likely to be an attributing factor for the overall degradation of the fen habitat outlined in Survey Area 1. Any restoration measures would be dependent on the termination of the maintained drainage scheme.

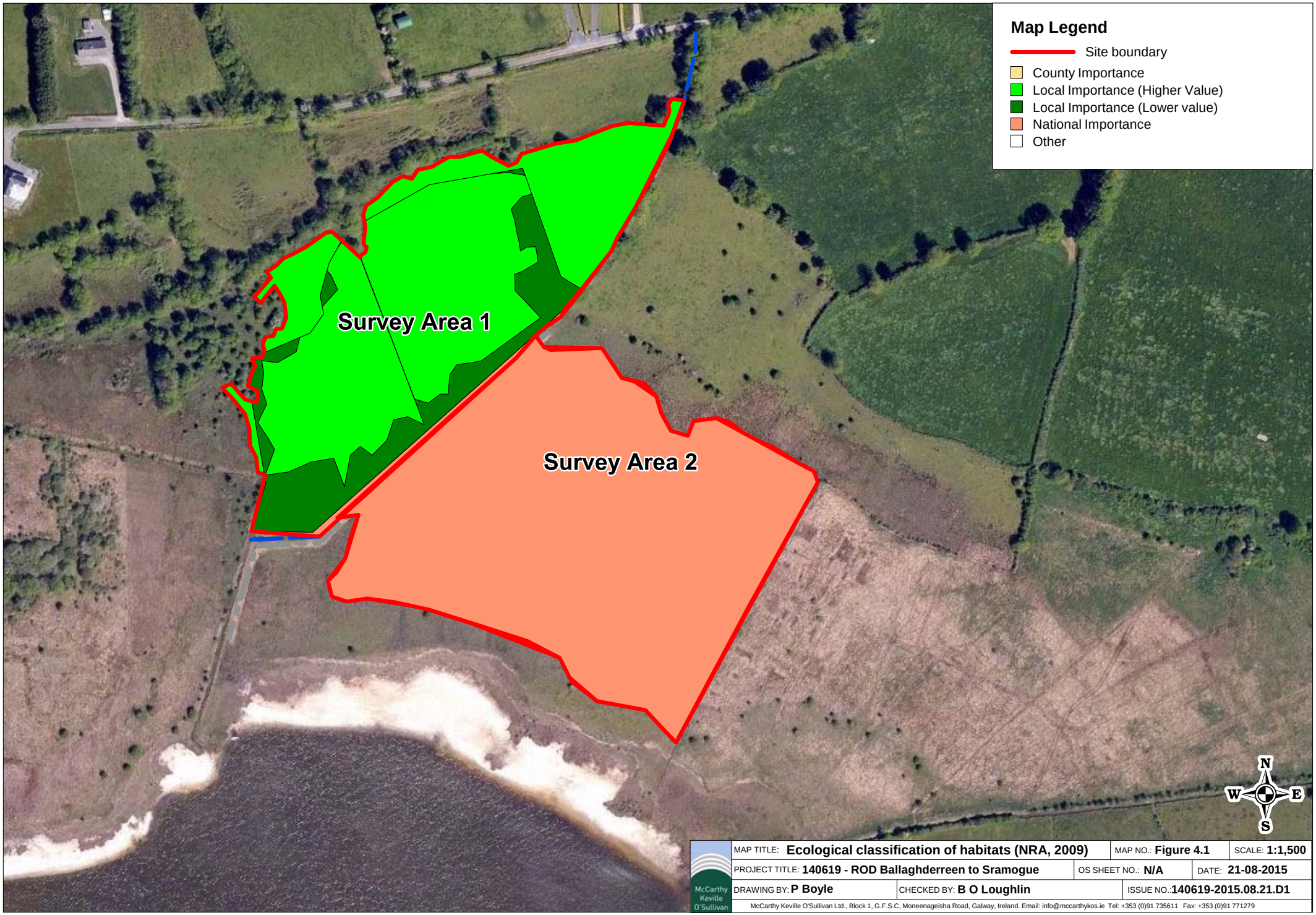
In contrast, Survey Area 2 (see Plate 2) was characterised by favourable hydrological conditions with surface standing water and open pools recorded at the location of Relevé 3 and 4 respectively. A number of brown moss indicator species such as *Scorpidium scorpioides* and *Drepanocladus intermedius* were recorded in this area. Other mosses recorded include *Calliergonella cuspidata* and *Calliergon giganteum*. Plant species such as *Schoenus nigricans*, *Carex panicea*, *Eriophorum angustifolium*, *Glyceria fluitans*, *Carex viridula*, *Molinia caerulea*, *Menyanthes trifoliata*, *Mentha aquatica* and *Juncus subnodulosus* were some of the plants recorded within the relevés (refer to Appendix 2). Based on the presence and cover of brown mosses, typical plant species recorded onsite together with the hydrology of the site (open pools and surface standing water) and absence of obvious threats and pressures (poaching, nutrient enrichment, drainage ditches, etc.), it has been assessed that the site conforms to the Annex I habitat type 'alkaline fens (7230)' and is deemed to be of national importance based on this information. The Rich fen component of Survey Area 2 conforms to the criterion '*Sites containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive. 'Viable areas' are defined as 'areas of a habitat which are of sufficient size, shape and integrity (in terms of species composition, ecological processes and function) such that it will endure in the face of unpredictable change*' (refer to Table 2.4) (NRA, 2009) (see Figure 4.1). Similarly, the site conservation status for Survey Area 2 is deemed to be of national importance based on the conservation value scores calculated for this site. The site supports an area of the Annex I habitat 'alkaline fens (7230)' and conforms to the criterion–'*Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive*' (refer to Table 2.3) (Foss & Crushell, 2008).

The current route alignment avoids land-take associated with Survey Area 2 and is sufficiently removed located further to the north.

Plate 1: Much of Survey Area 1 has been poached due to livestock grazing. The water table is below the surface and is affected by drainage operations within the site (Photograph taken on the 18/06/2015).

Plate 2: Survey Area 2 comprises brown indicator moss species and favourable hydrological conditions (pools and standing water) at Relevé 3 (Photograph taken on the 18/06/2015).

Plate 3: Relevé 4 was located south of the maintained drainage ditch (Survey Area 2). Ground conditions were characterised as soft and wet underfoot with some surface standing water present (Photograph taken on the 11/09/2015).



MAP TITLE: **Ecological classification of habitats (NRA, 2009)**	MAP NO.: **Figure 4.1**	SCALE: **1:1,500**	
PROJECT TITLE: **140619 - ROD Ballaghderreen to Sramogue**	OS SHEET NO.: **N/A**	DATE: **21-08-2015**	
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5 DISCUSSION

The potential road alignment avoids direct habitat loss where the annex I habitat 'alkaline fens (7230)' have been identified in Survey Area 2. In the absence of suitable mitigation and appropriate control measures, potential exists for indirect or secondary impacts on Annex I habitats. If such impacts significantly alter the type and/or quality of the Annex I habitat, then such changes represent additional habitat losses. Indirect/Secondary impacts on 'alkaline fens (7230)' during the construction and post-construction phases of the potential road alignment could include:

- Hydrological Impacts (drainage) (construction and post-construction phase)
- Nutrient discharge and sediment release (nutrient enrichment) (construction phase)
- Changes in habitat management (construction and post-construction phase)

Hydrological impacts

Hydrological impacts to habitats could result from changes to patterns of surface water and/or ground water drainage. While it may be relatively straightforward to prevent changes to surface water drainage patterns, changes to ground water hydrology may be much more difficult to predict at a scale relevant to potential ecological impacts. In general, habitats such as bog, fen and lakes are potentially susceptible to hydrological impacts and localised hydrological changes may have significant habitat impacts. The alkaline fen habitat ('alkaline fens (7230)') in Survey Area 2 is dependent on a high water table and any alterations to hydrological sensitivities through transverse drainage operations could result in the loss of this habitat (through drainage impacts) over time.

Nutrient discharge and sediment release (construction phase)

There is potential risk to water quality and adjacent peatland habitats due to accidental spillages of fuel or other harmful substances during the construction phase of the project. In addition, mobilisation and transport of sediment due to excavation of soil could potentially impact on freshwater and terrestrial ecology of downstream water-courses and lands adjacent to construction works. The road design will involve the excavations of 6-8m depth of soils and subsoils and associated backfilled material. Should suspended solids or pollutants become entrained in surface water and transported into surrounding watercourses or become stockpiled in adjacent terrestrial habitats, potential exists for impacts (smothering vegetation, infill, etc.) on the Annex I habitat 'alkaline fens (7230)' in Survey Area 2. .

Changes in habitat management (construction and post-construction phase)

Changes in the present management (including agricultural practices) of the site may cause negative or positive impacts on the ecological integrity of the Annex I habitat 'alkaline fens (7230)'.

Appropriate mitigation and control measures have been incorporated into the design phase of the project that potential adverse impacts during construction and post-construction phase are considered to be insignificant. The proposed works will have due regard to best practice control measures during the construction and post-construction phases of the project.

6 CONCLUSIONS

Based on the results of the current study and the distribution of Annex I habitats within the study area, the following key points are summarised below:

- Survey Area 1 located immediately south of the proposed road alignment at Tullyloyd and Tullycartron supports a degraded area of Rich fen and flush (PF1) and Wet grassland (GS4) not found to have any links with the Annex I habitats 'alkaline fens (7230)' or 'calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)'. The habitat is affected by drainage, nutrient enrichment and poaching. It is likely that the habitat conformed to the Annex I habitat type 'alkaline fens (7230)' in the past prior to existing threats and pressures it faces in current times.
- Survey Area 2 (occurs south of a maintained drainage ditch) was found to conform to the Annex I habitat type 'alkaline fens (7230)'. The area supports Rich fen and flush (PF1) and indicator brown mosses. Hydological conditions in this area and further to the south are deemed to be favourable in terms of supporting criteria for the presence of the Annex I habitat 'alkaline fens (7230)' (European Commission, 2013; Foss & Crushell (2008)).
- Survey Area 1 has a site conservation status that corresponds to category **C: high value, locally important** (refer to Table 2.3) while Survey Area 2 has a site conservation status that corresponds to category **B: national importance**.
- The proposed road alignment occurs to the north of Survey Area 2. The road avoids land take associated with annex I fen habitats that fringe Lough Clooncullaan.
- Best practice control measures have been incorporated into the design phase of the project that avoids potential impacts on areas of Annex I fen habitat during the construction and post-construction phases of the project.

7 REFERENCES

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Appendix 1

National Fen Survey of Ireland Relevé Card

National Fen Survey of Ireland Relevé Card

Site Name		**Relevé Size m^2**		**Altitude (m)**	
Site Code		**Slope** degrees		**Aspect**	
Relevé Code		**Survey Date**			
County		**Discovery Map No.**			
X Y Grid Ref		**Water Sample Code No.**			
Surveyor(s)		**Water Table Height (cm)**			
Photo Nos.		**pH**			
		Conductivity			
Substrate type	☐ **Clay** ☐ **Peat** ☐ **Silt** ☐ **Tufa** ☐ **Rock** ☐ **Other:**			**Depth (cm)**	
Stability	☐ **Very Firm** ☐ **Firm** ☐ **Some quaking** ☐ **Quaking** ☐ **Floating mat**				
Management in Relevé	☐ **None** ☐ **R. grazing** ☐ **Burnt** ☐ **Cut for:** ☐ **Other:**				
Adjacent landuse	☐ **Semi-natural habitat** ☐ **Pasture rough** ☐ **Pasture semi-improved** ☐ **Improved pasture** ☐ **Arable** ☐ **Urban** ☐ **Forestry** ☐ **Other:**				
Hydrology					

Layers	Cover %	Height (cm)
Total Cover		
Tree		
Shrub		
Herbs/Grass/Sedge		
Bryophytes		
Litter		
Bare Peat/Soil		
Algal		
Open Water		

Fen Vegetation Type

Fen Habitat: ❑ **7140 Transition Mire** ❑ **7210 Cladium fen** ❑ **7230 Alkaline fen**
❑ **7220 Petrifying springs** ❑ **Poor fen** ❑ **Non-calcareous springs**

Quadrat Description (Additional flora species surrounding area, 5 m radius; plus faunal records)

Cover value	**+:** single individual – no measurable cover	**1:** 1-2 individuals – no measurable cover	**2:** several individuals but less than 1% cover	**3:** 1-5%	**4:** 6-10%	**5:** 11-25%
		6: 26-33%	**7:** 34-50%	**8:** 51-75%	**9:** 76-90%	**10:** 91-100%

	Aneura ping	180		Sphag ripar	225		Cirsium dis	041		Juncus bulb	089		Potamo perfol	136
	Aulocom pal	181		Sphag squarr	226		Cirsium pal	042		Juncus cong	235		Potamo poly	138
	Brachy riv	182		Sphag subnit	227		Cladium mar	043		Juncus eff	090		Pot erecta	139
	Bry pseudo	183		Sphag subsec	228		Dactlyor incar	044		Juncus subn	091		Pot palust	140
	Call gig	184		Thuid tamar	230		Dactlyor macu	045		Lemna min	092		Ranunc flam	141
	Call stram	185		Toment nit	231		Dactlyor maj	046		Lemna tri	093		Ranunc ling	142
	Call cusp	186		Agros can	001		Dactyl glom	047		Leont autum	094		Rhynch alba	143
	Calyp muell	187		Agrost stol	002		Descha caes	048		Littor unifl	095		Rorrip amph	144
	Camp stell	188		Alisma pl aq	003		Drosera rot	049		Lotus ulig	096		Rorrip palus	145
	Cinc font	189		Alnus glut	004		Dryopt affin	050		Luzula camp	097		Rumex atosa	146
	Cladop fluit	190		Alop genic	005		Dryopt carth	051		Luzula mult	098		Rumex cong	147
	Clim dend	191		Anag tenella	006		Dryopt fx-ma	052		Lynchnis flos	099		Rumex hydro	148
	Craton filicin	192		Angel sylv	007		Eleoch mult	053		Lycopus eu	100		Salix aur	149
	Ctenid moll	193		Anthox od	008		Eleoch pal	054		Lysimac nem	101		Salix cin	150
	Dicran scop	194		Apium inunda	009		Eleoch quin	055		Lythrum sal	102		Salix frag	151
	Drep cosson	195		Apium nodi	010		Elodea can	056		Mentha aq	103		Salix rep	152
	Drep revolv	197		Berula erec	011		Epilob hirs	057		Menyanthes	104		Salix vim	153
	Euclad vertic	198		Betula pub	012		Epilob obscur	058		Molinia	105		Saxifrag aizo	154
	Eurhyn prae	199		Bidens cer	013		Epilob palu	059		Myosot laxa	106		Schoeno lac	155
	Fiss adian	200		Bidens tripar	014		Epilob parvi	060		Myosot secu	267		Schoenus	156
	Font anti	201		Briza med	015		Epipactis pal	061		Myosot scor	107		Senecio aq	157
	Hamat verni	202		Callitrich stag	016		Equis fluv	062		Myrica gale	108		Sparg erec	158
	Hyloc splend	203		Calluna vul	017		Equis pal	063		Myrioph alter	109		Sparg min	159
	Palust comm	204		Caltha pal	018		Equis varie	064		Myrioph spic	110		Stellar gram	160
	Palust c v c	205		Cardam pra	019		Erica tet	065		Narth ossi	112		Stellar pal	161
	Palust co v fa	206		Carex curta	020		Erioph ang	066		Nastur off	113		Stellar ulig	162
	Pellia epi	207		Carex diand	021		Erioph lat	068		Nuphar lut	114		Succisa prat	163
	Philon calc	208		Carex dioic	022		Erioph vag	069		Nymph alba	115		Thelyp pal	164
	Plagio aff	209		Carex disti	023		Eupat cann	070		Oenanth aq	116		Trigloc pal	165
	Plagio ellip	210		Carex echin	024		Fest arund	071		Oenanth croc	117		Typh ang	166
	Pleur schre	*262*		Carex flac	025		Fest rub	072		Parnassia pal	119		Typha latif	167
	Polyt comm	*130*		Carex hos	026		Filipend ulm	073		Pedic palust	120		Utric austral	168
	Scleropo pur	211		Carex lasio	027		Galium pal	074		Phalar arund	121		Utric inter	169
	Rhizo punc	212		Carex limosa	028		Galium sax	075		Phragmites	122		Utric minor	170
	Rhytid squar	213		Carex nigra	029		Galium ulig	076		Pinguic vul	123		Utric vulg	171
	Rhytid triq	214		Carex panic	030		Glyceria fluit	077		Plantago lan	124		Vaccin oxy	172
	Scorp scorp	216		Carex pancl	031		Glyceria not	078		Poa prat	125		Valeria offic	173
	Sphag fimb	217		Carex pulica	032		Hippuris	080		Poa triv	126		Veron an-aq	174
	Sphag angus	218		Carex ros	033		Holcus lan	081		Polygala serp	127		Veron becca	175
	Sphag capil	*241*		Carex brach	034		Hydrocot vul	082		Polygo amph	128		Veron caten	176
	Sphag cusp	219		Carex oed	035		Hyperic elod	083		Polygo hydro	129		Veron scutel	177
	Sphag dent	220		Carex virid	036		Hyperic tetrap	084		Potamo berc	131		Vicia cracca	178
	Sphag fallax	221		Cent nigra	037		Hypoch rad	085		Potamo color	132		Viola pal	179
	Sphag pal	222		Cerast font	038		Iris psuedo	086		Potamo crisp	133		Algae	233
	Sphag papil	223		Chara spp	039		Juncus acuti	087		Potamo lucen	134			
	Sphag recurv	224		Cicuta viro	040		Juncus artic	088		Potamo obtus	135			

Appendix 2

Results of Relevé Surveys

Quadrat 1 Relevé Card

Site Name	Tullyloyd and Tullycartron	**Relevé Size m²**	2m²	**Altitude (m)**	
Site Code	N/A	**Slope** degrees	N/A	**Aspect**	South
Relevé Code	001	**Survey Date**	18/05/2015		
County	RO	**Discovery Map No.**	N/A		
X Y Grid Ref	M 88933; 86252	**Water Sample Code No.**	N/A		
Surveyor(s)	Barry O'Loughlin and John Hynes	**Water Table Height (cm)**	-20cm		
Photo Nos.		**pH**	N/A		
		Conductivity	N/A		
Substrate type	**Peat**			**Depth (cm)**	Ca. 0.5m
Stability	**Very Firm**				
Management in Relevé	**Rough grazing**				
Adjacent landuse	**Semi-natural habitat, Rough Pasture & Improved pasture**				
Hydrology	The water table is estimated to be -20cm below the surface. Conditions were characterised as very dry and firm underfoot.				

Layers	Cover %	Height (cm)
Total Cover	80	
Tree	0	-
Shrub	0	-
Herbs/Grass/Sedge	80	15
Bryophytes	10	-
Litter	0	-
Bare Peat/Soil	20	-
Algal	0	-
Open Water	10	-

Fen Vegetation Type

Fen Habitat: The habitat at this location does not conform to Annex I Fen Habitat type.

Quadrat Description (Additional flora species surrounding area, 5 m radius; plus faunal records)

The quadrat is characterised by an encroachment of grassland species and broadleaved herbs associated with meadow grassland. Typical grassland species recorded at this location include Sweet Vernal Grass (*Anthoxanthum odoratum*) and Yorkshire Fog (*Holcus lanatus*). There is no surface water recorded at this location and substrate conditions are dry underfoot. The quadrat location is heavily poached due to cattle access. A drainage ditch occurs nearby. The habitat Rich Fen (PF1) forms mosaics with Improved agricultural grassland (GA1) and Wet grassland (GS4) at this location.

Cover value	**+:** single individual – no measurable cover	**1:** 1-2 individuals – no measurable cover	**2:** several individuals but less than 1% cover	**3:** 1-5%	**4:** 6-10%	**5:** 11-25%
		6: 26-33%	**7:** 34-50%	**8:** 51-75%	**9:** 76-90%	**10:** 91-100%

	Aneura ping			Sphag ripar		**2**	Cirsium dissectum			Juncus bulb			Potamo perfol	
	Aulocom pal			Sphag squarr		**2**	Cirsium palustre			Juncus cong			Potamo poly	
	Brachy riv			Sphag subnit			Cladium mar			Juncus eff			Pot erecta	
	Bry pseudo			Sphag subsec			Dactlyor incar			Juncus subn			Pot palust	
	Call gig			Thuid tamar			Dactlyor macu			Lemna min			Ranunc flam	
	Call stram			Toment nit			Dactlyor maj			Lemna tri			Ranunc ling	
4	Calliergonella cuspidata			Agros can			Dactyl glom			Leont autum			Rhynch alba	
	Calyp muell			Agrost stol			Descha caes			Littor unifl			Rorrip amph	
	Camp stell			Alisma pl aq			Drosera rot			Lotus ulig			Rorrip palus	
	Cinc font			Alnus glut			Dryopt affin			Luzula camp			Rumex atosa	
	Cladop fluit			Alop genic			Dryopt carth			Luzula mult			Rumex cong	
	Clim dend			Anag tenella			Dryopt fx-ma			Lynchnis flos			Rumex hydro	
	Craton filicin			Angel sylv			Eleoch mult			Lycopus eu			Salix aur	
	Ctenid moll		**5**	Anthoxanthum odoratu			Eleoch pal			Lysimac nem			Salix cin	
	Dicran scop			Apium inunda			Eleoch quin			Lythrum sal			Salix frag	
	Drep cosson			Apium nodi			Elodea can			Mentha aq			Salix rep	
	Drep revolv			Berula erec			Epilob hirs			Menyanthes			Salix vim	
	Euclad vertic			Betula pub			Epilob obscur		**3**	Molinia caerulea			Saxifrag aizo	
	Eurhyn prae			Bidens cer			Epilob palu			Myosot laxa			Schoeno lac	
	Fiss adian			Bidens tripar			Epilob parvi			Myosot secu		**4**	*Schoenus nigricans*	
	Font anti			Briza med			Epipactis pal			Myosot scor			Senecio aq	
	Hamat verni			Callitrich stag		**3**	Equisetum fluviatile			Myrica gale			Sparg erec	
	Hyloc splend			Calluna vul			Equis pal			Myrioph alter			Sparg min	
	Palust comm			Caltha pal			Equis varie			Myrioph spic			Stellar gram	
	Palust c v c			Cardam pra			Erica tet			Narth ossi			Stellar pal	
	Palust co v fa			Carex curta			Erioph ang			Nastur off			Stellar ulig	
	Pellia epi			Carex diand			Erioph lat			Nuphar lut		**5**	Succisa pratensis	
	Philon calc			Carex dioic			Erioph vag			Nymph alba			Thelyp pal	
	Plagio aff			Carex disti			Eupat cann			Oenanth aq			Trigloc pal	
	Plagio ellip			Carex echin			Fest arund			Oenanth croc			Typh ang	
	Pleur schre			Carex flac			Fest rub			Parnassia pal			Typha latif	
	Polyt comm			Carex hos		**4**	Filipendula ulmaria			Pedic palust			Utric austral	
	Scleropo pur			Carex lasio			Galium pal			Phalar arund			Utric inter	
	Rhizo punc			Carex limosa			Galium sax			Phragmites			Utric minor	
	Rhytid squar		**1**	Carex nigra			Galium ulig		**1**	Pinguicula vulgaris			Utric vulg	
	Rhytid triq		**8**	Carex panicea		**3**	Glyceria fluitans			Plantago lan			Vaccin oxy	
	Scorp scorp			Carex pancl			Glyceria not			Poa prat			Valeria offic	
	Sphag fimb			Carex pulica			Hippuris			Poa triv			Veron an-aq	
	Sphag angus			Carex ros		**5**	Holcus lanatus			Polygala serp			Veron becca	
	Sphag capil			Carex brach		**1**	Hydrocotyle vulgaris			Polygo amph			Veron caten	
	Sphag cusp			Carex oed		**1**	Hypericum elodes			Polygo hydro			Veron scutel	
	Sphag dent			Carex virid			Hyperic tetrap			Potamo berc			Vicia cracca	
	Sphag fallax			Cent nigra			Hypoch rad			Potamo color			Viola pal	
	Sphag pal			Cerast font			Iris psuedo			Potamo crisp			Algae	
	Sphag papil			Chara spp			Juncus acuti			Potamo lucen				
	Sphag recurv			Cicuta viro			Juncus artic			Potamo obtus				

Additional Species

Bellis perennis – 3 *Hylocomium splendens* – 3 *Poa* sp. – 4 *Potamogeton* sp. – 4 *Ranunculus acris* – 2	

Quadrat 2 Relevé Card

Site Name	Tullyloyd and Tullycartron	**Relevé Size m²**	2m²	**Altitude (m)**	
Site Code	N/A	**Slope** degrees	N/A	**Aspect**	South
Relevé Code	002	**Survey Date**	18/05/2015		
County	RO	**Discovery Map No.**	N/A		
X Y Grid Ref	M 88963; 86298	**Water Sample Code No.**	N/A		
Surveyor(s)	Barry O'Loughlin and John Hynes	**Water Table Height (cm)**	-20cm		
Photo Nos.		**pH**	N/A		
		Conductivity	N/A		
Substrate type	**Peat**			**Depth (cm)**	Ca. 0.5m
Stability	**Very Firm**				
Management in Relevé	**Rough grazing**				
Adjacent landuse	**Semi-natural habitat, Rough Pasture & Improved pasture**				
Hydrology	The water table is estimated to be -20cm below the surface. Conditions are firm underfoot.				

Layers	Cover %	Height (cm)
Total Cover	70	
Tree	0	-
Shrub	0	0
Herbs/Grass/Sedge	70	20
Bryophytes	10	-
Litter	0	-
Bare Peat/Soil	30	-
Algal	0	-
Open Water	<5	-

Fen Vegetation Type

Fen Habitat: The habitat at this location does not conform to Annex I Fen Habitat type.

Quadrat Description (Additional flora species surrounding area, 5 m radius; plus faunal records)

This location comprises an abundance of *Schoenus nigricans* in small tussock formations. The quadrat was taken from an area of Rich fen and flush (PF1) but does not conform to the E.U. Annex I habitat types 'alkaline fens (7230) and the priority habitat 'calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)'. There is a notable absence of brown moss indicator plant species typically associated with E.U Annex I habitats. The site is heavily poached due to cattle access (as indicated by areas of bare soil) and consequently suffers from nutrient enrichment as a result. The presence of broadleaved herbs and grasses together with a low water table suggests that the habitat is drying out. The moss species *Calliergonella cuspidata* was recorded at this location.

Cover value	**+:** single individual – no measurable cover	**1:** 1-2 individuals – no measurable cover	**2:** several individuals but less than 1% cover	**3:** 1-5%	**4:** 6-10%	**5:** 11-25%
		6: 26-33%	**7:** 34-50%	**8:** 51-75%	**9:** 76-90%	**10:** 91-100%

	Aneura ping			Sphag ripar			Cirsium dis			Juncus bulb			Potamo perfol		
	Aulocom pal			Sphag squarr			Cirsium pal			Juncus cong			Potamo poly		
	Brachy riv			Sphag subnit			Cladium mar		3	Juncus effusus		4	Potentilla erecta		
	Bry pseudo			Sphag subsec			Dactlyor incar			Juncus subn			Pot palust		
	Call gig			Thuid tamar			Dactlyor macu			Lemna min			Ranunc flam		
	Call stram			Toment nit			Dactlyor maj			Lemna tri			Ranunc ling		
1	Calliergonella cuspidata			Agros can			Dactyl glom			Leont autum			Rhynch alba		
	Calyp muell			Agrost stol			Descha caes			Littor unifl			Rorrip amph		
	Camp stell			Alisma pl aq			Drosera rot			Lotus ulig			Rorrip palus		
	Cinc font			Alnus glut			Dryopt affin			Luzula camp			Rumex atosa		
	Cladop fluit			Alop genic			Dryopt carth			Luzula mult			Rumex cong		
	Clim dend			Anag tenella			Dryopt fx-ma			Lynchnis flos			Rumex hydro		
	Craton filicin			Angel sylv			Eleoch mult			Lycopus eu			Salix aur		
	Ctenid moll		5	Anthoxanthum odoratu			Eleoch pal			Lysimac nem			Salix cin		
	Dicran scop			Apium inunda			Eleoch quin			Lythrum sal			Salix frag		
	Drep cosson			Apium nodi			Elodea can			Mentha aq			Salix rep		
	Drep revolv			Berula erec			Epilob hirs			Menyanthes			Salix vim		
	Euclad vertic			Betula pub			Epilob obscur		3	Molinia caerulea			Saxifrag aizo		
	Eurhyn prae			Bidens cer			Epilob palu			Myosot laxa			Schoeno lac		
	Fiss adian			Bidens tripar			Epilob parvi			Myosot secu		8	*Schoenus nigricans*		
	Font anti			Briza med			Epipactis pal			Myosot scor			Senecio aq		
	Hamat verni			Callitrich stag			Equisetum fluviatile			Myrica gale			Sparg erec		
	Hyloc splend			Calluna vul			Equis pal			Myrioph alter			Sparg min		
	Palust comm			Caltha pal			Equis varie			Myrioph spic			Stellar gram		
	Palust c v c			Cardam pra			Erica tet			Narth ossi			Stellar pal		
	Palust co v fa			Carex curta			Erioph ang			Nastur off			Stellar ulig		
	Pellia epi			Carex diand			Erioph lat			Nuphar lut		6	Succisa pratensis		
	Philon calc			Carex dioic			Erioph vag			Nymph alba			Thelyp pal		
	Plagio aff			Carex disti			Eupat cann			Oenanth aq			Trigloc pal		
	Plagio ellip			Carex echin			Fest arund			Oenanth croc			Typh ang		
	Pleur schre			Carex flac			Fest rub			Parnassia pal			Typha latif		
	Polyt comm			Carex hos			Filipendula ulmaria		3	Pedicularis palustris			Utric austral		
	Scleropo pur			Carex lasio			Galium pal			Phalar arund			Utric inter		
	Rhizo punc			Carex limosa			Galium sax			Phragmites			Utric minor		
	Rhytid squar			Carex nigra			Galium ulig		2	Pinguicula vulgaris			Utric vulg		
	Rhytid triq		4	Carex panicea		2	Glyceria fluitans			Plantago lan			Vaccin oxy		
	Scorp scorp			Carex pancl			Glyceria not			Poa prat			Valeria offic		
	Sphag fimb			Carex pulica			Hippuris			Poa triv			Veron an-aq		
	Sphag angus			Carex ros		4	Holcus lanatus		2	Polygala serpyllifolia			Veron becca		
	Sphag capil			Carex brach		1	Hydrocotyle vulgaris			Polygo amph			Veron caten		
	Sphag cusp			Carex oed			Hypericum elodes			Polygo hydro			Veron scutel		
	Sphag dent			Carex virid			Hyperic tetrap			Potamo berc			Vicia cracca		
	Sphag fallax			Cent nigra			Hypoch rad			Potamo color			Viola pal		
	Sphag pal			Cerast font			Iris psuedo			Potamo crisp			Algae		
	Sphag papil			Chara spp			Juncus acuti			Potamo lucen					
	Sphag recurv			Cicuta viro			Juncus artic			Potamo obtus					

Additional Species

Bellis perennis – 2 *Hylocomium splendens* – 4 Taraxacum sp. – 3	

Quadrat 3 Relevé Card

Site Name	Tullyloyd and Tullycartron	**Relevé Size m^2**	$2m^2$	**Altitude (m)**	
Site Code	N/A	**Slope** degrees	N/A	**Aspect**	South
Relevé Code	003	**Survey Date**		18/05/2015	
County	RO	**Discovery Map No.**		N/A	
X Y Grid Ref	M 89041; 86093	**Water Sample Code No.**		N/A	
Surveyor(s)	Barry O'Loughlin and John Hynes	**Water Table Height (cm)**		At surface	
Photo Nos.		**pH**	N/A		
		Conductivity	N/A		

Substrate type	**Peat**	**Depth (cm)**	Ca. >1m
Stability	**Some quaking**		
Management in Relevé	**None**		
Adjacent landuse	**Semi-natural habitat, Rough Pasture & Improved pasture**		
Hydrology	The water table was recorded at the surface with surface pools recorded at these locations.		

Layers	Cover %	Height (cm)
Total Cover	50	
Tree	0	-
Shrub	0	0
Herbs/Grass/Sedge	60	45
Bryophytes	10	-
Litter	0	-
Bare Peat/Soil	0	-
Algal	0	-
Open Water	50	-

Fen Vegetation Type

Fen Habitat: The habitat at this location conforms to the Annex I habitat 'alkaline fens (7230)'.

Quadrat Description (Additional flora species surrounding area, 5 m radius; plus faunal records)

This location comprises areas of standing water within an area classified as Rich fen and flush (PF1). The quadrat supports a number of indicator brown mosses typically associated with the Annex I habitat type 'alkaline fens (7230)' including *Scorpidium scorpioides*, *Calliergon giganteum* and *Drepanocladus intermedius* (recorded nearby). Other mosses recorded include *Calliergonella cuspidata.* With the exception of a drainage ditch located to the north (maintained by the OPW), there are no other threats and pressures recorded in this area. Based on the presence and cover of brown mosses, typical plant species recorded onsite together with the hydrology of the site (open pools and surface standing water) and absence of obvious threats and pressures (poaching, nutrient enrichment, drainage ditches, etc.), it has been assessed that the site conforms to the Annex I habitat type 'alkaline fens (7230)' and is deemed to be of national importance based on this information. The Rich fen component of this quadrat location conforms to the criterion '*Sites containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive. 'Viable areas' are defined as 'areas of a habitat which are of sufficient size, shape and integrity (in terms of species composition, ecological processes and function) such that it will endure in the face of unpredictable change*' (NRA, 2009)

Cover value	**+:** single individual – no measurable cover	**1:** 1-2 individuals – no measurable cover	**2:** several individuals but less than 1% cover	**3:** 1-5%	**4:** 6-10%	**5:** 11-25%
		6: 26-33%	**7:** 34-50%	**8:** 51-75%	**9:** 76-90%	**10:** 91-100%

	Aneura ping			Sphag ripar		**4**	Cirsium dissectum			Juncus bulb			Potamo perfol	
	Aulocom pal			Sphag squarr			Cirsium pal			Juncus cong			Potamo poly	
	Brachy riv			Sphag subnit			Cladium mar		**3**	Juncus effusus		**3**	Potentilla erecta	
	Bry pseudo			Sphag subsec			Dactlyor incar		**4**	Juncus subnodulosus			Pot palust	
4	Calliergon giganteum			Thuid tamar			Dactlyor macu			Lemna min			Ranunc flam	
	Call stram			Toment nit			Dactlyor maj			Lemna tri			Ranunc ling	
3	Calliergonella cuspidata			Agros can			Dactyl glom			Leont autum			Rhynch alba	
	Calyp muell			Agrost stol			Descha caes			Littor unifl			Rorrip amph	
	Camp stell			Alisma pl aq			Drosera rot			Lotus ulig			Rorrip palus	
	Cinc font			Alnus glut			Dryopt affin			Luzula camp			Rumex atosa	
	Cladop fluit			Alop genic			Dryopt carth			Luzula mult			Rumex cong	
	Clim dend			Anag tenella			Dryopt fx-ma			Lynchnis flos			Rumex hydro	
	Craton filicin			Angel sylv			Eleoch mult			Lycopus eu			Salix aur	
	Ctenid moll		**4**	Anthoxanthum odoratu			Eleoch pal			Lysimac nem			Salix cin	
	Dicran scop			Apium inunda			Eleoch quin			Lythrum sal			Salix frag	
	Drep cosson			Apium nodi			Elodea can		**3**	Mentha aquatica			Salix rep	
	Drep revolv			Berula erec			Epilob hirs		**3**	Menyanthes trifoliata			Salix vim	
	Euclad vertic			Betula pub			Epilob obscur		**8**	Molinia caerulea			Saxifrag aizo	
	Eurhyn prae			Bidens cer			Epilob palu			Myosot laxa			Schoeno lac	
	Fiss adian			Bidens tripar			Epilob parvi			Myosot secu		**7**	*Schoenus nigricans*	
	Font anti			Briza med			Epipactis pal			Myosot scor			Senecio aq	
	Hamat verni			Callitrich stag			Equisetum fluviatile			Myrica gale			Sparg erec	
	Hyloc splend			Calluna vul			Equis pal			Myrioph alter			Sparg min	
	Palust comm			Caltha pal			Equis varie			Myrioph spic			Stellar gram	
	Palust c v c		**2**	Cardamine pratensis			Erica tet			Narth ossi			Stellar pal	
	Palust co v fa			Carex curta		**5**	Eriophorum angustifoli			Nastur off			Stellar ulig	
	Pellia epi			Carex diand			Erioph lat			Nuphar lut		**4**	Succisa pratensis	
	Philon calc			Carex dioic			Erioph vag			Nymph alba			Thelyp pal	
	Plagio aff			Carex disti			Eupat cann			Oenanth aq			Trigloc pal	
	Plagio ellip			Carex echin			Fest arund			Oenanth croc			Typh ang	
	Pleur schre			Carex flac			Fest rub			Parnassia pal			Typha latif	
	Polyt comm			Carex hos		**3**	Filipendula ulmaria			Pedicularis palustris			Utric austral	
	Scleropo pur			Carex lasio		**2**	Galium palustre			Phalar arund			Utric inter	
	Rhizo punc			Carex limosa			Galium sax			Phragmites			Utric minor	
	Rhytid squar		**3**	Carex nigra			Galium ulig			Pinguicula vulgaris			Utric vulg	
	Rhytid triq		**6**	Carex panicea		**2**	Glyceria fluitans			Plantago lan			Vaccin oxy	
2	Scorp scorp			Carex pancl			Glyceria not			Poa prat			Valeria offic	
	Sphag fimb			Carex pulica			Hippuris			Poa triv			Veron an-aq	
	Sphag angus			Carex ros		**4**	Holcus lanatus			Polygala serpyllifolia			Veron becca	
	Sphag capil			Carex brach			Hydrocotyle vulgaris			Polygo amph			Veron caten	
	Sphag cusp			Carex oed			Hypericum elodes			Polygo hydro			Veron scutel	
	Sphag dent		**2**	Carex viridula			Hyperic tetrap			Potamo berc			Vicia cracca	
	Sphag fallax			Cent nigra			Hypoch rad			Potamo color			Viola pal	
	Sphag pal			Cerast font			Iris psuedo			Potamo crisp			Algae	
	Sphag papil			Chara spp			Juncus acuti			Potamo lucen				
	Sphag recurv			Cicuta viro			Juncus artic			Potamo obtus				

Additional Species

Quadrat 4 Relevé Card

Site Name	Tullyloyd and Tullycartron	**Relevé Size m^2**	$2m^2$	**Altitude (m)**	
Site Code	N/A	**Slope** degrees	N/A	**Aspect**	South
Relevé Code	004	**Survey Date**	11/09/2015		
County	RO	**Discovery Map No.**	N/A		
X Y Grid Ref	M 89056; 86247	**Water Sample Code No.**	N/A		
Surveyor(s)	Barry O'Loughlin	**Water Table Height (cm)**	At surface		
Photo Nos.		**pH**	N/A		
		Conductivity	N/A		
Substrate type	**Peat**			**Depth (cm)**	Ca. >1m
Stability	**Some quaking**				
Management in Relevé	**None**				
Adjacent landuse	**Agriculture (Rough Pasture & Improved pasture)**				
Hydrology	The water table was recorded at the surface with some surface water pools present.				

Layers	Cover %	Height (cm)
Total Cover	100	
Tree	0	-
Shrub	0	0
Herbs/Grass/Sedge	60	40
Bryophytes	10	-
Litter	0	-
Bare Peat/Soil	0	-
Algal	0	-
Open Water	5	-

Fen Vegetation Type

Fen Habitat: The habitat at this location corresponds to the Annex I habitat 'alkaline fens (7230)'.

Quadrat Description (Additional flora species surrounding area, 5 m radius; plus faunal records)

The quadrat location was taken from an area of habitat that corresponds to the habitat 'Rich fen and flush (PF1)'. The quadrat supports a number of indicator moss species typically associated with the Annex I habitat type 'alkaline fens (7230)' including *Calliergon giganteum*. Other mosses recorded include *Calliergonella cuspidata.* Based on the presence and cover of indicator moss sp., typical plant species recorded onsite together with the hydrology of the site (surface standing water) and absence of obvious threats and pressures (poaching, nutrient enrichment, intensive drainage network, etc.), it has been assessed that the site conforms to the Annex I habitat type 'alkaline fens (7230)' and is deemed to be of national importance based on this information.

Cover value	**+:** single individual – no measurable cover	**1:** 1-2 individuals – no measurable cover	**2:** several individuals but less than 1% cover	**3:** 1-5%	**4:** 6-10%	**5:** 11-25%
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	Aneura ping			Sphag ripar			Cirsium dissectum			Juncus bulb			Potamo perfol		
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	Brachy riv			Sphag subnit			Cladium mar			Juncus effusus			Potentilla erecta		
	Bry pseudo			Sphag subsec			Dactlyor incar		**3**	Juncus subnodulosus		**4**	Pot palust		
4	Calliergon giganteum			Thuid tamar			Dactlyor macu			Lemna min		**3**	Ranunc flam		
	Call stram			Toment nit			Dactlyor maj			Lemna tri			Ranunc ling		
5	Calliergonella cuspidata			Agros can			Dactyl glom			Leont autum			Rhynch alba		
	Calyp muell			Agrost stol			Descha caes			Littor unifl			Rorrip amph		
	Camp stell			Alisma pl aq			Drosera rot			Lotus ulig			Rorrip palus		
	Cinc font			Alnus glut			Dryopt affin			Luzula camp			Rumex atosa		
	Cladop fluit			Alop genic			Dryopt carth			Luzula mult			Rumex cong		
	Clim dend			Anag tenella			Dryopt fx-ma			Lynchnis flos			Rumex hydro		
	Craton filicin			Angel sylv			Eleoch mult			Lycopus eu			Salix aur		
	Ctenid moll		**5**	Anthoxanthum odoratu			Eleoch pal			Lysimac nem			Salix cin		
	Dicran scop			Apium inunda			Eleoch quin			Lythrum sal			Salix frag		
	Drep cosson			Apium nodi			Elodea can		**6**	Mentha aquatica			Salix rep		
	Drep revolv			Berula erec			Epilob hirs			Menyanthes trifoliata			Salix vim		
	Euclad vertic			Betula pub			Epilob obscur		**4**	Molinia caerulea			Saxifrag aizo		
	Eurhyn prae			Bidens cer			Epilob palu			Myosot laxa			Schoeno lac		
	Fiss adian			Bidens tripar			Epilob parvi			Myosot secu		**7**	Schoenus nigricans		
	Font anti		**5**	Briza med			Epipactis pal			Myosot scor			Senecio aq		
	Hamat verni			Callitrich stag		**3**	Equisetum fluviatile			Myrica gale			Sparg erec		
	Hyloc splend			Calluna vul			Equis pal			Myrioph alter			Sparg min		
	Palust comm			Caltha pal			Equis varie			Myrioph spic			Stellar gram		
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	Pellia epi			Carex diand			Erioph lat			Nuphar lut		**5**	Succisa pratensis		
	Philon calc			Carex dioic			Erioph vag			Nymph alba			Thelyp pal		
	Plagio aff			Carex disti			Eupat cann			Oenanth aq			Trigloc pal		
	Plagio ellip			Carex echin			Fest arund			Oenanth croc			Typh ang		
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	Rhytid squar			Carex nigra			Galium ulig			Pinguicula vulgaris			Utric vulg		
	Rhytid triq			Carex panicea			Glyceria fluitans			Plantago lan			Vaccin oxy		
	Scorp scorp		**3**	Carex pancl			Glyceria not			Poa prat			Valeria offic		
	Sphag fimb			Carex pulica			Hippuris			Poa triv			Veron an-aq		
	Sphag angus		**4**	Carex ros			Holcus lanatus			Polygala serpyllifolia			Veron becca		
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	Sphag cusp			Carex oed			Hypericum elodes			Polygo hydro			Veron scutel		
	Sphag dent			Carex viridula			Hyperic tetrap			Potamo berc			Vicia cracca		
	Sphag fallax			Cent nigra			Hypoch rad			Potamo color			Viola pal		
	Sphag pal			Cerast font			Iris psuedo			Potamo crisp			Algae		
	Sphag papil			Chara spp			Juncus acuti			Potamo lucen					
	Sphag recurv			Cicuta viro			Juncus artic			Potamo obtus					

Additional Species

APPENDIX 7.3

Assessment of Cregga Turlough 2015

Assessment of Cregga Turlough 2015

N5 Ballaghadereen to Scramoge Road Project

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

DOCUMENT DETAILS

Client:	Roscommon County Council
Project title:	N5 Ballaghadereen to Scramoge Road Project

Project Number:	140619
Document Title:	Assessment of Cregga Turlough 2015
Doc. File Name:	140619 – Turlough – 2016.08.05 – D4
Prepared By:	McCarthy Keville O'Sullivan Ltd. Planning & Environmental Consultants Block 1, G.F.S.C. Moneenageisha Road, Galway

Document Issue:

Rev	Status	Issue Date	Document File Name	Author(s)	Approved By:
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03	D3	07.03.2016	140619 – Turlough – 2016.03.07 – D3	RG/JH /PB	JH/PR
04	D4	05.08.2016	140619 – Turlough – 2016.08.05 – D3	RG/JH /PB	JH/PR

Table of Contents

1 INTRODUCTION

1.1 General Introduction

This report has been completed to provide information regarding the ecological and conservation status of a seasonal lake (Cregga Turlough), which lies 50m to the southwest of the proposed N5 Ballaghaderreen to Scramoge road alignment.

The proposed N5 Ballaghadereen to Scramoge Road Project extends from the townland of Rathkerry (Grid Ref: E169065 N293002), located west of Frenchpark, to the townland of Scramoge, east of Strokestown (Grid Ref: 196117 N279615), where the newly proposed road alignment will tie into the existing N5. The proposed N5 route is approximately 34km in length. Figure 1.1 shows the route of the proposed development.

1.2 Objectives

The classification and evaluation objectives of this report are as follows:

- To identify the limits of the turlough habitat
- To identify and classify the vegetation communities present
- To evaluate the conservation status of Cregga Turlough
- To determine if the habitat conforms to the Annex I priority habitat Turloughs [3180].
- To give an indication of the conservation value of Cregga Turlough

The assessment objectives can be summarised as follows:

- To provide the baseline information necessary to identify potential impacts of the proposed development on Cregga Turlough
- To provide the baseline information necessary to assess the direct, indirect and cumulative effects of the proposed road alignment on Cregga Turlough.

1.3 Site Location

Cregga Turlough is located approximately 3.2km to the north-west of Strokestown in County Roscommon (Grid Ref: 191780, 284530). The location of Cregga Turlough in relation to the proposed N5 land take is shown on Figure 1.2

1.4 Description of Area

Cregga Turlough is situated in a depression with a rounded ridge of hills along its eastern side and with elevated land to the west except at its central point where contours level to Annaghmore Lough, less than 1km away. There are no inflowing streams to the basin but an old channel leads west to Annaghmore Lough, presumably taking some overflow during high water.

The floor of the basin is undulating with a number of depressions trending NW-SE. These depressions hold temporary or more permanent ponds with the deepest being at the northern end. The waterbodies, shown on the Historic 6 Inch OSI map, lie in two of these depressions in the west of the basin but these were not found to be especially deep or wet during the field survey. Nearby is a shallow historic quarry (OSI Historic 25 inch map), which now appears to flood independently of the main turlough basin.

The basin is divided into about 5 fields but is all grazed by cattle.

Plate 1.1 North Cregga Turlough, February 2015

2 METHODOLOGY AND LIMITATIONS

The flora and habitats of the Cregga Turlough were assessed by means of a desk study of information and literature pertinent to the site and surrounding area. Information pertaining to legislation/designations and other notable ecological records were reviewed. A field survey of the site was also carried out including a survey of flora, fauna and general observation work.

The site and assessment was conducted on the 24th of June 2015 by Roger Goodwillie of Roger Goodwillie & Associates who was met on-site by John Hynes (B.Sc., M.Sc., GradCIEEM). The site visit was conducted during the recognised optimum period for vegetation surveys/habitat mapping i.e. May to September (Smith et al., 2011).

The site was systematically walked, noting key botanical features and the extent of identified vegetation communities. The limits of the identified vegetation communities were sketched onto field maps and later digitised using OSI vector mapping and the GIS software programme MapInfo 10.5. The dominant species from each identified vegetation community were identified in the field and the vegetation community later classified in accordance with Waldren (2015). This thesis report documents the vegetation communities of 22 turloughs from counties Galway, Clare, Roscommon and Mayo and 28 vegetation communities associated with Turlough habitats. These communities range from the fully aquatic to terrestrial, with a range of intermediate vegetation types.

3 DESKTOP REVIEW

3.1.1 Turloughs * [3180]

Information on this habitat was gained from the NPWS (2013) *The Status of EU Protected Habitats and Species in Ireland Habitat* Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. Hereafter referred to as the NPWS Article 17 report.

The habitat account in that document reads as follows:

> *A turlough is a depression in karst limestone that temporarily and/or seasonally floods from groundwater. There is usually winter flooding, and recession of flood water during summer, though this varies greatly with rainfall and groundwater dynamics, and there is considerable variation in flooding regime among different turloughs. Turloughs lack a permanent overland outflow, though sometimes there is overland inflow. They are entirely restricted to well-bedded, relatively pure karst Carboniferous limestone. Turloughs typically contain wetland vegetation communities in their lower zones, and communities more characteristic of drier limestone soils in their upper zones. Turloughs therefore do not generally contain unique vegetation types and in some cases may not be easy to distinguish from other wetlands; the NPWS database of turloughs (Mayes, 2008) contains many areas identified as potential turloughs, but which await detailed on site verification. Turloughs contain numerous specialist aquatic invertebrates; they also provide important winter feeding grounds for several species of waterfowl and wading birds, with some of these species utilising the habitat for breeding. Turloughs are largely restricted to Ireland, though turloughs have also been described very locally from Estonia, Germany, Slovenia and Wales.*

The range (biogeographical occurrence) and area (habitat coverage) of this habitat in Ireland has been assessed as favourable in the NPWS Article 17 Report (2013a).

The specific structure and functions (including species) and future prospects for the habitat have both been assessed as inadequate (stable). On the basis of the above, the overall assessment of conservation status is inadequate with the overall trend assessed as stable.

The main pressures and threats identified in the Article 17 report are listed below:

Pressures

- Intensive cattle grazing (medium importance)
- Diffuse groundwater pollution due to agricultural and forestry activities (medium importance)
- Diffuse groundwater pollution due to non-sewered population (low importance)
- Stock feeding (low importance)
- Pollution to groundwater (point sources and diffuse sources) (low importance)

Threats

- Diffuse groundwater pollution due to non-sewered population (low importance)
- Intensive cattle grazing (medium importance)
- Diffuse groundwater pollution due to agricultural and forestry activities (medium importance)
- Agricultural intensification (low importance)
- Removal of stone walls and embankments (low importance)
- Flooding and rising precipitations (low importance)
- Grassland removal for arable land (low importance)
- Pollution to groundwater (point sources and diffuse sources) (low importance)
- Abandonment of pastoral systems, lack of grazing (low importance)

Table 3.1. Targets and Attributes associated with site specific conservation objectives for Turloughs [3180]

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes.
Habitat distribution	No decline subject to natural processes
Hydrological regime: flood duration, frequency, area, depth, permanently flooded area	Appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat
Soil type: area	Variety, area and extent of soil types necessary to support turlough vegetation and other biota
Soil nutrient status: nitrogen and phosphorus	Nutrient status appropriate to soil types
Physical structure bare ground	Sufficient wet bare ground as appropriate
Chemical processes: calcium carbonate deposition and concentration	Appropriate $CaCO_3$ deposition rates and concentration in soil
Water quality: nutrients; colour; phytoplankton; epiphyton	Appropriate water quality to support the natural structure and functioning of the habitat
Active peat formation	Active peat formation where appropriate
Vegetation composition: area of vegetation communities	Maintain area of sensitive and high conservation value vegetation communities/units at each turlough
Vegetation composition: vegetation zonation	Maintain vegetation zonation/mosaic characteristic of each turlough
Vegetation structure: sward height	Sward heights appropriate to the vegetation unit, and a variety of sward heights across each turlough
Typical species: terrestrial, wetland and aquatic plants, invertebrates and birds	Maintain typical species within and across all turloughs
Fringing habitat: area	Maintain marginal fringing habitats that support turlough vegetation, invertebrate mammal and/or bird populations
Vegetation structure: turlough woodland	Maintain appropriate turlough woodland diversity and structure

3.2 Geological Context

Cregga Turlough lies on a Regionally Important Aquifer – Karstified (conduit) and occurs within and has been assigned the National Vulnerability classifications Extreme (E) and Rock at or near Surface or Karst (X) (GSI web-mapper, 2015).

There is an identified Karst feature in the form of an enclosed depression located towards the central basin of the turlough at Grid Ref: 191782, 284682 (GSI web-mapper, 2015). Cregga Turlough occurs within the Geological Heritage site Mid Roscommon Ribbed

Moraines. This field of ribbed moraine forms part of a small, discrete field northwest of Slieve Bawn and the moraines form the perfect 'ribbed' topography (GSI web-mapper, 2015).

4 BASELINE ENVIRONMENT

4.1 Flora

The vegetation is relatively uniform in that a similar pattern exists around most of the ponds and depressions. The edges give rise to other communities, partly interfered with by scrub clearance (and filling in the NE corner). Eight plant communities can be recognised and these are illustrated on Figure 4.1. The map has been derived from field survey and cross referenced with high definition satellite orthophotography. The community classification and nomenclature follows the criteria set out in Waldren (2015). It may be pointed out that community names are generally those of characteristic species which do not have to be the most frequent plants within the identified community. Thus *Carex nigra* or *Cardamine pratensis* occur in a wide range of communities but are not used in the nomenclature.

1. ***Persicaria amphibia-Mentha aquatica***
This occupies the most permanent waterbodies, at the centres of the depressions which were still flooded at the time of the visit in June. *Oenanthe aquatica*, *Ranunculus aquatilis* and *Hippuris vulgaris* are present along with the above.

2. ***Persicaria amphibia/Eleocharis palustris***
The edges of ponds and other water tracks which still have *Persicaria amphibia* but also *Apium inundatum*, *Veronica scutellata*, *Cardamine pratensis*

3. ***Eleocharis palustris-Ranunculus flammula*** community
The most widespread community in the basin showing much reddish *Juncus articulatus* and *Galium palustre* as well as the named species.

4. ***Carex hostiana/Cirsium dissectum***,
Occupying mid-level ground on the western side, the sedge gives this a yellowish colour on the generally green background. *Lysimachia vulgaris* is relatively common, along with *Lythrum salicaria* and *Senecio aquaticus*.

5. ***Filipendula/Vicia cracca***
An edging community of (potentially) tall herbs depending on grazing levels, this contains other noticeable species such as *Lotus corniculatus*, *Potentilla erecta*, *P.anserina* and *Festuca (Schedonorus) arundinacea*.

6. ***Agrostis stolonifera-Ranunculus repens***
This is a grassy community characteristic of the north end of the turlough where the grazing (and manuring) by cattle is most intense and the ground dries out early. *Carex hirta*, *Leontodon (Scorzoneroides) autumnalis* and *Iris pseudacorus* are common.

7. **Limestone grassland**
This is the top edge of turlough vegetation where the shallow, rocky soil is inundated for the shortest period in winter. *Succisa pratensis*, *Galium verum* and *Thymus polytrichus* were frequent. It contains noticeable *Viola canina* but this also extends to deeper levels.

8. ***Lolium perenne – Trifolium repens***
Growing on slightly deeper or enriched soil, particularly at the southern end, this vegetation is grazed frequently and contains *Bellis perennis*, *Prunella vulgaris* and *Festuca rubra*.

4.2 Fauna

Cregga Turlough is an important overwintering site for a range of wildfowl species. Wigeon, Little grebe, Tufted Duck, Mallard, Mute Swan and Lesser Black-backed Gull were recorded from the site during dedicated winter vantage point and point count surveys conducted

during the winter of 2014/2015. In addition, a Whooper Swan population of county importance, peak count 81 birds, was recorded utilising Cregga Turlough and adjacent grassland habitats during the overwintering period. Whooper Swan is listed on Annex I of the EU Birds Directive. Detailed information on Winter and Breeding Bird surveys are provided in Appendices 9 and 10, respectively, of the Flora and Fauna Chapter

Dedicated breeding bird surveys of the turlough basin were conducted during the 2015 breeding season the results of which are provided in the Flora and Fauna Chapter.
Hydrology
Cregga Turlough is situated in a depression with a rounded ridge of hills along the eastern side and relatively high land to the west except at the central point where the contours lead to Annaghmore Lough, less than 1km away. The proposed road development runs north and north-east of Cregga Turlough between Ch.36+600 and Ch.37+950. Setback distances from the proposed road adjacent to the Turlough are between 100 – 250m.

Due to the undulating nature of the landscape at this location, sections of the proposed N5 alignment require significant earthworks as it passes the Turlough including large cuttings between chainages 35+150 to 36+450 and 36+900 to 37+650.

The Turlough receives surface runoff from surrounding areas and discharges directly to groundwater through its base. It is therefore imperative that any silt and sediment laden waters running off the construction works are controlled through interception and settlement in sedimentation ponds prior to discharge.

4.3 Discussion

All the vegetation communities observed during the site visit correspond with typical turlough communities as outlined in Waldren (2015) and fulfil the criteria for Annex I habitat (3180) also as defined in the Interpretation Manual of European Union Habitats (2013). The site has a flooding pattern consistent with a turlough, drying out only in April and May. The site has also been classified as a Turlough (3180), named "*Cuilrevagh/turlough se of Caldragh"* on the NPWS Article 17 Turlough Point Distribution GIS Dataset Some surface drainage must enter the basin as run-off but there are no identifiable or mapped streams, strongly indicating the site is fed by groundwater.

'Turlough' has a limited definition in the Interpretation Manual of European Union Habitats (2013) but one which is fulfilled by Cregga.

> "*Temporary lakes principally filled by subterranean waters and particular to karstic limestone areas. Most flood in the autumn and then dry up between April and July. However, some may flood at any time of the year after heavy rainfall and dry out again in a few days; others, close to the sea, may be affected by the tide in summer. These lakes fill and empty at particular places. The soils are quite variable, including limestone bedrock, marls, peat, clay and humus, while aquatic conditions range from ultra-oligotrophic to eutrophic. The vegetation mainly belongs to the alliance Lolio-Potentillion anserinaeTx. 1947, but also to the Caricion davallianae Klika 1934"*

Only two mosses, *Cinclidotus fontinaloides* and *Fontinalis antipyretica* (both of which occur at Cregga Turlough) are identified as diagnostic of the habitat. Subsequent work within the NPWS, Turlough (3180) Conservation Status Assessment Report, lists 54 characteristic plants, 32 of which occur at Cregga. None of these are exclusively turlough species as detailed there.

The notable features of Cregga Turlough are its uniformity – one main type of vegetation covers most of the base and pools occur regularly through this – its light degree of grazing and the lack of consequent weedy communities and the general naturalness of the turlough. The only threats and pressures, which relate back to the Attributes and Targets of the

habitat listed in Table 3.1 above, are marginal infill at the NE end from an adjacent quarry and some recent scrub clearance nearby. The presence of the quarry itself which is about 625m away at its nearest point may influence rainfall penetration to groundwater.

Infilling in the NE end has reduced the turlough area marginally. The removal of the fringing scrub to the North West has resulted in the loss of cover habitat for a range of bird species; however scrub clearance and subsequent grassland restoration is likely to result in an increase in grassland habitat which may be utilised by foraging Whooper Swans in subsequent overwintering periods.

In terms of conservation status, Cregga Turlough is of considerable ecological value and its vegetation and function are considered to be of equivalent standing to Turlough sites designated as Special Areas of Conservation (SAC) or Natural Heritage Areas (NHA). To date, the site is not afforded national or European level protection. However, it is considered to be of **National** value, given that it is a site which merits designation as a NHA (NRA 2009). Based on the expert opinion of the author the site would be considered as of lower value to Brierfield pNHA (Site Code (0594) and possibly Castleplunket pNHA (0598) but higher than Newtown pNHA (1646), Corbally pNHA (1627), Carrowreagh pNHA (1624) and Rathnalulleagh pNHA (0613).

5 IMPACT ASSESSMENT

5.1 Direct Impacts

The proposed road development has been constraint-led from the initial phases of route selection. Throughout an iterative design process, sensitive habitats such as Cregga Turlough have been avoided in the design of the Project. Consequently there is no potential for Direct Impacts on Cregga Turlough. .

5.2 Indirect Impacts

5.2.1 Construction Phase Impacts

Potential indirect impacts in the absence of mitigation include changes to the hydrological regime of the Turlough resulting from road construction and cut and fill located above the level of the Turlough. Effects may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the Turlough. In addition, this Turlough is hydrologically linked to Annaghmore Lough SAC and hydrological impacts could potentially impact on this receptor also.

Other possible indirect impacts in the absence of mitigation include the interception of drainage paths by the Road formation resulting in diversion of waters and in a dewatering effect on adjacent soils and wetland areas.

5.2.2 Operational Phase Impacts

Potential Indirect operational impacts on hydrology are similar to those predicted during the construction phase.

The deep cutting will intercept hill slope runoff, interflow and groundwater recharge and flow which could potentially impact on the flow regime, the water balance and the water chemistry of the Turlough. Such an impact is considered to represent a potential significant impact to the hydrological function of the Turlough Habitat.

5.2.3 Ecological Significance of Impacts if Unmitigated

Pollution of the Turlough during the construction phase is considered to be a potential Short Term Moderate-Significant Negative Impact in that it would potentially result in an alteration of the character of the habitat rather that a permanent or widespread alteration of the habitat. It is considered that impacts could be reversible through appropriate design and mitigation.

Changes to the hydrological regime represent a more Permanent Significant Negative Impact in that the proposed works have the potential to permanently alter the hydrological function of this Turlough habitat on an ongoing basis. It is considered that this impact is irreversible.

It is considered that, in the absence of mitigation, the proposed road development has the potential to result in significant impacts on this Ecological Receptor at the National level.

5.3 Mitigation

The following sections outline the measures proposed to prevent and avoid indirect hydrological impacts on Cregga Turlough during the construction and operation phase of the proposed development.

Construction Stage

The water balance to the Turlough during construction must be maintained and therefore cut-off drains shall be provided to direct waters away from the construction site and to the Turlough.

The following specific construction requirements to reduce potential contamination impacts upon the Turlough will be put in place:

- Site works will be limited to the minimum required to undertake the necessary elements of the project.
- Baseline conditions have been previously established for water quality in the Turlough. In addition pre-construction water quality monitoring shall take place in the Turlough with a minimum of six monthly samples being taken to establish baseline conditions.
- A water quality monitoring programme will be undertaken by the contractor at suitable locations in the receiving watercourse/waterbody during the construction phase. It will be continued post construction of the road for a period of 24 months to enable the identification of any changes in water quality parameters.
- Top soil stripping in proximity to the Turlough will be undertaken as much as feasible in dry weather conditions and all stockpiles shall be located as far as practically possible away from the Turlough.
- The storage of oils, fuel, chemicals, hydraulic fluids, shall only take place within site compounds and will be located at a minimum distance of 10m from any watercourse. Storage shall be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005 Oil Storage Guidelines).
- All machinery operating in the works area adjacent to the Turlough will be steam-cleaned in advance of works and routinely checked to ensure no leakage of oils or lubricants occurs.

Detailed and specific construction sequencing together with specific drainage designs are proposed surrounding Cregga Turlough. The construction sequence for cuttings adjacent to the Turlough shall ensure that they are completed in sections so that the base gradient allows conveyance to temporary settlement ponds located within the cutting. A temporary settlement pond may be relocated as the dig advances with the preceding settlement area only filled in once the new settlement area is operational and the road and cutting drainage is constructed. Settlement ponds, temporary or otherwise, will be constructed prior to the excavation works commencing and will be constructed as detailed in the Construction Erosion and Sediment Control Plan (CESCP). During construction, impermeable barriers will be placed at 50m intervals in the proposed permeable infiltration galleries (see next section) to prevent runoff of pollutants to surface and ground waters.

Operational Stage
The road construction and cutting into the hillslopes east of Cregga Turlough have the potential to intercept and divert necessary and significant recharge waters from the Turlough. Without mitigation a significant volume of recharge water could be intercepted and diverted northwest in the road drainage system to the Ovaun stream that outfalls to Clooncullaan Lough.

The design of this section of the proposed road (Ch. 36+000 to Ch. 38+600) has included suitable drainage design to separate the natural hill slope runoff, interflow and ground waters from the potentially contaminated road pavement waters. Recharge flow from the cuttings will be collected in a separate filter drain and discharged to the Turlough at two separate outfall locations via an infiltration basin so as to maintain the recharge regime of Cregga Turlough.

To capture and separate natural water runoff from up-gradient lands, cut-off ditches will be provided along the up-gradient boundary of the cut section (which is in the natural catchment of the Turlough). The intercepted water will be allowed to discharge to the Turlough through infiltration galleries constructed between Ch. 36+500 to Ch. 36+700, Ch. 37+670 to Ch. 37+870 and Ch. 38+030 to Ch. 38+130 to facilitate the natural recharge of the Turlough. These infiltration galleries are to be utilised during the operational phase of the proposed road development to allow natural recharge water to drain to the Turlough. The inclusion of impermeable barriers at 50m intervals in the permeable infiltration galleries will restrict water flowing laterally along the road formation and will direct water towards the Turlough.

No direct discharge of road pavement runoff waters to the Turlough will be permitted. This will avoid any potential pollution of the Turlough and its groundwater system. This also avoids any potential downstream impacts to Annaghmore Lough cSAC as the Cregga Turlough in flood conditions overflows via a surface drain to the Lough. The road pavement waters will be collected in a sealed drainage system and discharged to the Ovaun Stream Outfall at Ch. 34+650. They represent c.6% of the total turlough catchment.

5.4 Residual Impacts

Table 5.2 Assessment of Residual Impacts

Residual Impacts			
Stage	Description of Impact (pre-mitigation)	Summary of Mitigation Measure Proposed	Residual Impact
Construction	Changes to the hydrological regime of the Turlough resulting from road construction, cut and fill located up gradient of the Turlough. Construction activity may include the run off of silt and other pollutants during the construction phase of the development from the construction site to the Turlough. In addition, this Turlough is hydrologically linked to Annaghmore Lough SAC and hydrological impacts could potentially impact on this receptor also. Other possible indirect impacts in the absence of mitigation include the interception of drainage paths by the permeable Road formation (off pavement) resulting in diversion of waters and in a dewatering effect on adjacent soils and wetland areas.	A Construction Sediment Erosion and Control Plan (CSECP) has been prepared. The measures outlined above in section 5.3 shall be adhered to during construction and operation of the proposed road. In addition an Environmental Operating Plan (EOP) will also be put in place. The measures outlined in the CSECP and the EOP will ensure no adverse impacts on the hydrological regime or water quality occur.	Slight

Operational	Potential Indirect operational impacts on hydrology are similar to those predicted during the construction phase. The deep cutting will intercept hill slope runoff, interflow and groundwater recharge and flow which will potentially impact on the flow regime, the water balance and the water chemistry of the Turlough. Such an impact is considered to represent a potential significant impact to the hydrological function of the Turlough Habitat.	Interceptor ditches and filter drains will collect existing overland and interflow which discharge to the Turlough in three distribution galleries between Ch.36+500 to Ch.36+700, between Ch.37+670 to Ch. 37+870 and between Ch.38+030 to Ch.38+130,. The existing ground will be excavated to bedrock and filled with free draining material to existing ground level to facilitate the dispersal/infiltration of overland drainage intercepted by the scheme. The provision of transverse impermeable bunds at 50m intervals to prevent longitudinal flow of sub-surface water will be incorporated within the free draining material. This will ensure that the existing water balance of the Turlough is maintained.	Slight

6 CONCLUSIONS

Cregga Turlough is of considerable ecological value and is classified as an ecological receptor of National Importance.

Direct Impacts on Cregga Turlough have been avoided by the design of the Road Project . After implementation of the mitigation measures outlined in Section 5.2.1 above, only slight residual impacts on the Turlough are anticipated.

Overall, significant impacts on the ecological functioning of Cregga Turlough are not anticipated.

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APPENDIX 7.4

Watercourse Crossing Report

Watercourse Crossing Report

N5 Ballaghaderreen to Scramoge Road Project

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

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1 INTRODUCTION

1.1 General Introduction

This report has been completed to provide information regarding the nature of watercourses that are crossed by the proposed N5 Ballaghaderreen to Scramoge road project.

The proposed N5 Ballaghadereen to Scramoge Road Project extends from the townland of Rathkerry (Grid Ref: E169065 N293002), located west of Frenchpark, to the townland of Scramoge, east of Strokestown (Grid Ref: E196117 N279615), where the newly proposed N5 preferred route option will tie into the existing N5. The proposed N5 route is approximately 34.2 km in length. The proposed N5 is located entirely within the Upper Shannon Hydrological Catchment (EPA, web mapper 2015).

The current report provides details of the river habitats at these crossing points. This information will highlight any ecological constraints that may be identified and inform the design team with regard to the construction of the structures and any mitigation that is required. The ecological assessment is based on a desk study and field visits by suitably qualified ecologists.

Much of the route of the proposed road is located in a karst limestone area and as such there were relatively few watercourses with only six major watercourses encountered. Drainage ditches that were small in size and appeared to be entirely man-made and form part of a land drainage network were not included in the assessment. The location of the watercourses that were subject to assessment are shown in Figure 1.1. and listed below.

1. Scramoge/Mountain River
2. Un-named Stream C51+150
3. Upper Owenur River
4. Un-named StreamC21+325
5. Owennaforeesha River
6. Un-named Stream C12+700
7. Carricknabraher River
8. Watercourse at C22+000 (Identified by Inland Fisheries Ireland)
9. Watercourse at C33+250 (Identified by Inland Fisheries Ireland)

1.2 Methodology and Limitations

The watercourses that are assessed in this document were first identified from preliminary desk studies of aerial photographs and OSI Discovery Range 1:50,000 maps of the area undertaken prior to field surveys. The identified watercourses were briefly assessed during the multidisciplinary walkover survey that was undertaken conducted on 14 and 28 July and 31 October 2014. During the surveys, watercourses 1-7, as listed above, were selected for further assessment due to their size, naturalness or connectivity with larger or more sensitive rivers. Assessment of these watercourses was conducted on the 13 February (Otter Survey) and 27 March 2015.

In a preliminary design response in October 2015, watercourses at C22+000 and C33+250 were identified by Inland Fisheries Ireland (IFI) as having fisheries potential or having connectivity with fish-bearing waters. The watercourse at C33+250 was assessed on 6 October 2015 and the watercourse at C22+250 was assessed on 23 November 2015.

The watercourses were surveyed up to a distance of 250m either side of the proposed crossing points. Notes on the, morphology, physical characteristics and potential of the river

habitat to support protected flora and fauna including (Otter, Kingfisher fisheries etc.) were recorded. Information regarding riparian habitats, macrophytes present and any other ecological information was recorded. These watercourses were also studied as part of Otter surveys that were undertaken.

The descriptive terms *right bank* and *left bank* are relative to an observer looking downstream in which the right bank is to the observer's right. (Standard Convention)

The watercourses listed above were identified as having potential to support White-clawed Crayfish (*Austropotamobius pallipes*), with is listed on Annex II of Directive 92/43/EEC (Habitats Directive). Where possible, hand searches were conducted for this species (under Licence No. C161/2015). Where encountered, Otter spraints were also examined for the presence of crayfish remains, which would give an indication as to whether the species was present in the area.

Detailed fish stock surveys were not conducted given that significant impacts to fisheries are not anticipated. This followed the guidance outlined in NRA (2009) guidelines, which states that "*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*".

The watercourse assessments were undertaken by Pat Roberts B.Sc. (Env.) MCIEEM and John Hynes B.Sc. (Env.) GradCIEEM with assistance from Laoise Kelly B.Sc. (Env.).

Pat Roberts has completed numerous river corridor studies and morphology studies whilst working as a contracted lead ecologist on Ecological Assessments for the Office of Public Works (OPW) nationwide drainage schemes from 2009 to 2011. He has also worked closely with IFI on a number of projects including a proposed re-grading of the Bandon River as part of a flood relief scheme and a number of fisheries enhancement works on OPW channels. He has completed a course on freshwater invertebrate sampling (Field Studies Council), has held licences for Stage One and Two surveys for the protected species Freshwater Pearl Mussel (*Margaritifera margaritifera*) and has extensive experience of surveying for this species.

John Hynes has completed numerous river corridor and morphology studies whilst working as a contracted ecologist on Ecological Assessments for the OPW nationwide drainage schemes in 2013. In addition, John worked for the Western River Basin District Office in Galway County Council in 2012, prioritizing watercourses for assessment based on the water quality, morphology, ecological and other available data.

Laoise Kelly is proficient in the Small Streams Risk Assessment methodology and has gained experience of water quality/watercourse evaluation in the course of her position as an assistant ecologist with McCarthy Keville O'Sullivan.

1.3 EPA Water Quality

The EPA Envision map viewer was consulted on 10 December 2015 regarding the water quality status of the watercourses within the study area. The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample.

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The online EPA Envision map viewer provides access to water quality information at individual

waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters] and coastal waters) or to groundwaters.

Table 1.1 shows the information retrieved regarding water quality status at the major watercourse crossings within the study area.

Table 1.1 EPA Envision Water Quality Results

River	WFD Status 2010-2012	Q-Value Status (2004-Present)
Scramoge River	This watercourse has been assigned Poor Status at the proposed crossing point	Q4 – Good Status (Sample point upstream of crossing location at Scramoge Bridge, Grid ref; 195279, 279468)
Unnamed Stream C51+150	This watercourse has been assigned Poor Status at the proposed crossing point	Q3-4 – Moderate Status (Sample point upstream of crossing at Grid ref: 194263, 280948)
Upper Owenur River	The watercourse has been assigned Good Status at the proposed crossing point	Q4 – Good Status (Sample point downstream of crossing at Bridge near Ballyoughter House, Grid ref: 187249, 286534)
Unnamed Stream C22+175	The watercourse has been assigned Good Status at the proposed crossing point	Q4 – Good Status (Sample point downstream of crossing at N61 Bridge, Grid ref: 173666, 290293)
Owennaforeesha River	The watercourse has been assigned Poor Status at the proposed crossing point	Q3-4 – Moderate Status (Sample point upstream of crossing at Bellanagare Bridge, Grid ref: 175020, 287506)
Unnamed Stream C12+700	The watercourse has been assigned Poor Status at the proposed crossing point	None on watercourse
Carricknabraher River	The watercourse has been assigned Good Status at the proposed crossing point, reducing to Poor further downstream	Q4 – Good Status (Sample point downstream of crossing at Cloonshanville Bridge, Grid ref: 173666, 290293)

2 SURVEY RESULTS

2.1 Scramoge/Mountain River

2.1.1 General Description

2.1.1.1 Crossing Point

The crossing ID for the Scramoge River is N5-C12 and it occurs at chainage 52+830. The channel at the crossing point consisted of a Depositing/lowland river (FW2) (see Plate 2.1). The river was approximately 10-12 m wide, 0.8-1 m deep (February site visit), with a substrate dominated by silt. The channel had been arterially drained in the past and the river banks were high and sloping. The river had been recently dredged from the western bank and there was a berm of silt spread on the left (western) bank. In-stream vegetation was sparse, probably due to the recent maintenance works having been undertaken. There was no woody bankside vegetation at the crossing point, with Wet grassland (GS4) and Improved agricultural grassland (GA1) dominating the fields surrounding the river. The banks supported grassy vegetation classified as Dry meadows and grassy verges (GS2). Areas where dredged material had been spread on the bank were classified as Spoil and bare ground (ED2) and Recolonising bare ground (ED3) where vegetation was starting to

recolonise. There were Tree lines (WL2) close to the crossing point but none at the proposed crossing point.

In addition to the crossing of the Scramoge River, the proposed route also crosses over a small channelised stream (tributary of the Scramoge River) that flows into the river from the south east. This channel is narrow (approx. 1.5 m) and is overgrown with Bramble-dominated Scrub (WS1) that accompanies a Tree line (WL2). This stream has been subject to straightening in the past. The watercourse has a gravel and cobble substrate and offers potential connectivity for wildlife to a woodland area to the south east of the crossing point (see Plate 2.2). The gravelly substrate in this stream was considered to provide suitable habitat for spawning salmonid species and a potential juvenile nursery area.

Plate 2.1. The recently maintained Scramoge/Mountain River close to the crossing point for the proposed road.

Plate 2.2. Small Stream that flows into the Scramoge River.

2.1.1.2 Wider Areas surveyed

The existing Scramoge River channel over the course of the 500 m survey area was homogenous. The in-stream vegetation was generally sparse, probably due to the recent maintenance activity. The banks supported vegetation that was, in general, uniform (only one vegetation type) or simple (two to three vegetation types). The habitat types on the banks varied from improved wet grassland (GS4) at the downstream end to an unimproved wet grassland (GS4) with some scrub (WS1) and isolated trees upstream of the crossing point. A number of large Drainage ditches (FW4) entered the river from both the right and left banks throughout the 500 m surveyed. The entire area surveyed is shown in Figure 2.1.

2.1.2 River Features

The Scramoge River at the crossing point and within the 500 m surveyed exhibited no natural features such as riffles or pools. The channel was dominated by a depositing glide habitat with a silty substrate and graded banks.

The tributary of the Scramoge River that flows in from the south east was narrow and very shallow at the time of the visit and had been subject to historic morphological modifications including dredging and straightening.

2.1.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.1 Vegetation Recorded within the Scramoge River at the Crossing Point

Aquatic	Emergent	Bankside
Broadleaved Pondweed (*Potamogeton natans*)	Yellow Flag (*Iris pseudacorus*)	Hard Rush (*Juncus inflexus*)

Aquatic	Emergent	Bankside
Floating Sweet Grass (*Glyceria fluitans*)	Common Reed (*Phragmites australis*)	Broad Leaved Dock (*Rumex obtusifolius*)
Water Starwort (*Callitriche* sp.)	Reed Sweet Grass (*Phalaris arundinacaea*)	Curled Dock (*Rumex crispus*)
Water Mint (*Mentha aquatica*)	Fools watercress (*Apium nodiflorum*)	
	Willowherb (*Epilobium* sp.)	

2.1.3 Other Ecological Information

Other features of ecological interest that were recorded during the assessment are presented below:

- Shells of *Anodonta* sp. (a non-margaratiferid bivalve) were recorded in the dredged material on the bank.
- Birds of interest seen or heard included Chiff Chaff, Moorhen and Heron.
- Otter spraint, prints and a couch were recorded. This species is listed on Annexes II and IV of the Habitats Directive and is assessed in a separate report.
- Crayfish remains were identified from the Otter spraint and the species is assumed present within the watercourse though none were recorded during dedicated surveys.
- Silt accumulations which may provide nursery areas for Lamprey ammocoetes were recorded within the survey area.
- Frogspawn was recorded in the field to the south of the small stream that flows into the Scramoge River.
- Badger scuffle marks and latrines were recorded in the field to the south of the small stream that flows into the Scramoge River.
- A total of eight species of fish were recorded from the Scramoge River by IFI as part of the Water Framework Directive fish sampling conducted in 2012: Perch (*Perca fluviatilis*), Gudgeon (*Gobio gobio*), Pike (*Esox lucius*), Lamprey sp. (*Lampetra* sp.), Roach (*Rutilus rutilus*), Stoneloach (*Barbatula barbatula*), Eel (*Anguilla anguilla*), Brown Trout (*Salmo trutta*) (Sampling Fish for the Water Framework Directive, Rivers 2011, Shannon International River Basin District 2012). The fish sampling was conducted at Carrowclogher and Riverdale, which are located approximately 4 km downstream of the proposed crossing point.

2.1.4 Ecological Assessment

The Scramoge River at the proposed crossing point is a modified channel which has been the subject of straightening, bank re-profiling and regular dredging. There is no natural pattern of riffles, glides and pools as would be expected in a natural channel. Potential salmonid spawning areas were not recorded but the river does provide suitable salmonid habitat. There is little cover of natural vegetation on the banks in the area studied. The watercourse is used by Otter and the river as a whole has been shown to have good fisheries potential.

The small stream that flows into the Scramoge River near the crossing point, whilst obviously straightened in the past, has a gravelly substrate and, at preliminary inspection, has the potential to support spawning of salmonid fishes. It also provides potential habitat connectivity to a woodland area located to the south east.

It is considered important that the design of any infrastructure in this location should:

- Take into account the National Roads Authority (NRA) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes* (2008a);
- Allow for the continued passage of Otter along the bank in accordance with the aforementioned guidelines;

- Allow for continued passage of fish and other aquatic species through the watercourse crossing; and,
- Allow for the continued passage of fish/Otter and other species along the tributary stream that flows into the Scramoge River from the south east. Diversion to retain open channel should be considered following further study along with the possibility of importing or saving the existing gravel substrate.

2.1.5 Watercourse Crossing Details

A clear-span bridge is proposed at this crossing location, retaining aquatic habitat and ensuring the continued passage of migrating fish. The bridge supports shall be set back from the riverbank to facilitate access along the river by anglers, fisheries personnel, the general public and wildlife.

No diversions are required on the Scramoge River. However, diversions are required in relation to the first-order tributary of the river and in relation to a drainage ditch that debouches into the tributary. It is proposed to permanently divert the tributary for a distance of approximately 250 m to the north of the works area. The newly created channel will debouch into the Scramoge River to the north of the proposed crossing point.

Small-scale diversion (approx. 80 m) of the drainage ditch to the south is also required. It is proposed that the diversion should follow the southern boundary of the works area.

The new channels shall be constructed in such a way as to not impede the passage of migrating fish. Diversion channels will normally incorporate in-stream features and meanders as would be found in fish-bearing waters and that would give rise to flow variation. The channel base width should be inkeeping with the original channel width and bank slopes will be agreed in advance of works. IFI will be consulted and agree the final design of new channel.

Details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.2 Strokestown River C51+150

2.2.1 General Description

2.2.1.1 Crossing Point

The crossing ID for the watcorse is N5-C10 and it occurs at chainage 51+150. The proposed crossing point is located on the Cloonradoon/Vesnoy townland boundary at Grid Ref: IG 194599, 281275. The channel consisted of a small canalised stream classified as a Depositing/lowland river (FW2) (see Plate 2.3). It is a tributary of the Scramoge River. The river was 3-4 m wide, 0.4-0.6 m deep (during February site visit), with a substrate dominated by silt. The watercourse flows in the direction of Strokestown and the water level was formerly controlled by a sluice located just upstream of Strokestown House.

The banksides were dominated by rank Dry meadow and grassy verges (GS2) and Bramble (*Rubus fruticosus* agg.) dominated Scrub (WS1).

The adjacent habitats included: Hedgerows (WL1), Buildings and artificial surfaces (BL3), Scrub (WS1) Wet grassland (GS4) and Bog woodland (WN7) (the bog woodland does not correspond to any habitat listed on Annex I of the Habitats Directive).

Plate 2.3. The Strokestown River close to the crossing point with rank grasslands and vegetation on both sides.

2.2.1.2 Wider Areas Surveyed

There was little variation in the channel over the course of the 500 m of the river surveyed. The channel was small and highly modified from its natural state. The in-stream vegetation was generally sparse. The banks supported vegetation that was in general uniform (only one vegetation type) or simple (two or three vegetation types). The habitat types on the banks were dominated by rank Dry meadow and grassy verges (GS2) and Bramble (*Rubus fruticosus* agg.) dominated Scrub (WS1). A number of large Drainage ditches (FW4) entered the river from both the right and left banks throughout the 500 m surveyed. The entire area surveyed is shown in Figure 2.2.

2.2.2 River Features

The Scramoge River at the crossing point and within the 500 m surveyed exhibited no natural features such as riffles or pools. The channel was dominated by a depositing glide habitat with a silty substrate and graded banks.

2.2.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.2 Dominant Vegetation Recorded within the River at the Crossing Point

Aquatic	Emergent	Bankside
Floating Sweet Grass	Yellow Flag (*Iris pseudacorus*)	Reed Sweet Grass (*Phalaris*

Aquatic	Emergent	Bankside
(*Glyceria fluitans*)		*arundinacaea*)
Water Starwort (*Callitriche* sp.)	Common Reed (*Phragmites australis*)	Bramble (*Rubus fruticosus*)
	Reed Sweet Grass (*Phalaris arundinacaea*)	Curled Dock (*Rumex crispus*)
	Fools watercress (*Apium nodiflorum*)	Creeping Bent (*Agrostis stolonifera*)
	Willowherb (*Epilobium* sp.)	Hard Rush (*Juncus inflexus*)
	Reedmace (*Typha latifolia*)	Grey Willow (*Salix cinerea*)

2.2.3 Other Ecological Information

Other features of ecological interest that were recorded during the assessment are presented below:

- Shells of *Anodonta* sp. (a non-margaratiferid bivalve) were recorded in the channel.
- Mallard was recorded form the watercourse.
- Otter spraint, was recorded adjacent to a drainage ditch that flows from nearby woodland into this river. This species is listed on Annexes II and IV of the Habitats Directive but is assessed in a separate report.
- Crayfish remains were identified for the Otter spraint and the species is assumed to be present within the watercourse.
- Mute Swan (*Cygnus olor*) droppings recorded in the rank grassland on the banks.

2.2.4 Ecological Assessment

The Strokestown River is a straightened, modified channel with characteristic access routes on the banks to facilitate maintenance. These banks support rank, scrubby vegetation with Reed Canary Grass and Bramble dominant and some young Willow saplings along the riverbanks. The woodlands and scrub on either side provide good cover for a range of fauna. The channel itself supports a silty substrate with a few large rocks but little spawning potential for salmonid fishes. Evidence of Otter (spraint)was recorded on a nearby drain and Swan droppings were also recorded.

It is considered important that the design of in the crossing at this location should:

- Take into account the NRA (2008a) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- Allow for the continued passage of Otter along the bank in accordance with the NRA (2008b) *'Guidelines for the Treatment of Otters prior to the construction of National Road Schemes'*, and,
- Allow for continued passage of fish and other aquatic species through the watercourse crossing.

2.2.5 Watercourse Crossing Details

It is proposed to divert the existing watercourse and to install an off-line box culvert the crossing location. The culvert shall be 47 m in length and 2.1 m in height. The culvert width shall be 4.2 m which is similar to the width of the existing channel. The box culvert will be installed 0.5 m below the bed of the river and the bottom of the culvert covered with natural material. This will ensure that fish passage and aquatic habitat is retained.

Small-scale watercourse diversions are required to north and south of the culvert. The diversion has been designed to ensure that there is no net loss of watercourse length or fisheries habitat. The RHS diversion is approximately 100 m in length and the LHS diversion is approximately 35 m in length. The proposed bed width of the diversions has been designed to match the existing width of approximately 4 m. The proposed slope has also been designed to match the slope of the existing watercourse.

The new channel shall be constructed in such a way as to not impede the passage of migrating fish. Diversion channels will normally incorporate in-stream features and meanders as would be found in fish-bearing waters and that would give rise to flow variation. The channel base width should be in-keeping with the natural channel width and bank slopes will be agreed in advance of works. IFI will be consulted and agree the final design of new channel.

There will be not net loss of fisheries habitat associated with the diversion.

Details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.3 Upper Owenur River

2.3.1 General Description

2.3.1.1 Crossing Point

The crossing ID for the Upper Owenur River is N5-C09 and it occurs at chainage 30+720. The proposed crossing point is located on the Gortnacrannagh, Killeen West and Cherryfield townland boundaries at Grid Ref: IG 186031, 286146. The channel consisted of a small, canalised river with vertical, straight, high banks. This is classified as a Depositing/lowland river (FW2) (see Plate 2.4). The river was 3-5 m wide (during February site visit) with a substrate dominated by silt. Sections of the watercourse had been dredged with spoil on the banks. The channel was choked with aquatic vegetation in places. The habitats surrounding the crossing point were dominated by semi-improved Wet grassland (GS4) with little vegetative cover and isolated Hawthorn (*Crataegus monogyna*) bushes on the banks.

Plate 2.4. The Upper Owenur River just downstream of the crossing point.

2.3.1.2 Wider Areas surveyed

The area downstream of the crossing point was very similar to the habitat described above, with a slow-flowing, canalised channel crossing fields of open grassland and with little or no tall vegetation on the banks. There was potential for in-stream vegetation (where it had not been dredged). This is represented in very similar information being recorded in the spot checks from downstream of the crossing point to the crossing itself. It is noted that the grasslands in this area are highly drained and the proposed route crosses a number of these large drains, all of which ultimately discharge to the Upper Owenur River (14 discharges within the 500 m surveyed, mostly downstream of the crossing point).

Upstream of the crossing point, the banks become higher and covered in dense Hawthorn-dominated scrub. There is more natural gradient and the flow becomes faster and the water shallower with some rippling on the surface. It is still obviously a managed channel exhibiting severe tunnelling and it is almost devoid of aquatic macrophytes. The entire area surveyed is shown in Figure 2.3.

2.3.2 River Features

The Upper Owenur River at the crossing point and for the 250 m downstream was relatively featureless with no riffles or pools and exhibiting an obviously maintained glide with a silty substrate and managed, graded banks. Whilst no features that could be referred to as pools, riffles or bends were identified, the upstream section was steeper, faster and had a rippled surface, which was slightly less managed and more natural than the downstream section.

2.3.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.3 Vegetation Recorded at the Crossing Point

Aquatic	Emergent	Bankside
Broadleaved Pondweed (*Potamogeton natans*)	Yellow Flag (*Iris pseudacorus*)	Hard Rush (*Juncus inflexus*)
Floating Sweet Grass (*Glyceria fluitans*)	Common Reed (*Phragmites australis*)	Broad Leaved Dock (*Rumex obtusifolius*)
Water Starwort (*Callitriche* sp.)	Reed Sweet Grass (*Phalaris arundinacaea*)	Curled Dock (*Rumex crispus*)
Water Mint (*Mentha aquatica*)	Fools watercress (*Apium nodiflorum*)	Meadowsweet (*Filipendula ulmaria*)
Mares tail (*Hippurus vulgaris*)	Willowherb (*Epilobium* sp.)	Tufted Hair Grass (*Deschampsia caespitosa*)
Native Water Milfoil (*Myriophyllum* sp.)	Bottle Sedge (*Carex rostrata*)	Cocksfoot (*Dactylis glomerata*)
	Watercress (*Rorippa nasturtium aquaticum*)	Creeping Bent (*Agrostis stolonifera*)
		Nettle (*Urtica dioica*)

2.3.3 Other Ecological Information

Other features of ecological interest that were recorded during the assessment are presented below:

- Frogspawn recorded in an adjacent drainage ditch close to the crossing point.
- Birds of interest seen or heard included Snipe (*Gallinago gallinago*) and Skylark (*Alauda arvensis*).
- Shells of *Anodonta* sp. (a non-margaratiferid bivalve) were recorded in the channel.
- No evidence of Otter or Crayfish were observed form this watercourse. However, the area provided suitable habitat for both species and each have favourable ranges and population levels within the Republic of Ireland at present (NPWS, Article 17 Reporting 2013).
- Irish Hare (*Lepus timidus hibernicus*) was recorded.

2.3.4 Ecological Assessment

The Upper Owenur River at the point where the proposed road crosses it is a highly modified channel with no natural pattern of riffles, glides and pools as would be expected in a natural channel. Upstream of the crossing point, there were limited areas that could potential be utilised by spawning salmonids. However, the crossing point and areas downstream do not provide suitable spawning habitat. There is little cover of natural vegetation on the banks at and downstream of the crossing point. Despite the fact that no Otter signs were recorded, based on the species widespread distribution and favourable range (NPWS, 2013), the species is likely to be present within this watercourse, at least on occassion.

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA (2008a)*Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- Allow for the continued passage of Otter along the bank in accordance with the NRA (2008b) '*Guidelines for the Treatment of Otters prior to the construction of National Road Schemes*'; and,
- Allow for continued passage of fish and other aquatic species through the watercourse crossing.

2.3.5 Watercourse Crossing Details

A-clear span bridge is proposed at this crossing location, retaining aquatic habitat and ensuring the continued passage of migrating fish. The bridge supports shall be set back from

the riverbank to facilitate access along the river by anglers, fisheries personnel, the general public and wildlife.

No diversions are required on the Owenur River. However, diversions are required in relation to drainage channels located to the south of the crossing point.

Small-scale diversions (approx. 155 m and 140 m) of two drainage ditches to the south of the crossing point are required. It is proposed that the diversions shall follow the southern boundary of the works area.

While the drainage channels are considered to be of little fisheries value, the new channels shall be constructed in such a way as to not impede the passage of migrating fish. Diversion channels will normally incorporate in-stream features and meanders as would be found in fish-bearing waters and that would give rise to flow variation. The channel base width should be in-keeping with the natural channel width and bank slopes will be agreed in advance of works. IFI will be consulted and agree the final design of new channels.

Details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.4 Unnamed Stream C21+325

2.4.1 General Description

2.4.1.1 Crossing Point

The watercourse is a first order tributary of the Owenur River and is located on the Raheen/Cartronagor townland boundary at Grid reference IG 182745, 287599. There are two crossing points on this watercourse. Crossing N5-C6 (Chainage 21+325) is located on the proposed alignment and crossing N5-C7 (Chainage -0+125) is located on the proposed realignment of a local road (LS-6023).

The channel consisted of a modified, cannalised stream classified as a Depositing/lowland river (FW2) (see Plate 2.5). The stream was 2.0-2.5 m wide and 0.2-0.4 m deep (duringOctober site visit), with a substrate dominated by silts but with pockets of clean gravel further downstream. The watercourse was dominated by glide habitat. The dominant in-stream macrophyte was Water Starwort (*Callitriche* sp.). Watercress (*Rorippa nasturtium-aquaticum*), Water Parsnip (*Berula erecta*) and Water Speedwell (*Veronica anagallis*) were also recorded in-stream. The banks were steep and dominated by rank wet grassland (GS4) and scrub (WS1).

The adjacent habitats included Hedgerows (WL1), Conifer plantation (WD4) and Wet grassland (GS4) .

Plate 2.5. Un-named stream at location of crossing point on proposed alignment.

2.4.1.2 Wider Areas surveyed

The stream had a similar morhhology for much of its course, with the exception of some potential salmonid spawning gravels which were recorded downstream of the crossing point in close proximity to the R369. The watercourse is evidently maintained, managed and subject to regular dredging. The entire area surveyd is shown on (Figure 2.4).

2.4.2 River Features

Dominated by slow, depositng glides, with pockets of clean gravels being recorded downsteam, closer to crossing N5-C7.

2.4.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.4 Vegetation Recorded at the Crossing Point

Aquatic	Emergent	Bankside
Water Starwort (*Callitriche* sp.)		Hard Rush (*Juncus inflexus*)
Watercress (*Rorippa nasturtium-aquaticum*)		Broad Leaved Dock (*Rumex obtusifolius*)
Water parsnip (*Berula erecta)*		Curled Dock (*Rumex crispus*)
Water Speedwell (*Veronica anagallis*)		Meadowsweet (*Filipendula ulmaria*)
		Soft Rush (*Juncus effuses*)
		Cocksfoot (*Dactylis glomerata*)
		Creeping Bent (*Agrostis stolonifera*)
		Creeping buttercup (*Ranunculus repens*)

2.4.3 Other Ecological Information

- Evidednce of Deer crossing watercourse (Prints and traisl)
- Snipe recorded from adjacent waterlogged Wet Grassland (GS4)
- Two Lapwing observed flying over, moving north-east

2.4.4 Ecological Assessment

This small channel has some fisheries potential and some potential salmonid habitat was recorded downstream of the crossing point, in close proximity to the R369. The watercourse is evidently maintained, managed and subject to regular dredging.

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA (2008a) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- Allow for the continued passage of Otter along the bank in accordance with the NRA (2008b) '*Guidelines for the Treatment of Otters prior to the construction of National Road Schemes'* (though it is considered unlikely that this species is likely to use this watercourse extensively due to its limited fisheries potential and high levels of modification and disturrbance);
- Allow for continued passage of fish and other aquatic species through the watercourse crossing.

2.4.5 Watercourse Crossing Details

An online boxculvert is proposed at Crossing N5-C6 (C 21+325) whilst a watercourse diversion and offline culvert is proposed for crossing N5-C7 (C -0+125). The online boxculvert at Crossing N5-C6 shall be 30 m in length, 2.7 m in width and 1.8 m in height. Culvert N5-C7 is a proposed offlined culvert. The culvert shall be 25 m in length, 3 m in width and 1.8 m in height.

The culvert widths shall be similar to the width of the existing channel. The box culverts will be installed 0.5 m below the bed level of the river and the bottom of the culvert covered with natural material. This will ensure that fish passage and aquatic habitat is retained.

A small-scale watercourse diversion is required to the left-hand side (LHS) of Culvert N5-C6. The diversion length is approximately 40 m. The diversion has been designed to ensure that there is no net loss of watercourse length or fisheries habitat.

Small-scale watercourse diversions are required to the left-hand side (LHS) and right-hand side (RHS) of Culvert N5-C7. The combined diversion length is approximately 80 m. The diversion has been designed to ensure that there is no net loss of watercourse length or fisheries habitat. The proposed bed width of the diversions has been designed to match the existing watercourse width of approximately 2.7-3.0 m. The proposed slope has also been designed to match the slope of the existing watercourse.

The new channel segments shall be constructed in such a way as to not impede the passage of migrating fish. Diversion channels will normally incorporate in-stream features and meanders as would be found in fish-bearing waters and that would give rise to flow variation. The channel base width should be in-keeping with the natural channel width and bank slopes will be agreed in advance of works. IFI will be consulted and agree the final design of new channels.

Details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.5 Owennaforeesha River

2.5.1 General Description

2.5.1.1 Crossing Point

The crossing ID for the Owennaforeesha River is N5-C3 and it occurs at chainage 14+540. The proposed crossing point is located on the Drummin townland boundary at Grid Ref: IG 176002, 288167. The watercourse consisted of a Depositing/lowland river (FW2) (see Plate 2.6). The river was 4-5 m wide, 0.3-6.0 m deep (during February site visit), with a substrate dominated by gravel and small cobbles with pockets of fine silt. The river was dominated by riffles and glides. Numerous small Brown trout (*Salmo trutta*) were observed in-stream. This watercourse had been subject to arterial drainage and fisheries improvement and the banks were steep and sloping. The banks were dominated by Dry meadows and grassy verge (GS2) habitat. The watercourse provides potential spawning habitat for salmonid species.

The adjacent habitats included Dry Meadows and grassy verges (GS2), Improved agricultural grassland (GA1), Wet grassland (GS4) and Bog woodland (WN7) (the bog woodland does not correspond to any habitat listed on Annex I of the Habitats Directive).

Plate 2.6. Owennaforeesha River just upstream of the crossing point.

2.5.1.2 Wider Areas Surveyed

The area downstream of the crossing point comprised a maintained channel that was dominated by gravels with some silt deposits on meanders. The banks were grassy with occasional Grey Willow overhanging. The channel has been straightened and deepened river. Moving upstream, the banks become slightly shaded with Ash (*Fraxinus excelsior*), Alder (*Alnus glutinosa*) and Willow (*Salix* sp.), with dominant Bryophyte cover on the shady banks.

The large drainage ditch located to the east of the river which requies diversion was assessed during the watercourse assessment and, whilst it supported no obvious fisheries potential and no signs of Otter were recorded, there was a relatively high flow and it may allow connectivity to a drainage ditch network to the east. This ditch discharges into the river from the right bank, to the north of the crossing point. The ditch will be subject to a diversion and shall be crossed via a box culvert. The entire area surveyed is shown in Figure 2.5.

2.5.2 River Features

The Owennaforeesha River at the crossing point supported a relatively fast flowing river over a gravel and cobble substrate, though the river was a relatively uniform glide at this point and downstream. Upstream of the crossing however, there appeared to be a series of man-made riffle-pool sequences with gravels possibly imported. It is likely that this was undertaken to enhance the fishery potential of the river following drainage activities in the past. Seven riffle sequences were recorded in the 250 m upstream of the crossing point.

2.5.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.5 Vegetation Recorded within the Owennaforeesha River at the Crossing Point

Aquatic	Emergent	Bankside
	Yellow Flag (*Iris pseudacorus*)	Hard Rush (*Juncus inflexus*)
Floating Sweet Grass (*Glyceria fluitans*)	Common Reed (*Phragmites australis*)	Willowherb (*Epilobium* sp.)
Water Starwort (*Callitriche* sp.)	Reed Sweet Grass (*Phalaris arundinacaea*)	Curled Dock (*Rumex crispus*)
Water Mint (*Mentha aquatica*)	Fools watercress (*Apium nodiflorum*)	Meadowsweet (*Filipendula ulmaria*)
	Willowherb (*Epilobium* sp.)	Tufted Hair Grass (*Deschampsia caespitosa*)
Water Crowfoot (*Ranunculus* sp.)	Branched Bur Reed (*Sparganium erectum*)	Cocksfoot (*Dactylis glomerata*)
		Creeping Bent (*Agrostis stolonifera*)
		Nettle (*Urtica dioica*)
		Ash (*Fraxinus excelsior*)
		Alder (*Alnus glutinosa*)
		Grey Willow (*Salix cinerea*)

2.5.3 Other Ecological Information

Other features of ecological interest that were recorded during the assessment are presented below:

- Birds of interest seen or heard included Dipper (*Cinclus cinclus*).
- Otter spraint and prints were recorded. This species is listed on Annexes II and IV of the Habitats Directive but is assessed in a separate report.
- Crayfish remains were recorded from the Otter spraints and it is assumed that the species is present in the watercourse. In a hand search, no evidence of the species was recorded.

2.5.4 Ecological Assessment

The Owennaforeesha River is a modified channel but has a gravel substrate and is relatively fast flowing. It appears to have good stocks of salmonid fishes (visual assessment) and has been subject to fisheries enhancement with good spawning potential. Abundant signs of Otter were recorded on this channel.

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA (2008a) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- Allow for the continued passage of Otter along the bank in accordance with the NRA (2008b) '*Guidelines for the Treatment of Otters prior to the construction of National Road Schemes'*,
- Allow for continued passage of fish and other aquatic species through the crossing; and,
- Consider provision of mammal access for aquatic species to the east of the river where there may be severance of drainage ditches.

2.5.5 Watercourse Crossing Details

The crossing ID for the Owennaforeesha River is N5-C3 and it occurs at chainage 14540.

A clear-span bridge is proposed at this crossing location. The bridge shall be 40 m in length (Span) have a clearance of 3.3 m. The bridge width shall be 5 m, which is similar to the width of the existing channel. No instream works will be required. This will ensure that fish passage and aquatic habitat is retained. Mammal passage is also to be included within the bridge design.

Further details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.6 Unnamed Stream C12+700

2.6.1 General Description

2.6.1.1 Crossing Point

The watercourse is a first order tributary of the Carricknabraher River and is located on the Leggatinty townland boundary at Grid reference IG 174415, 288996. There are two crossing points on this watercourse. Crossing N5-C2 (Chainage 12+700) is located on the proposed alignment and crossing N5-C2A (Chainage 0+250 is located on a proposed realigned local road LT-56403 North.

The channel consisted of a small stream classified as a Depositing/lowland river (FW2) (see Plate 2.7). The stream was 2-3 m wide, 0.1-0.4 m deep (during February site visit), with a substrate dominated by pockets of clean gravels upstream and slow depositing glides downstream, with high levels of silt deposition. The dominant in-stream macrophyte was Water Starwort (*Callitriche* sp.).

The watercourse was heavily shrouded by Bramble (*Rubus fruticosus* agg.) Scrub (WS1). Collapsed banks and large instream boulders observed are likely to hinder fish passage. The adjacent habitats included Hedgerows (WL1) Buildings and artificial surfaces (BL3). Wet grassland (GS4) was the dominant adjacent habitat.

Plate 2.7. Un-named Stream at location of crossing point.

2.6.1.2 Wider Areas Surveyed

The adjacent lands were dominated by wet grassland. Ther were no featues of ecological significance noted. The area surveyed is shown in Figure 2.6.

2.6.2 River Features

The watercourse exhibited a mixture of slow, depositing glides and faster-flowing sections with clean gravels.

2.6.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.6 Vegetation Recorded at the Crossing Point

Aquatic	Emergent	Bankside
Water Starwort (*Callitriche* sp.)		Hard Rush (*Juncus inflexus*)
		Bramble (*Rubus fruiticosus* agg.)
		Ivy (*Hedera helix*)
		Hawthorn (*Crataegus monogyna*)

2.6.3 Other Ecological Information

- No featuers of ecological significance were noted

2.6.4 Ecological Assessment

This small overgrown channel has some fisheries potential but is very overgrown. Whilst it may have been maintained and managed in the past, it is now has collapsed banks and shading of vegetation at the crossing point.

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA (2008a) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;

- Allow for the continued passage of Otter along the bank in accordance with the NRA (2008b) '*Guidelines for the Treatment of Otters prior to the construction of National Road Schemes'* (though it is considered unlikely that this species uses this watercourse extensively due to the limited fisheries potential of the watercourse and the extensive vegetated growth in and adjacent to the watercourse); and,
- Allow for continued passage of fish and other aquatic species through the watercourse crossing.

2.6.5 Watercourse Crossing Details

It is proposed to divert the existing watercourse and to install off-line box culverts at the crossing locations. Culvert N5-C2 on the proposed N5 alignment shall be 37 m in length and 2.7 m in height. Culvert N5-C2A on the realigned local road shall be 33 m in length and 2.7 m in height.

The culvert widths shall be 2.7 m, which is similar to the width of the existing channels. The box culverts will be installed 0.5 m below the bed level of the river and the bottom of the culvert covered with natural material. This will ensure that fish passage and aquatic habitat is retained.

Small-scale watercourse diversion are required to the left-hand side (LHS) and right-hand side (RHS) of Culvert N5-C2. The diversions have been designed to ensure that there is no net loss of watercourse length or fisheries habitat. The RHS diversion is approximately 20 m in length and the LHS diversion is approximately 50 m in length. The proposed bed width of the diversions has been designed to match the existing watercourse width of approximately 3 m. The proposed slope has also been designed to match the slope of the existing watercourse.

The new channel segments shall be constructed in such a way as to not impede the passage of migrating fish. Diversion channels will normally incorporate in-stream features and meanders as would be found in fish-bearing waters and that would give rise to flow variation. The channel base width should be in-keeping with the natural channel width and bank slopes will be agreed in advance of works. IFI will be consulted and agree the final design of new channels.

Details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.7 Carricknabraher River

2.7.1 General Description

2.7.1.1 Crossing Point

The crossing ID for the Caracknabraher River is N5-C1 and it occurs at chainage 10+130. The crossing point on this watercourse is located on the Corskeagh townland boundary at Grid Ref: IG 172526, 290429. The watercourse consisted of an Upland/erodig river (FW1) (see Plate 2.8). The river was approximately 4-5 m wide, 0.3-6.0 m deep (during February site visit), with a substrate dominated by gravels, small cobbles and pockets of fine silts. The river was dominated by a series of riffles and glides with some pools and natural bends. Numerous small Brown trout (*Salmo trutta*) were observed in-stream. The banks were dominated by Dry meadows and grassy verges (GS2) and Wet grassland (GS4). There was some evidence of bank erosion and destabilisation. A large drain enters the river from the south at the crossing point.

The adjacent habitats included Wet grassland (GS4) on the left bank and Conifer plantation (WD4) on the right.

Plate 2.8. Carricknabraher River just upstream of the crossing point.

2.7.1.2 Wider Areas Surveyed

The 500 m section that was surveyed was broadly similar to that described above with a channel with signs of some modification and maintenance but with a cobble and gravel substrate and natural form with riffles, glides and pools along with sweeping bends. There was some bank stabilisation works in an area just upstream of the crossing point. These took the form of driven wooden stakes. Of all the channels surveyed, this channel had the greatest level of diversity in its flow morphology and fishery potential. The entire area surveyed is shown in Figure 2.7.

Numerous drains flow into this river from the surrounding lands in the 500 m surveyed. 22 were recorded.

2.7.2 River Features

The Carricknabraher River at the crossing point supported a relatively fast-flowing river over a gravel and cobble substrate. The river morphology was varied and was typical of a natural watercourses with a series of riffles pools and depositing glides. Bank erosion was evident within the 500 m study section and bank stabilisation works had been undertaken at some time in the past at a location upstream of the crossing point. The river is subject to a degree of shading from the adjacent conifer plantation.

2.7.2.1 Aquatic, Emergent and Bankside Vegetation

Table 2.7 Vegetation Recorded at the Crossing Point

Aquatic	Emergent	Bankside
Floating Sweet Grass (*Glyceria fluitans*)	Yellow Flag (*Iris pseudacorus*)	Purple Moor Grass (*Molinia caerulea*)
Water Starwort (*Callitriche* sp.)	Reed Sweet Grass (*Phalaris arundinacaea*)	Willowherb (*Epilobium* sp.)
Water Mint (*Mentha aquatica*)	Fools watercress (*Apium nodiflorum*)	Bramble (*Rubus fruiticosus*)
Willow Moss (*Fontinalis* spp.)	Willowherb (E*pilobium* sp.)	Meadowsweet (*Filipendula ulmaria*)
		Tufted Hair Grass (*Deschampsia caespitosa*)
		Cocksfoot (*Dactylis glomerata*)
		Creeping Bent (*Agrostis stolonifera*)
		Sitka Spruce (*Picea sitchensis*)

2.7.3 Other Ecological Information

Other features of ecological interest that were recorded during the assessment are outlined below:

- Birds of interest seen or heard included Kingfisher (*Alcedo atthis*). No suitable nesting habitat was recorded.
- Fox (*Vulpes vulpes*) prints recorded in mud alongside river.
- No evidence of Otter or Crayfish were observed form this watercourse. However, suitable habitat for both species was present and both species have favourable ranges and population levels within the Republic of Ireland at present (NPWS, 2013).

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2.7.4 Ecological Assessment

The Carricknabraher River is a relatively natural channel with a gravel- and cobble-dominated substrate. The watercourse is morphologically varied with a natural gradient and good flow pattern variation. It appears to have good stocks of salmonid fishes (visual assessment) and has the most diverse and natural morphology of all the channels surveyed in relation to this road scheme, with good salmonid spawning potential. No signs of Otter were recorded on this channel but are considered likely to occur due to the high fisheries potential and the widespread range and distribution of the species within the Repbulic of Ireland (NPWS, 2013).

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA (2008a) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- Allow for the continued passage of Otter along the bank in accordance with the NRA (2008b) '*Guidelines for the Treatment of Otters prior to the construction of National Road Schemes'*,
- Allow for continued passage of fish and other aquatic species through the crossing; and,
- Allow for the continued passage of Otter and other species along the large drain that flows into the River from the south.

2.7.5 Watercourse Crossing Details

The crossing ID for the Caracknabraher River is N5-C1 and it occurs at chainage 10+130. A clear-span bridge is proposed at this crossing location. The bridge shall be 32 m in length (Span) have a clearance of 3.3 m. The bridge width shall be 8 m, which is similar to the width of the existing channel. No instream works will be required. This will ensure that fish

passage and aquatic habitat is retained. Mammal passage is also to be included within the bridge design.

Further details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.8 Inland Fisheries Ireland (IFI) Design Recommendations

A Preliminary design response was received from IFI on the 15th of October 2015.

IFI identified 2 pipe culverts that they felt should be removed from the drainage schedule as they were watercourses. IFI recommended that the watercourses should be the subject of 1200 mm piped culverts embedded by 300 mm. The culverts in question occur at chainages C23+000 and C33+250.

These watercourses were identified as they flow *"to a fish bearing watercourse and can act as vectors for water pollution during works if appropriate mitigation is not put in place during works".* IFI also acknowledged that the watercourses/drains may not be fish-bearing.

2.8.1 Watercourse at C 23,000

2.8.1.1 General Description

2.8.1.1.1 Crossing Point

The culvert crossing ID for the Watercourse N5-15 and it occurs at chainage 23+175. The watercourse is a minor watercourses that joins with a tributary of the Owenur River. The watercourses is located on the townland boundaries of Gortnacrannagh and Creeve at grid reference IG E184389, N286759.

The channel consisted of a small modified Upland/eroding river (FW1). The watercourse was 30-50 cm wide ad 10-15 cm deep. The substrate was dominated by silt will some small pockets of gravels.

In-stream macrophytes recorded included Fool's Watercress (*Apium nodiflorum*), Angelica (*Angelica sylvertris*) and Floating Sweet-grass (*Glyceria fluitans*). Reed Canary-grass (*Phalaris arundinacea*) was recorded in scattered location on the bankside. Hawthorn and Bramble Scrub (WS1) have casued shading of the watercourse.

The watercourse was bordered by Hedgerow (WL1) and a mixture of Improved agricultural grassland (GA1) and Wet grasslands (GS4).

Plate 2.9. Watercourse at chainage 22+175.

2.8.1.2 Ecological Assessment

This drainage ditch has limited fisheries potential. However, the watercourses had a link with the Owenur River.

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*; and,
- Allow for continued passage aquatic species through the crossing.

2.8.1.3 Watercourse Crossing Details

It is proposed to install a pipe culvert at the crossing location.

The pipe culvert shall be 37 m in length with a diameter of 1.20 m. The pipe culvert will be installed 0.3 m below the bed level of the river and the bottom of the culvert covered with natural material. This will ensure that fish passage and aquatic habitat is retained.

The proposed in-stream works associated with the diversion of the tributary at this location can only be carried out between the 1st of May and the 30th of September in order to avoid impacts on fisheries.

Further details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

2.8.2 Watercourse at C 33,250

2.8.2.1 General Description

2.8.2.1.1 Crossing Point

The culvert crossing ID for the Watercourse is N5-16 and it occurs at chainage 33+200. The watercourse is located on the Killeen East and Tullyloyd townland boundary at Grid reference IG 188522, 286227.

The channel consisted of a small Drainage ditch (FW4). There was very little water in the drain and there was no perceivable flow (during October site visit). The watercourse was dominated by 100% silt and was partially vegetated. Species recorded from the drain included Creeping Buttercup (*Ranunculus repens*), Nettle (*Urtica dioica*) and Floating Sweet Grass (*Glyceria fluitans*). The drain was choked with vegetation downstream. If the entire length of the drain was to be cleaned, it would have surface water connectivity with Clooncullaan Loughs.

The watercourse was bordered by Treelines (WL2) and a mixture of Improved agricultural grassland (GA1) and Wet Grassland (GS4).

Plate 2.10. Watercourse at chainage 33+200.

2.8.2.2 Ecological Assessment

This drainage ditch has no fisheries potential but, should the drain be dredged, it would have a potential link with Clooncullaan Loughs.

It is considered important that the design of any infrastructure in this location should:

- Take into account the NRA (2008a) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*; and,
- Allow for continued passage of aquatic species along the watercourse.

2.8.2.3 Watercourse Crossing Details

It is proposed to install an off-line pipe culvert at the crossing location. The pipe culvert shall be 41 m in length with a diameter of 1.20 m. The pipe culvert will be installed 0.3 m below the bed level of the river and the bottom of the culvert covered with natural material. This will ensure that fish passage is reinstated.

The proposed in-stream works associated with the diversion of the tributary at this location can only be carried out between the 1st of May and the 30th of September in order to avoid impacts on fisheries.

Further details in relation to best construction practice and mitigation regarding the watercourse crossing and channel diversions are provided in Section 3 below.

3 GENERAL MITIGATION

All works in proximity to watercourses shall follow the guidance outlined in the following documents:

- National Roads Authority (2008) Guidelines for the crossing of Watercourses During Construction of National Road Schemes. National Roads Authority, Dublin.
- Southern Regional Fisheries Board (2009) Protection and Conservation of Fisheries Habitat with Particular Reference to Road Construction. Southern Regional Fisheries Board, Clonmel.
- Eastern Regional Fisheries Board (2004) Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board, Blackrock.

3.1 No Net Loss Principle

The no net loss principle is fundamental to the habitat conservation goal. The principle takes into consideration the habitat and water quality requirements of fish in the context of site-specific evaluations in order to avoid losses of habitats or habitat components that can limit the production of fisheries resources.

There must be no net loss of fish habitat or or potential of any habitat to support fish. All culverts and diversions have been designed to ensure that there will be no net loss of fisheries habitat.

3.2 Crossings

Crossings proposed as part of the project include clear-span bridges, box culverts and pipe culverts.

On environmental grounds, all culverts need to be over designed in relation to flow. This will ensure that velocities through the culvert will be acceptable to allow the passage of fish at any time. The inclusion of baffles, pools or weirs or similar mechanisms to reduce flow velocity and assist the passage of fish, may be required. This is a site-specific detail which shall be agreed with IFI.

Culverts should be kept as short and as high as possible. Any embankments should be notched back so as to facilitate this. This increases the amount of light entering the culvert and allows for the passage of fisheries personnel and wildlife.

Where a box culvert is required, the invert of the culvert needs to be set at least 500 mm below the existing bed level, and at or near the same gradient as the existing bed. If the gradient is excessive, additional works may be required to reduce flow, minimise bank erosion and facilitate passage of fish. Such works may include the installation of baffles or pools and rock armour to protect the banks. Where a pipe culvert is required, the invert of the culvert needs to be set at least 300 mm below the existing bed level.

IFI will require that original bed material is reinstated or, where imported, consist of rounded washed gravels that are either seeded upstream of the culvert or are placed in the culvert before it becomes live.

Over-sized culverts will require rock armour training from the inside of the headwalls back to natural channel width to form a low flow channel.
Off-line culverts will require channel stabilisation works (for all channels) and fisheries development works to suit the individual watercourse's fishery status (See Appendix 1).

Prior to construction, the contractor shall prepare detailed method statements for maintaining the free passage of fish in any water likely to be affected by the works. At all times, these shall be submitted to the engineer and IFI for their approval in advance of works.

The screening of temporary or permanent culverts to prevent build-up of debris can cause an obstruction to fish passage and will generally not be permitted.

No in-stream works are to be carried out between 1st of 1st October and 30th of April and only then with the approval of IFI.

3.3 Diversions

Should dewatering of a channel be required, IFI and a suitably qualified contractor will conduct an electrofishing operation to remove any fish from the channel prior to dewatering.

Where a temporary/permanent diversion is required, the design, construction and operation of the channel may require the provision of artificial geotextile membrane sheeting or rock armour on the sides and base of the temporary channel. This will minimise erosion and potential increases in sediment load.

Where it is feasible and in an effort to reduce the number of culverts and loss of fisheries habitat, the construction of new river channels running parallel to the road sections have been incorporated into the project design (*e.g.* diversion of the tributary of the Scramoge River). The new channels shall be constructed in dry conditions. Channels shall also be constructed in such a manner as to facilitate the passage of migrating fish and to a specification agreed with IFI. Newly created channels shall incorporate in-stream features and meanders that will give rise to flow variation as found in fish-bearing waters. The channel base widths have been designed to match the width of the diverted channels.

A wide range of fisheries development and in-stream works to enhance and recreate natural river channels and the rationale for these works are described in *Channels and Challenges* (O'Grady, 2006).

All watercourse diversions will be subject to channel stabilisation works, which consist of lining the new channel with rounded washed gravel to a maximum depth of 300 mm below the finished bed level and bank scour protection in the form of rock armour, along the channel as deemed necessary by IFI. These works will need to be completed to IFI's specifications before the new channel can become live.

The riparian zone along river channels is very important and IFI will require an input into the landscaping plan along newly created channels. All planting along these channels should be of native deciduous trees with a mix of species such as Oak, Ash, Alder, Whitethorn, Birch, Holly, Willow. There should be no planting within 5 m of the channel. The reasons for this, as per (IFI Enhancement Guidelines) are as follows:

1. To provide bank stability and prevent excessive erosion.
2. Will provide shade to stream in summer which will help to keep the stream cool.
3. Will lose leaf in the winter allowing light into the stream.
4. The fallen, decaying leaf litter will be a food source to the macro-invertebrates in the stream, which in turn are a food source for fish.
5. The mix of tree species will supply leaf litter to the stream through the winter.

3.4 Pollution of Watercourses

This project has potential to cause pollution of the surrounding environment. Pollution could take a number of forms and could occur during a number of the operations involved in the construction process. Listed below are the activities during which pollution may arise and the type of pollution that may occur, along with prescribed mitigation measures.

3.4.1 Earth Works

Construction of the proposed works will involve excavation. This creates the potential for sediment and/or nutrient run-off, especially if soil is stored in an unconsolidated state. Suspended solids or nutrients resulting from the decomposition of organic material could potentially enter aquatic habitats via existing drainage features. The following mesues will be put in place to prevent adverse impacts:

- Prior to the outset of any excavation works, the works area will be assessed and clearly delineated with temporary fencing. The minimum area necessary will be identified as part of the works area and there will be no access beyond this area for works vehicles.
- All storage of plant, excavated material/topsoil and other materials required for construction/landscaping will be within the works area.
- Any excavated rock will be used as infill to replace excavated soil.
- Excavations will be carried out using a suitably-sized excavator.
- No washing of plant, vehicles or equipment will be completed within 50 m of a watercourse. The site foreman will ensure that all deliveries are required to complete wash-out at their own company base, not on-site.
- In all circumstances, excavation depths and volumes will be minimised and excavated material will be re-used where possible.

A Sediment Control Plan has been prepared for the development and the measures outlined in the document shall be strictly adhered to during the construction and operational phase.

3.4.2 Hydrocarbon usage

The use of hydrocarbons during the construction process leads to the potential for pollution to enter the wider environment, including drainage ditches andwatercourses. Leaks in poorly maintained plant and machinery could lead to hydrocarbon dispersal over works areas. Leaks in fuel storage tanks and spillages during refueling operations could lead to larger releases of hydrocarbons into the environment.

The use of machinery carries the potential for accidental hydrocarbon contamination of works areas by fuel spillages or oil leaks, for example. The works will be carried out in accordance with the following measures to avoid such impacts:

- It is likely that all machinery will be refueled from mobile tankers on the local/access road. No refueling is to take place within 50 m of any watercourse.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double-skinned.
- When not in use, all valves and fuel trigger guns from fuel storage containers will be locked.
- All plant refueling will take place using mobile fuel bowsers. Only trained and competent personnel will carry out refueling operations. Plant refueling will take place as far as practicable from watercourses. A spill kit and drip tray shall be on site at all times and available for all refueling operations. Equipment shall not be left unattended during refueling. All pipework from containers to pump nozzles will have anti siphon valves fitted.

- Strict procedures for plant inspection, maintenance and repairs shall be detailed in the contractor's method statements and machinery shall be checked for leaks before arrival on site.
- All site plant will be inspected at the beginning of each day, prior to use. Defective plant shall not be used until the defect is satisfactorily fixed.
- All major repair and maintenance operations will take place off site.
- Care will be taken at all times to avoid contamination of the environment with contaminants other than hydrocarbons, such as uncured concrete or other chemicals.
- Specific measures to offset potential impacts relating to surface water runoff during the operation of the road have been incorporated into the desing of the scheme. Theses include the use of hydrocarbon interceptors and attenuation systems.

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NRA (2008b) *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.* National Roads Authority, Dublin, Ireland.

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Wildlife Amendment Act (2000) Wildlife Amendment Act, Ireland, 18 December 2000, No. 38 of 2000.

Appendix 1

Enhancement IFI

Enhancement of river channels.

The riparian zone along river channels is very important and Inland Fisheries Ireland will require an input into the landscaping plan along newly created channels. All the planting along these channels should be with native deciduous trees with a mix of species such as Beach, Oak, Ash, Alder, Whitethorn, Birch, Holly, Willow and Sycamore. There should be no planting within five metres of the channel. The reasons for this are as follows,

1. To provide bank stability and prevent excessive erosion.
2. Will provide shade to stream in summer which will help to keep the stream cool.
3. Will lose leaf in the winter allowing light into the stream.
4. The fallen decaying leaf litter will be a food source to the macro-invertebrates in the stream, which in turn are a food source for fish.
5. The mix of tree species will supply leaf litter to the stream right though the winter.

The works described below are graded according to the level of fisheries development required (which in turn is informed by the fish species present and the fisheries status of the existing channel, which will be completed once the list of diversions is agreed.

At minimum all watercourse diversions will have channel stabilization works, which consist of lining the new channel with rounded washed gravel to a maximum depth of 300 mm below finished bed level and bank scour protection in the form of rock armour, along the channel at locations as deemed necessary by IFI. These works will need to be completed to IFI's specifications before the new channel can become live.

Level 1

Streams classed as level 1 will have scour protection put in place along the full extend of the excavated channel. On any meander bends and on the lead into and out of any culvert the channel will be rip rapped. Random boulders should be placed along the channel bed within the zone where a thalweg is likely to develop. If the channel base width is greater then the natural width a two stage channel will have to be created. A narrow sinuous channel will be rebuilt within the channel using alternating deflectors.

Level 2

Streams classed as Level 2 will have scour protection put in place along the full extend of the excavated channel. On any meander bends and on the lead into and out of any culvert the channel will be rip rapped. Random boulders should be placed along the channel bed within the zone where a thalweg is likely to develop. If the cannel base width is greater then the natural width a two stage channel will have to be created. A narrow sinuous channel will be rebuilt within the channel using alternating deflectors. At gradient breaks a stone weir will have to be put in place downstream of the break, a scour pool will form at the downstream end of these weirs. If the stream bed is suitable at the end of these pools spawning gravels should be added. Down stream of these weirs cover shelves will have to be created either in stone or timber.

Level 3

Streams classed a level 3 will have scour protection put in place along the full extend of the excavated channel. On any meander bends and on the lead into and out of any culvert the channel will be rip rapped. Random boulders should be placed along the channel bed within the zone where a thalweg is likely to develop. If the cannel base width is greater then the natural width a two stage channel will have to be created. A narrow sinuous channel will be rebuilt within the channel using alternating deflectors. Gradient breaks will

form in these channels every 5 to 7 times the base width of the stream and stone weirs will have to be put in place downsteam of these points, a scour pool will form at the downstream end of these weirs. If the stream bed is suitable at the end of these pools spawning gravels should be added. Down stream of these weirs cover shelves will have to be created either in stone or timber. It may be necessary to dig the pools at the tail of the weirs as the bed may be too hard.

The contractor must agree a plan for works based on this document and the agreed list of diversions. IFI Officers will supervise and inspect these works. The contractor is responsible for bearing these costs and the costs associated with drawing up any plan of works.

Rip Rap is the term used to describe the protection of river banks with rock to prevent them from eroding. The Key points are,

- Ensure that the base line of rocks extend out from the bank beneath stream bed level.
- Slope the structure back at a 45 degree angle to the vertical.
- Backfill behind each line of boulders with large cobbles.
- In some cases it may be necessary to build the Rip Rap to the top of the bank.
- See photo.

Meanders will have to be build into the channel to provide pools and lies for adult fish. Theses cover areas will be constructed using round log 225cm in diameter placed along the toe of the stream and sitting on 225cm high stools. This will keep the log 225cm up off

the stream bed providing a shelf which will provide fish with cover. These logs will be drilled at each end, and a 20ml round bar 2 meters long driven though the log into the stream bed to hold the log in place. Before driving the log a round washer should be placed over the round bar. When driven home the bar will head and form a rivet to prevent the log and bar coming apart. On top of the log Rip Rap will be placed to prevent erosion and anchor the logs. These bends should be placed along the channel at intervals of 7 to 10 meters. (See photo below)

Photo showing log been prepared to form the cover shelf on each of the bends. The two ‘off cuts’ are placed in the bed of the channel, the log is then placed on top and pined to the channel bed though the stool (‘off cut’).

At the gradient break in the straight between each bend a log weir will need to be put in place. This can be a straight notched log weir or a ‘V’ log weir. (See photos below). These logs need to be dug well into the bank, wire nailed to the log and ran back up the channel for 5 to 6 meters. The bed of the channel will have been removed to a depth of one meter to receive the wire. Term will be fixed to the log and placed on top of the wire. The bed material can then be placed back in the channel bed on top of the term. A hole can now be dug downstream of the log to form a pool. Rip Rap will need to be put in place 3 to 4 meters on the lead into the weir and on the lead out of the weir. This will prevent back eroding as these weirs can generate a significant level of back eddies along the bank.

Spawning gravels will need to be place at the ends of these pools. This gravel will be 2’’ down washed round stone. Material that has been put though a crusher should not be used as the sharp edges could cause injury to spawning fish.

In some streams there will be a need to develop a two stage channel. These streams will have formed part of the arterial drainage schemes under taken by the Office of Public Works (OPW) or newly created channels which are wider than the existing watercourses. The OPW should be consulted before any works is under taken in these channels. The aim is to restore the natural base width in the arterially drained stream. This is essentially a channel within a channel such that all the water at low flow is confined to a defined sub-section of the total base width. To achieve this two stage channel the bed will be re-excavated along the eroding side of the channel. The material removed will be re-deposited along the depositing bank. Over time this material will grass over. We now have a low flow and a high flow channel within the original channel.

The riparian zone is also very important to the fishery habitat as it supports the macroinvertebrate life within the stream. Thus it is very important that care is taken when planting along the banks of the new stream. A mixed planting of deciduous trees should be planted in the riparian zone. Suitable species would include Oak, Ash, Holly, Birch, Whitethorn and Blackthorn. Individual stands should be planted 5 meters from the stream and a variety of species. This will prevent tunneling problems when the trees mature.

An Inland Fisheries Ireland officer will attend the site, as required during the rehabilitation of the stream. The cost of this supervision will be covered by the contractor. This work can only be carried out between the 1st May and the 30th September.

APPENDIX 7.5

Woodland Assessment Report

Woodland Assessment Report

N5 Ballaghadereen to Scramoge Road Project

McCarthy Keville O'Sullivan

Planning & Environmental Consultants

Table of Contents

1 INTRODUCTION

1.1 General Introduction

This report has been completed to provide information regarding the classification and status of broadleaved woodlands within/adjacent to the proposed alignment of the N5 Ballaghadereen to Scramoge road project. This assessment will highlight any features of particular importance and identify whether any woodland habitats listed on Annex I of Directive 92/43/EEC (Habitats Directive) are located within the study area. Conifer plantations were not included in this assessment.

The proposed N5 Ballaghadereen to Scramoge road project extends from the townland of Rathkerry (Grid Ref: E169065 N293002), located west of Frenchpark, to the townland of Scramoge, east of Strokestown (Grid Ref: E196117 N279615), where the newly proposed N5 preferred route option will tie into the existing N5. The proposed N5 route is approximately 34 km in length.

The woodland assessment is based on a desk study and field visits by suitably qualified ecologists including Pat Roberts B.Sc. (Env.) MCIEEM, John Hynes B.Sc. (Env.) GradCIEEM and Pamela Boyle Ph.D. All three surveyors have extensive experience in woodland classification and survey techniques and have conducted detailed woodland assessment for a number of developments including national road projects and flood relief schemes.

The woodland assessment surveys described in this report have been undertaken with reference to the following guidelines:

- National Roads Authority (2009) *Guidelines for assessment of ecological impacts of national road schemes (Revision 2, June 2009),* Dublin, Ireland.
- Perrin, P.M, Martin, J.R., Barron, S.J., O'Neill, F.H., McNutt, K.E. & Delaney, A.M. (2008) National Survey of Native Woodlands 2003-2008: Volume I: Main report. Report submitted to National Parks & Wildlife Service, Dublin.
- Perrin, P.M, Martin, J.R., Barron, S.J., O'Neill, F.H., McNutt, K.E. & Delaney, A.M. (2008) National Survey of Native Woodlands 2003-2008: Volume II: Woodland classification. Report submitted to National Parks & Wildlife Service, Dublin.

The conclusions and any recommendations based on the results of the surveys are provided in Section Five.

2 METHODOLOGY

2.1 Desk Study

Initially, a desk study of pertinent information relating to woodland was carried out for the study area. This included a review of aerial photography and mapping along the route to identify potential semi-natural woodland in advance of field surveys.

The National Parks & Wildlife Service (NPWS) Article 17 woodland reporting are available for download at http://www.npws.ie/maps-and-data/habitat-and-species-data. The datasets were downloaded and reviewed on 16 November 2015 in order to determine if any identified Annex I woodland habitats were located in the study area.

The NPWS Ancient and Long-established Woodland database was also downloaded and reviewed. This dataset shows areas of long established woodland including stands of non-native species and conifer woodland.

The Teagasc soils map (http://gis.teagasc.ie/soils/) was consulted to determine the underlying soil type associated with the various identified woodlands in the study area. This was of particular importance with regard to identification of Alluvial Woodland. The results of the desk study are presented in Section Three.

2.2 Field Surveys

The woodlands that are assessed in this document were first identified during preliminary desk studies of aerial photographs and OSI Discovery Range 1:50,000 maps of the area . The identified woodlands were then briefly assessed during multidisciplinary walkover surveys conducted on 14 and 28 July and 31 October 2014. During this survey, woodland stands were selected for further assessment based on their size, naturalness or connectivity with larger or more sensitive areas. The woodlands and additional sensitive areas were classified as key ecological receptors (KERs). Detailed assessments of the woodlands were conducted on 30 September and 6 October 2015. Specific field sheets were used for recording the survey data. Homogeneous representative 20 m × 20 m relevés were assessed at each woodland site and the woodland areas were thoroughly walked and assessed.

For each site surveyed the following data were recorded as per Perrin (2008):

Site species list: A comprehensive list of vascular plants was recorded for each site. For tree and shrub species, presence/absence in each of the canopy, shrub and field layers was recorded.

Site situation: The altitudinal range (in metres) for each site was recorded from the appropriate Discovery Map. The general slope (in degrees) for the woodland as a whole was estimated by eye.

Area: Site (in hectares) was measured from GIS mapping.

Internal features: The predominant soil moisture regime (*i.e.* firm, soft *etc.*) observed at the site was recorded. In addition, any hydrological features (*e.g.* streams, ditches and flushes) observed were noted. All evidence of management, both previous and current, in the wood was noted. This included planting, felling, amenity use and coppicing. The presence of historical features such as banks and ruined buildings was also recorded. Evidence of grazing and use by livestock was also noted.

Surface cover: The surface cover of various strata was assessed to give a general indication of the structure of the woodland. The DAFOR scale (dominant, abundant, frequent, occasional, rare or absent) was used to assess cover of: rock and boulders; stones and gravel; bare soil; litter; bryophytes; herbs; and, low woody species. Only the actual wooded area was assessed; gravel-covered forest tracks/roads, car parks *etc.* were not included when assigning scores to the categories.

Vegetation communities: Vegetation communities were identified and classified using the system of Fossitt (2000) and Perrin (2008). Major variations in the woodland vegetation were regarded as different communities even if they were encompassed by a single category using Fossitt (2000). The distribution of vegetation communities at each site was described in the site notes and marked on 1:5,000 vector maps, as were any changes to the site boundary. The proportion of the woodland area allotted to each Fossitt category was noted. The woodland composition was assessed based on the canopy layer, shrub/low woody layer and herb layer and the Domin scale was used to quantify the frequency of species within each vegetation layer.

Additional Attributes: Additional attributes such as bare ground, leaf litter, invasive species, exposed rocks, dead wood *etc*. were recorded. The surrounding land cover observed during the field survey was recorded for each site using categories defined by Fossitt (2000) and Perrin (2008).

3 DESK STUDY RESULTS

3.1 Initial Walkover and Orthophotography Review

During the initial walkover surveys conducted in July and October 2014 and review of aerial photographs conducted in 2014/15, the areas of broadleaved woodland outlined in Table 3.1 below were identified. The woodland areas were identified for further assessment based on their size, naturalness, connectivity with larger or more sensitive areas, or potential to correspond to Annex I habitat types. The woodland locations are displayed on Figures 3.1 and 3.2.

Table 3.1 Identified Woodland areas within the Study Area

Chainage	Key ecological receptor	Details	Soil association (Teagasc soil map)
C.13+950 to C.14+200	No 7	Potential bog woodland surrounding area of cutover and degraded raised bog	*Peat*
C.14+500 to C.14+675	No 9	Potential bog woodland located in close proximity to cutover bog	*Peat*
C.15+150 to C.15+300	No 10	Potential bog woodland located in close proximity to cutover bog	*Peat*
C.16+675 to C.17+200	No 11	Potential bog woodland associated with cutover bog; area subject to land drainage associated with forestry plantation	*Peat*
C.50+850 to C.51+700	No 17	Potential bog woodland surrounding areas of cutover bog	*Peat*
C.52+250 to C.52+700	No 18	Potential alluvial woodland located to the west of Scramoge River	*Fine loamy drift with limestone*
C.53+300 to C.53+950	No 20	Potential semi-natural woodland, unlikely to correspond to Annex I habitat	*Fine loamy drift with siliceous stones*

3.2 NPWS Woodland Records

A review of the NPWS GIS Article 17 and Long-established Woodland datasets was conducted on 16 November2015. The datasets were downloaded and overlaid on the proposed alignment route.

The nearest area of Bog woodland* [91D0] is located approximately 2.5 km to the north of the proposed alignment at Cloonshanville Bog SAC. There were no records for this habitat within the current study area. The nearest identified area of Residual alluvial forests* [91E0] is located approximately 11.5 km to the east of the alignment. There were no records for this habitat within the current study area. The nearest identified area of Old oak woodlands [91A0] is located approximately 10.3 km to the east of the proposed alignment. There were no records for this habitat within the current study area.

In relation to Ancient and Long-established Woodland, the NPWS database contained an identified woodland stand along the entrance lane to Mantua House at C18+300. This woodland stand is not traversed by the proposed alignment. As per the database, the woodland age classification is defined as "a stand for which there is evidence that the site is not ancient LEW (II)". The woodland is described as dominated by non-native broadleaved species (NNB). Consequently the woodland does not correspond to an Annex I habitat type. Given that the woodland is a non-native stand, it was not selected for detailed Annex I woodland habitat assessment.

Note: All habitats marked with an asterisk (*) are listed as "priority habitats".

4 FIELD STUDY RESULTS

4.1 C.13+950-C.14+200 (Bellanagare)

This semi-natural woodland was identified in the desk study as having potential to correspond to the Annex I habitat Bog woodland* [91D0] The woodland forms part of KER No 7 and surrounds areas of cutover and degraded raised bog. The overall woodland area is approximately 7 ha and the proposed alignment will result in the loss of approximately 1.2 ha of this woodland.

Table 4.1 Relevé 01 Details

Attributes	Details	Photograph
Grid reference:	E175611 N288239	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.2 Relevé 01 Results

Site Description		Species	Common name	Cover abundance (Domin Scale)
Altitude	70–80 m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	9
Topography	Low slope	*Sorbus aucuparia*	Rowan	2
Soil moisture regime	Moderately free draining	*Crataegus monogyna*	Hawthorn	1
Hydrological features	The woodland is subject to drainage	*Quercus robur*	Oak	1
Management	None of note	Herbs and ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	4
Internal features	None	*Rubus ideaus*	Raspberry	9
Dead wood	Fine woody debris	*Hedera helix*	Ivy	4
Rocks and boulders	N/A	*Vicia sp.*	Vetch	
Stones and gravel	N/A	*Circaea lutetiana*	Enchanter's Nightshade	1
Bare soil	R	*Lonicera periclymenum*	Honeysuckle	1
Litter	O	*Oxalis acetosella*	Wood Sorrell	1
Bryophyte	O	*Dryopteris dilatata.*	Fern	1
Herb	D	Bryophytes		
Low woody species	D	*Thuidium tamariscinum*		1
Invasive species	None	*Polytrichum commune*		1
Woodland Classification	WN7 Bog woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata*. This small section of woodland is situated on the soil type *Peat.* The adjacent habitats are wet grassland, cutover and degraded bog, scrub and dense bracken. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to any Annex I-listed habitat, but in particular Bog woodland* [91D0] . The assessment is provided in Table 4.3 below. As per Perrin 2008, this woodland subtype has "no significant correspondence" to Annex I habitats. In addition, based on the assessment criteria, the woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. *Sphagnum* moss was not recorded.				

Table 4.3 Relevé 01 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea		*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	✓
		Total shrub layer cover 10–50%	✓
		Field layer ≥ 20% cover and ≥ 20 cm high	✓
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL		
Other stop data			
Evidence of bark stripping (present = fail) % *Sphagnum* spp. cover (≥ 10% = pass)	PASS	All five criteria met = pass	PASS

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails on 25% of the assessment criteria including diversity of positive indicator species. In addition, *Sphagnum* species were not recorded form the woodland relevé.

In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*; the woodland has been assigned a status of Local Importance (Higher Value) given that it is a semi-natural habitat type with high biodiversity in a local context.

4.2 C.14+500-C.14+675 (Drummin)

This woodland was identified in the desk study as having potential to correspond to the Annex I habitat Bog woodland* [91D0]. The woodland was identified as KER No 9 and surrounds areas of wet grassland and degraded raised bog. This woodland has been subject to extensive drainage on the margins and is heavily poached by livestock. The canopy is dominated by Birch (*Betula pubescens*), but given that drier conditions prevail, the woodland understory is dense and dominated by Holly (*Ilex aquifolium*) with occasional Rowan (*Sorbus aucuparia*). The overall woodland area is 1.5 ha and the proposed alignment will result in the loss of approximately 0.16 ha of this woodland.

Table 4.4 Relevé 02 Details

Attributes	Details	Photograph
Grid reference:	E176029 N288134	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.5 Relevé 02 Results

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	70–80 m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	8
Topography	Relatively flat	*Sorbus aucuparia*	Rowan	1
Soil moisture regime	Free draining	*Ilex aquifolium*	Holly	8
Hydrological features	The woodland is dry underfoot and has significant drainage around it, including wide, deepened drainage ditches and the arterially drained Owennaforeesha River.			
Management	None of note	Herbs and ferns		
Grazing regime	Heavy poaching	*Geranium robertianum*	Herb Robert	1
Internal features	None	*Digitalis purpurea*	Foxglove	1
Dead wood	Fine woody debris	*Hedera helix*	Ivy	1
Rocks and boulders	N/A	*Stachys sylvatica*	Hedge Woundwort	1
Stones and gravel	N/A	*Lonicera periclymenum*	Honeysuckle	1
Bare soil	D	*Oxalis acetosella*	Wood Sorrell	1
Litter	O	*Dryopteris dilatata*	Fern	1
Bryophyte	O	Bryophytes		
Herb	O	*Thuidium tamariscinum*		1
Low woody species	O			
Invasive species	None			
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata*. Given that the woodland has been subject to extensive drainage, drier conditions prevail. Consequently, the woodland could, despite the absence of *Quercus* sp., be considered to have links to a variant of the *Fraxinus excelsior-Hedera helix* woodland subgroup d) *Ilex aquifolium-Sorbus aucuparia*. The latter classification rarely occurs in isolation and in this instance could be considered to occur as part of a bog woodland mosaic which has formed due to land drainage and management practices. This woodland is situated on the soil type *Peat*. The adjacent habitats are composed of wet grassland, cutover and degraded bog, depositing/lowland river and drainage ditches. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I-listed habitat, but in particular Bog woodland. The assessment is provided in Table 4.6 below. As per Perrin 2008, this woodland subtype has "no significant correspondence" to Annex I habitats. In addition, *Sphagnum* moss was not recorded.			

Table 4.6 Relevé 02 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea		*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	✓
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL	Total shrub layer cover 10–50%	
		Field layer ≥ 20% cover and ≥ 20 cm high	
Other stop data			
Evidence of bark stripping (present = fail)	PASS	All five criteria met = pass	FAIL
% *Sphagnum* spp. cover (≥ 10% = pass)			

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails on 50% of the assessment criteria including diversity of positive indicator species and habitat structure. In addition, *Sphagnum* species were not recorded form the woodland relevé.

In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*; the woodland has been assigned a status of Local Importance (Higher Value) given that is a semi-natural habitat type with high biodiversity in a local context.

4.3 C.15+150-C.15+300 (Peak)

This semi-natural Woodland was identified in the desk study as having potential to correspond to the Annex I habitat Bog woodland* [91D0]. The woodland forms part of KER No 10 and surrounds areas of cutover and degraded raised bog. The overall woodland area is 1.79 ha and the proposed alignment will result in the loss of approximately 0.5 ha of this woodland.

Table 4.7 Relevé 03 Details

Attributes	Details	Photograph
Grid reference:	E176686 N288025	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.8 Relevé 03 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	80–90 m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	9
Topography	Low slope	*Salix cinerea*	Grey Willow	5
Soil moisture regime	Moderately free draining	*Crataegus monogyna*	Hawthorn	1
Hydrological features	The woodland is subject to drainage			
Management	None of note	Herbs and Ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	8
Internal features	None	*Hedera helix*	Ivy	1
Dead wood	Fine woody debris	*Molinia caerulea*	Purple Moor Grass	5
Rocks and boulders	N/A	*Dryopteris dilatata*	Fern	1
Stones and gravel	N/A	Bryophytes		
Bare soil	F	*Thuidium tamariscinum*		1
Litter	O	*Polytrichum commune*		1
Bryophyte	O			
Herb	O			
Low woody species	O			
Invasive species	None			
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caeruleae* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata.* This small section of woodland is situated on the soil type *Peat.* The adjacent habitats are cutover and degraded bog, wet grassland, scrub and drainage ditches. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I-listed habitat, but in particular Bog woodland. The assessment is provided in Table 4.9 below. As per Perrin 2008, this woodland subtype has "no significant correspondence" to Annex I habitats. In addition, based on the assessment criteria, the woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. *Sphagnum* moss was not recorded.			

Table 4.9 Relevé 03 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea		*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	✓
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL	Total shrub layer cover 10–50%	✓
		Field layer ≥ 20% cover and ≥ 20 cm high	✓
Other stop data			
Evidence of bark stripping (present = fail)	PASS	All five criteria met = pass	PASS
% *Sphagnum* spp. cover (≥ 10% = pass)			

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails on 25% of the assessment criteria including diversity of Positive indicator species. *Sphagnum* species were not recorded form the woodland relevé.

In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*; the woodland has been assigned a status of Local Importance (Higher Value) given that is a semi-natural habitat type with high biodiversity in a local context.

4.4 C.16+675-C.17+200 (Mullenduff)

This semi-natural woodland was identified in the desk study as having potential to correspond to the Annex I habitat Bog woodland* [91D0]. The woodland forms part of KER No 11 and surrounds areas of cutover/degraded raised bog, conifer plantation and wet grassland.

The overall woodland area is 5.7 ha and the proposed alignment will result in the loss of approximately 0.28 ha of this woodland. The woodland was assessed at three stop points located on and to the north and south of the proposed alignment.

The results obtained from the three stop points were consistent and it was concluded that the woodland does not correspond to an Annex I habitat.

In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*; the woodland has been assigned a status of Local Importance (Higher Value) given that is a semi-natural habitat type with high biodiversity in a local context. The results of the assessment stops are presented below.

4.4.1 Assessment Stop (Proposed Alignment)

Table 4.10 Relevé 04 Details

Attributes	Details	Photograph
Grid reference:	E178253 N287724	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.11 Relevé 04 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	70-80m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	9
Topography	Low slope	*Crataegus monogyna*	Hawthorn	1
Soil moisture regime	Moderately free draining	*Salix cinerea*	Grey Willow	1
Hydrological features	The woodland is subject to drainage	*Ilex aquifolium*	Holly	1
Management	None of note	Herbs and ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	6
Internal features	None	*Pteridium aquilinum*	Bracken	7
Dead wood	Fine woody debris	*Dryopteris dilatata*	Fern	7
Rocks and boulders	N/A	Bryophytes		
Stones and gravel	N/A	*Thuidium tamariscinum*		6
Bare soil	R	*Polytrichum commune*		5
Litter	O	*Kindbergia praelonga*		5
Bryophyte	O			
Herb	D			
Low woody species	D			
Invasive species	None			
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caeruleae* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata.* This small section of woodland is situated on the soil type *Peat.* The adjacent habitats are cutover and degraded bog, conifer plantation, scrub and wet grassland to the west. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I-listed habitat, but in particular Bog woodland. The assessment is provided in Table 4.12 below. As per Perrin 2008, this woodland subtype has "no significant correspondence" to Annex I habitats. In addition, based on the assessment criteria, the woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat Type was not recorded. *Sphagnum* moss was not recorded.			

Table 4.12 Relevé 04 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea		*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum	✓		
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	✓
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL	Total shrub layer cover 10–50%	
		Field layer ≥ 20% cover and ≥ 20 cm high	✓
Other stop data			
Evidence of bark stripping (present = fail)	PASS	All five criteria met = pass	FAIL
% *Sphagnum* spp. cover (≥ 10% = pass)			

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails on 50% of the assessment criteria including positive indicator species and habitat structure. *Sphagnum* species were not recorded form the woodland relevé.

4.4.2 Assessment Stop (North of the Proposed Alignment)

Table 4.13 Relevé 05 Details

Attributes	Details	Photograph
Grid reference:	E178333 N287816	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.14 Relevé 05 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	70-80m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	10
Topography	Low slope	*Salix cinerea*	Grey Willow	5
Soil moisture regime	Moderately free draining	Herbs and ferns		
Hydrological features	The woodland is subject to drainage	*Rubus fruticosus agg*	Bramble	10
Management	None of note	*Pteridium aquilinum*	Bracken	4
Grazing regime	None	*Dryopteris dilatata*	Fern	4
Internal features	None	Bryophytes		
Dead wood	Fine woody debris	*Thuidium tamariscinum*		5
Rocks and boulders	N/A	*Polytrichum commune*		5
Stones and gravel	N/A			
Bare soil	R			
Litter	O			
Bryophyte	O			
Herb	A			
Low woody species	D			
Invasive species	None			
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata.* This small section of woodland is situated on the soil type *Peat.* The adjacent habitats comprise cutover and degraded bog, conifer plantation, scrub, dense bracken and wet grassland to the west. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I-listed habitat, but in particular Bog woodland. The assessment is provided in Table 4.15 below. As per Perrin 2008, this woodland subtype has "no significant correspondence" to Annex I habitats. In addition, based on the assessment criteria, the woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. *Sphagnum* moss was not recorded.				

Table 4.15. Relevé 05 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea	✓	*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	✓
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL	Total shrub layer cover 10–50%	✓
		Field layer ≥ 20% cover and ≥ 20 cm high	✓
Other stop data			
Evidence of bark stripping (present = fail)	PASS	All five criteria met = pass	PASS
% *Sphagnum* spp. cover (≥ 10% = pass)			

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails by lacking the required suite of positive indicator species. *Sphagnum* moss species were not recorded from the woodland relevé or in the wider area.

4.4.3 Assessment Stop (South of Proposed Alignment)

Table 4.16 Relevé 06 Details

Attributes	Details	Photograph
Grid reference:	E178499 N287559	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.17 Relevé 06 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	70-80m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	8
Topography	Low slope	*Crataegus monogyna*	Hawthorn	1
Soil moisture regime	Moderately free draining	*Salix cinerea*	Grey Willow	4
Hydrological features	The woodland does not appear to flood	*Fagus sylvatica*	Beech	4
Management	Historic peat cutting	Herbs and ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	6
Internal features	Some pooling areas by peat exposed peat banks	*Pteridium aquilinum*	Bracken	4
Dead wood	Fine woody debris	*Dryopteris dilatata*	Fern	4
Rocks and boulders	N/A	*Calluna vulgaris*	Ling Heather	3
Stones and gravel	N/A	*Molinia caerulea*	Purple Moor-grass	1
Bare soil	R	Bryophytes		
Litter	O	*Thuidium tamariscinum*		1
Bryophyte	O	*Polytrichum commune*		1
Herb	A	*Sphagnum palustre*		1
Low woody species	O			
Invasive species	None			
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata.* This small section of woodland is situated on the soil type *Peat.* The adjacent habitats comprise cutover/degraded bog, dene bracken, scrub and conifer plantation. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex Ilisted habitat, but in particular Bog woodland. The assessment is provided in Table 4.18 below. As per Perrin 2008, this woodland subtype has "no significant correspondence" to Annex I habitats. In addition, based on the assessment criteria, the woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. *Sphagnum palustre* was the only *Sphagnum* moss species recorded and it only occurred in pools derived from historic peat extraction. *Sphagnum* moss did not occur outside the pooling areas.			

Table 4.18. Relevé 06 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea	✓	*Fagus sylvatica*	✓
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta	✓	*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.	✓		
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	FAIL
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	✓
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL	Total shrub layer cover 10–50%	
		Field layer ≥ 20% cover and ≥ 20 cm high	✓
Other stop data			
Evidence of bark stripping (present = fail) % *Sphagnum* spp. cover (≥ 10% = pass)	PASS	All five criteria met = pass	FAIL

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails on 75% of the assessment criteria including positive indicator species, negative indicator species and habitat structure. *Sphagnum palustre* was the only *Sphagnum* moss species recorded and it only occurred in pooling areas derived from historic peat extraction. The woodland at the assessment stop point does not correspond to an Annex I habitat.

4.5 C.50+850-C.51+700 (Vesnoy)

This woodland was identified in the desk study as having potential to correspond to the Annex I habitat Bog woodland* [91D0]. The woodland forms part of KER No 17 and surrounds areas of cutover and degraded raised bog. The woodland occurs in two distinct blocks located to the east and west of the Strokestown River. Both woodland blocks were thoroughly walked and a relevé stop point was assessed on either side of the river.

The woodland is set back approximately 10–15 m from the banks of the river and the intervening buffer is dominated by scrub and rank wet grassland. The combined overall area of the woodland is 26.42 ha and the proposed alignment and associated works will result in the loss of approximately 3.2 ha. Evidence of historic and recent peat extraction was observed to the west of the woodland stand traversed by the alignment and there are extensive areas of peat extraction to the east of the river.

The assessment concluded that the woodland does not correspond to the Annex I habitat Bog woodland* [91D0] as it failed on the assessment criteria including diversity of positive indicator species. *Sphagnum* species were not recorded from the woodland relevés.

In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes* the woodland has been assigned a status of Local Importance (Higher Value) given that is a semi-natural habitat type with high biodiversity in a local context.

4.5.1 West of Strokestown River (Proposed Alignment)

Table 4.19 Relevé 07 Details

Attributes	Details	Photograph
Grid reference:	E194571 N281369	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.20 Relevé 07 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	50–60 m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	5
Topography	Flat to low slope	*Salix cinerea*	Grey Willow	8
Soil moisture regime	Evidence of drainage	*Crataegus monogyna*	Hawthorn	1
Hydrological features	The woodland is subject to drainage	*Fraxinus excelsior*	Ash	1
Management	Peat extraction in the vicinity	Herbs and ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	7
Internal features	None	*Carex* spp.	Sedges	4
Dead wood	Fine woody debris	*Filipendula ulmaria*	Meadowsweet	4
Rocks and boulders	N/A	*Galium palustre*	Marsh Bedstraw	1
Stones and gravel	N/A	*Carex remota*	Remote Sedge	1
Bare soil	R	*Phalaris arundinacea*	Reed Canary-grass	1
Litter	O	*Iris pseudacorus*	Yellow Iris	1
Bryophyte	O	*Equisetum* sp.	Horsetail	1
Herb	D	*Angelica sylvestris*	Angelica	1
Low woody species	F	*Hedera helix*	Ivy	3
Invasive species	None	Bryophytes		
		Thuidium tamariscinum		4
		Polytrichum commune		4
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caerulea* woodland group, subcategory c) Salix *cinerea- Galium palustre.* The canopy is dominated by *Betula pubescens* and *Salix cinerea*. The absence of *Alnus glutinosa* distinguishes these stands from the wet woodlands of the *Alnus glutinosa-Filipendula ulmaria* woodland group (Perrin, 2008). This small section of woodland is situated on the soil associate type *Peat* and there is evidence of historic and recent peat extraction surrounding the woodland to the east. The adjacent habitats comprise wet grassland, cutover/degraded bog, scrub and lowland/depositing river. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I listed habitat, but in particular Bog woodland. The assessment is provided in Table 4.21 below. As per Perrin 2008, relevés conducted as part of the National Survey for the woodland subtype *Salix cinerea- Galium palustre* had 21% affinity with the Annex I habitat Bog woodland. Based on the assessment criteria, the assessed woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. *Sphagnum* moss was not recorded.				

Table 4.21. Relevé 07 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea	✓	*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL	Total shrub layer cover 10–50%	✓
		Field layer ≥ 20% cover and ≥ 20 cm high	✓
Other stop data			
Evidence of bark stripping (present = fail)	PASS	All five criteria met = pass	FAIL
% *Sphagnum* spp. cover (≥ 10% = pass)			

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0]as it fails on 50% of the assessment criteria including diversity of Positive indicator species. *Sphagnum* species were not recorded form the woodland relevé or in the wider area.

4.5.2 East of Strokestown River (Not on Alignment)

Table 4.22 Relevé 08 Details

Attributes	Details	Photograph
Grid reference:	E194795 N281187	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.23 Relevé 08 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	50-60m	Trees and woody species		
Aspect	-	*Betula pubescens*	Birch	7
Topography	Flat to low slope	*Salix cinerea*	Grey Willow	8
Soil moisture regime	Evidence of drainage	*Prunus spinosa*	Blackthorn	2
Hydrological features	Alternating banks and drains	*Fraxinus excelsior*	Ash	1
Management	Peat extraction in the vicinity	Herbs and ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	6
Internal features	None	*Carex* spp.	Sedges	6
Dead wood	Fine woody debris	*Filipendula ulmaria*	Meadowsweet	4
Rocks and boulders	N/A	*Hedera helix*	Ivy	3
Stones and gravel	N/A	*Viola* sp.	Violet sp.	1
Bare soil	R	*Dryopteris dilatata*	Fern	4
Litter	O	*Iris pseudacorus*	Yellow Iris	1
Bryophyte	O	*Lonicera periclymenum*	Honeysuckle	2
Herb	D	*Bracypodium sylvaticum*	False Brome	3
Low woody species	F	Bryophytes		
Invasive species	None	*Thuidium tamariscinum*		4
		Polytrichum commune		4
Woodland classification	WN7 Bog Woodland. This woodland falls into the Perrin category *Betula pubescens-Molinia caerulea* woodland group subcategory c) Salix *cinerea- Galium palustre.* The canopy is dominated by *Betula pubescens* and *Salix cinerea*. The absence of *Alnus glutinosa* distinguishes these stands from the wet woodlands of the *Alnus glutinosa-Filipendula ulmaria* woodland group (Perrin, 2008). This small section of woodland is situated on the soil associate type *Peat* and there is evidence of historic and recent peat extraction surrounding the woodland. The adjacent habitats comprise cutover/degraded bog, wet grassland, scrub and lowland/depositing river. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I-listed habitat, but in particular Bog woodland. The assessment is provided in Table 4.24 below. As per Perrin 2008, relevés conducted as part of the National Survey for the woodland subtype *Salix cinerea- Galium palustre* had 21% affinity with the Annex I habitat Bog woodland. Based on the assessment criteria the assessed woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. *Sphagnum* moss was not recorded from the relevé or in the wider area.				

Table 4.24. Relevé 08 Bog woodland* [91D0] structure and functions assessment (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Betula pubescens	✓	*Acer pseudoplatanus*	
Salix cinerea	✓	*Fagus sylvatica*	
		Non-native conifer species	
Herbs and ferns		Other:	
Anthoxanthum odoratum		Non-native shrub species	
Blechnum spicant		*Cotoneaster* spp.	
Carex echinata		*Prunus laurocerasus*	
Juncus effusus		*Rhododendron* spp.	
Molinia caerulea		*Symphoricarpos* spp.	
Potentilla erecta		*Cornus sericea*	
		Other:	
Mosses and liverworts			
Hypnum cupressiforme			
Kindbergia praelonga			
Mnium hornum			
Polytrichum commune			
Sphagnum spp.			
Thuidium tamariscinum	✓		
Ulota crispa/bruchii	✓		
		No negative indicator species recorded = pass	PASS
		Structural data	
		Median canopy height > 5 m	✓
		Total canopy cover > 30% of plot	✓
		Betula pubescens > 50% of canopy	
		Total shrub layer cover 10–50%	✓
		Field layer ≥ 20% cover and ≥ 20 cm high	
Betula pubescens, *Sphagnum* spp. plus ≥ 5 of the other listed species present = pass	FAIL		
Other stop data			
Evidence of bark stripping (present = fail)	PASS	All five criteria met = pass	FAIL
% *Sphagnum* spp. cover (≥ 10% = pass)			

The assessment area does not correspond to the Annex I habitat Bog woodland* [91D0] as it fails on 50% of the assessment criteria including diversity of positive indicator species and habitat structure. *Sphagnum* species were not recorded form the woodland relevé or in the wider area.

4.6 C.52+250-C.52+700 (Bumlin)

This semi-natural woodland was identified in the desk study as having potential to correspond to the Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* [91E0]. The woodland forms part of KER No 18 and is surrounded by areas of improved wet grassland. The woodland is located approximately 150 m from the Scramoge River. A large drainage ditch runs along the woodland boundary to the north. A fringe of Hawthorn dominated scrub runs along the southern woodland boundary. The road alignment overlaps with the Hazel (*Corylus avellana*) scrub and runs parallel to the boundary of the woodland. The overall woodland/scrub area is 1.9 ha and the proposed alignment will result in the loss of approximately 0.12 ha of the fringing Hazel scrub.

Table 4.25 Relevé 09 Details

Attributes	Details	Photograph
Grid reference:	E195441 N280346	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.26 Relevé 09 Details

Site Description		Species	Common name	Cover abundance (Domin scale)
Altitude	50–60 m	Trees and woody species		
Aspect	-	*Alnus glutinosa*	Alder	7
Topography	Low slope	*Fraxinus excelsior*	Ash	8
Soil moisture regime	Moderately free draining	*Crataegus monogyna*	Hawthorn	1
Hydrological features	The woodland is subject to drainage	*Corylus avellana*	Hazel	4
Management	None of note	Herbs and ferns		
Grazing regime	None	*Rubus fruticosus* agg.	Bramble	4
Internal features	None	*Carex remota*	Remote Sedge	6
Dead wood	Fine woody debris	*Luzula sylvatica*	Geater Wood-rush	3
Rocks and boulders	N/A	*Rumex sanguineus*	Wood dock	2
Stones and gravel	N/A	*Circaea lutetiana*	Enchanter's Nightshade	2
Bare soil	A	*Geranium robertianum*	Herb Robert	2
Litter	O	*Oxalis acetosella*	Wood Sorrell	2
Bryophyte	R	*Filipendula ulmaria*	Meadowsweet	2
Herb	O	*Ranunculus repens*	Creeping buttercup	2
Low woody species	O	*Urtica dioica*	Nettle	2
Invasive species	None	*Dryopteris dilatata*		2
		Melica uniflora	Wood Melick	2
		Geum urbanum	Wood Avens	2
Woodland classification	WN6 Wet willow-alder-ash woodland. This woodland falls into the Perrin Category *Alnus glutinosa-Filipendula ulmaria* woodland group, subcategory a) Fraxinus *excelsior-Carex remota.* This small section of woodland is situated on the soil type *Fine loamy drift with limestone.* The woodland is fringed by a drainage ditch to the north and a narrow band of Hazel scrub to the south. The adjacent land is dominated by improved wet pasture, dense bracken, cutover/degraded bog and scrub. The assessment data presented above was analysed in line with Table A4 of Perrin (2008) to determine if the habitat corresponded to the any Annex I-listed habitat, but in particular Residual alluvial forests. The assessment is provided in Table 4.27 below. As per Perrin 2008, relevés conducted as part of the National Survey for the woodland subtype Fraxinus *excelsior- Carex remota* had 43% affinity with the Annex I habitat Residual alluvial forests . Based on the assessment criteria the assessed woodland does not correspond to any Annex I habitat type as the species assemblage associated with the Annex I habitat type was not recorded. In addition, the woodland does not occur on alluvial soils, is subject to drainage and is located over 150 m from the nearest watercourse, *i.e.* the Strokestown River.				

Table 4.27. Relevé 09 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* [91E0]structure and functions assessment criteria (as per Perrin 2008)

Positive indicator species		Negative indicator species	
Trees and woody species		Non-native tree species	
Alnus glutinosa	✓	*Acer pseudoplatanus*	
Betula pubescens		*Fagus sylvatica*	
Crataegus monogyna	✓	Non-native conifer spp.	
Fraxinus excelsior	✓	Other:	
Salix cinerea			
		Non-native shrub species	
Herbs and ferns		*Cotoneaster* spp.	
Agrostis stolonifera		*Prunus laurocerasus*	
Angelica sylvestris	✓	*Rhododendron ponticum*	
Filipendula ulmaria		*Symphoricarpos albus*	
Galium palustre	✓	*Cornus sericea*	
Iris pseudacorus		Other:	
Mentha aquatica			
Phalaris arundinacea			
Rumex sanguineus	✓		
Urtica dioica	✓		
Mosses and liverworts			
Calliergonella cuspidata			
Hypnum cupressiforme		No negative indicator species recorded = pass	PASS
Kindbergia praelonga			
Ulota bruchii			
Ulota crispa		Structural data	
		Median canopy height > 7 m	✓
		Total canopy cover > 30% of plot	✓
		Target species > 50% of canopy	✓
		Total shrub layer cover 10–50%	
Fraxinus excelsior, *Alnus glutinosa*, *Salix cinerea* plus ≥ 6 of the listed species present = pass	FAIL	Field layer ≥ 20% cover and ≥ 20 cm high	✓
Other stop data			
Evidence of bark stripping (present = fail) % bryophyte cover (> 4% = pass)	PASS	All five criteria met = pass	FAIL

The assessment area does not correspond to the Annex I habitat Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* [91E0] as it fails on 50% of the assessment criteria including positive and negative indicator species. The woodland does not occur on alluvial soils, is subject to drainage and is located over 150 m from the nearest watercourse *i.e.* the Strokestown River.

In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*; the woodland has been assigned a status of Local Importance (Higher Value) given that is a semi-natural habitat type with high biodiversity in a local context.

4.7 C.53+300-C.53+950 (Scramoge)

This woodland was identified in the desk study as potential semi-natural woodland. The woodland forms part of KER No 20. On further assessment in the field, it was determined that the woodland is predominantly a planted, non-native Mixed broadleaved woodland. Consequently, the woodland has no links to any Annex I habitats. The overall woodland area is 4.2 ha and the proposed alignment will result in the loss of approximately 0.34 ha of this woodland. In accordance with the receptor importance classification criteria outlined in NRA (2009), *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*; the woodland has been assigned a status of Local Importance (Higher Value) given that is a semi-natural habitat type with high biodiversity in a local context. Results of the field assessment are present below.

Table 4.28 Relevé 10 Details

Attributes	Details	Photograph
Grid reference:	E196122 N279660	
Date:	06/10/2015	
Relevé area:	20 m × 20 m	

Table 4.29 Relevé 10 Details

Site Description		Species	Common name	Cover abundance (Domin Scale)
Altitude	60–70 m	Trees and woody species		
Aspect	-	*Acer* sp.	Maple	7
Topography	Low slope	*Acer pseudoplatanus*	Sycamore	7
Soil moisture regime	Moderately free draining	*Fraxinus excelsior*	Ash	4
Hydrological features	The woodland does not appear to flood	*Prunus spinosa*	Blackthorn	5
Management	None of note	*Corylus avellana*	Hazel	5
Grazing regime	None	*Salix* sp.	Willow	5
Internal features	None	Herbs and Ferns		
Dead wood	Fine woody debris	*Rubus fruticosus* agg.	Bramble	7
Rocks and boulders	N/A	*Hedera helix*	Ivy	4
Stones and gravel	N/A	*Geranium robertianum*	Herb Robert	3
Bare soil	R	*Lonicera periclymenum*	Honeysuckle	3
Litter	O	*Taraxacum* agg.	Dandelion	3
Bryophyte	O	*Dryopteris dilatata*	Fern	2
Herb	O			
Low woody species	F			
Invasive species	None			
Woodland classification	Mixed Broadleaved Woodland (WD1). This is a stand of planted woodland dominated by non-native species. It has no links to Annex I habitats. The adjacent habitats comprise improved agricultural grassland, dry meadows and grassy verges and buildings and artificial surfaces.			

5 OVERALL DISCUSSION AND CONCLUSIONS

The current report provides details of the Woodland habitats located along and traversed by the proposed alignment route. Broadleaved woodland habitats were initially identified from aerial photography and preliminary walkover surveys. Subsequently, detailed assessments of the identified woodlands were conducted to determine if any of the woodland habitats had links to habitats listed on Annex I of the EU Habitats Directive.

Seven woodland stands were selected for further assessment. The seven woodland stands identified have been classified as per Fossitt (2000) and Perrin (2008). Woodland types recorded included Bog woodland (WN7), Wet willow-alder-ash woodland (WN6) and Mixed broadleaved woodland (WD1). Annex I habitats were not recorded during the detailed assessment.

A summary of the assessment findings is presented in Table 5.1 below.

Table 5.1 Woodland Assessment Results Summary

Chainage	Key ecological receptor	Soil association (Teagasc soils map)	Annex I status	Evaluation NRA (2009)
C.13+950 to C.14+200	No 7. Bog woodland (WN7). *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata.*	*Peat*	No	Local Importance (Higher Value)
C.14+500 to C.14+675	No 9. Bog woodland (WN7). *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata .*	*Peat*	No	Local Importance (Higher Value)
C.15+150 to C.15+300	No 10. Bog woodland (WN7). *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata .*	*Peat*	No	Local Importance (Higher Value)
C.16+675 to C.17+200	No 11. Bog woodland (WN7). *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Rubus fruticosus-Dryopteris dilatata .*	*Peat*	No	Local Importance (Higher Value)
C.51+100 to C.51+550	No 17. Bog woodland (WN7). *Betula pubescens-Molinia caerulea* woodland group, subcategory a) *Salix cinerea-Galium palustre.*	*Peat*	No	Local Importance (Higher Value)
C.52+250 to C.52+500	No 18. Wet willow-alder-ash woodland (WN6). *Alnus glutinosa-Filipendula ulmaria* woodland group, subcategory a) *Fraxinus excelsior-Carex remota.*	*Fine loamy drift with limestone*	No	Local Importance (Higher Value)
C.53+300 to C.53+950	No 20. Stand of non-native Mixed broadleaved woodland (WD1).	*Fine loamy drift with siliceous stones*	No	Local Importance (Higher Value)

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Teagasc soils map (http://gis.teagasc.ie/soils/)

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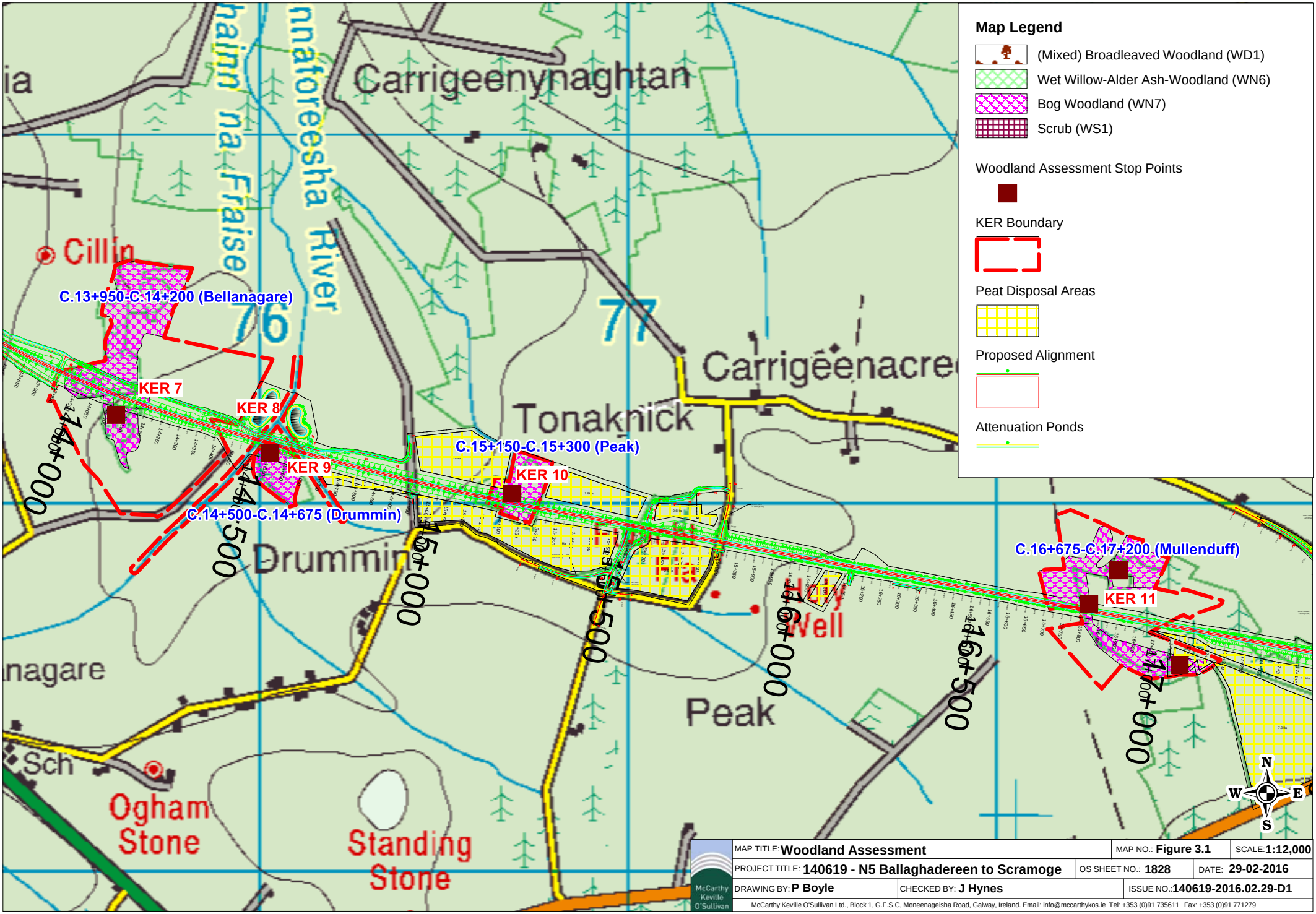

MAP TITLE: **Woodland Assessment**		MAP NO.: **Figure 3.1**	SCALE: **1:12,000**
PROJECT TITLE: **140619 - N5 Ballaghadereen to Scramoge**		OS SHEET NO.: **1828**	DATE: **29-02-2016**
DRAWING BY: **P Boyle**	CHECKED BY: **J Hynes**	ISSUE NO.: **140619-2016.02.29-D1**	

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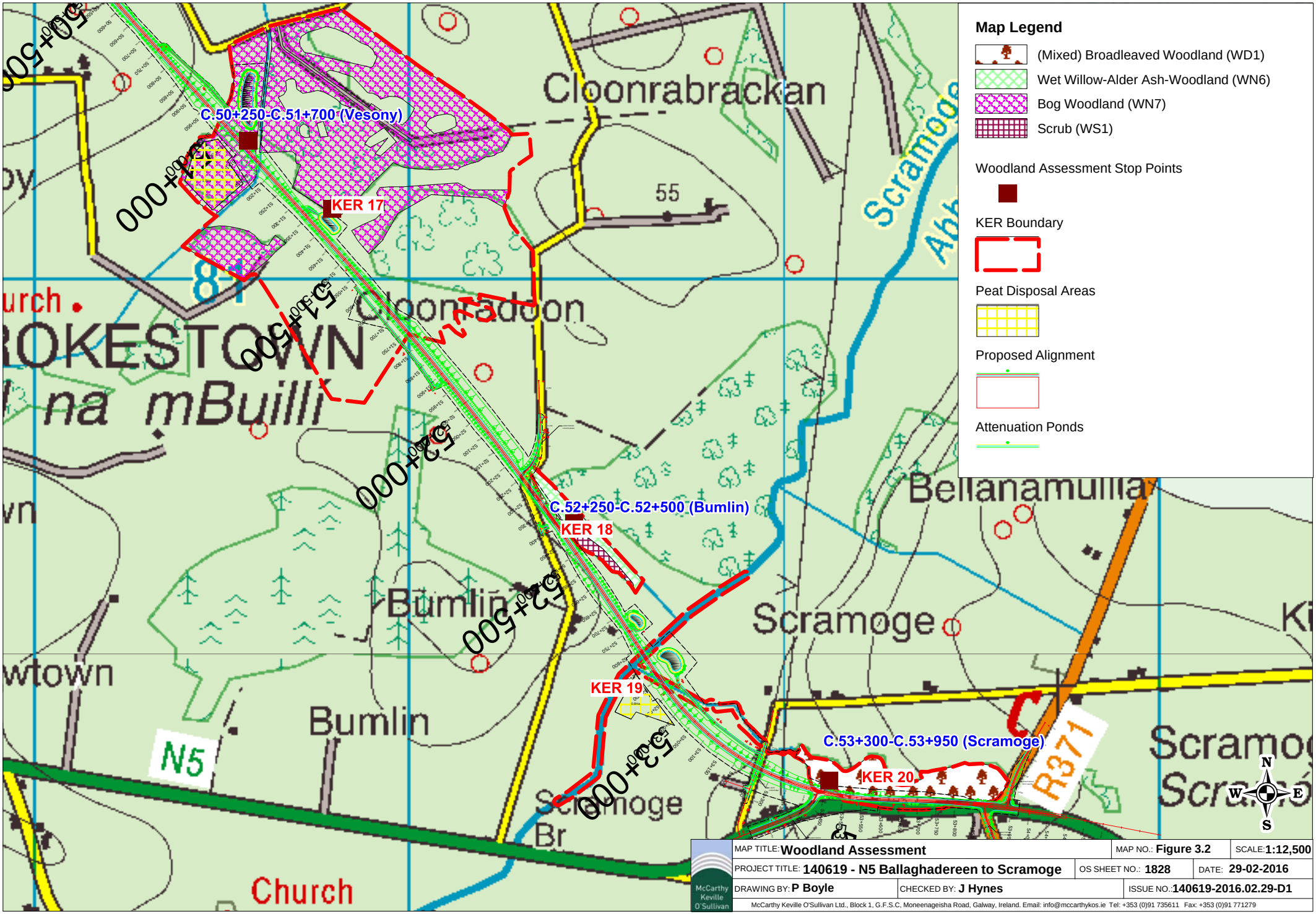

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PROJECT TITLE: **140619 - N5 Ballaghadereen to Scramoge**		OS SHEET NO.: **1828**	DATE: **29-02-2016**
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