N4-N15 Sligo Urban Improvement Scheme

Sligo County Council

Environmental Assessment Report Volume 4 of 4: Appendices

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April 2017

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Land of Heart's Desire
Sligo County Council

N4-N15 Sligo Urban Improvement Scheme

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Appendix 1.1 N4 Sligo EIA Screening Report

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N4-N15 Sligo Urban Improvement Scheme

Sligo County Council

Environmental Impact Assessment Screening Report

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Environmental Impact Assessment Screening Report

N4-N15 Sligo Urban Improvement Scheme

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Contents

1. Introduction

Sligo County Council (SCC) has developed proposals for the improvement of a section of the N4 and N15 national road corridor on the northwestern extents of Sligo City, hereafter referred to as "the proposed development".

The purpose of this report is to identify the legal requirement or otherwise for an Environmental Impact Assessment (EIA) for the project. This EIA Screening Report documents the methodology applied during the screening of the proposed development, with reference to relevant legislation and guidance documents.

2. Description of the Proposed Development

2.1 Proposed Development Location

The proposed development is situated north of the Garavogue River to the northwest of Sligo City centre. It extends over a distance of approximately 670m along the N4-N15 route corridor from a point just north of Hughes Bridge to a point just north of the N15 / R291 Rosses Point Road junction. The extent of the study area and its location in a wider context is shown in Figure 1, Appendix A.

Sligo Bay is immediately west of the proposed development. Both the Garavogue River and Sligo Bay are part of the Cummeen Strand / Drumcliff Bay (Sligo Bay) Special Area of Conservation (SAC) (site code: 000627) and proposed Natural Heritage Area (pNHA), and Cummeen Strand Special Protection Area (SPA) (site code: 004035), see Figure 2, Appendix A.

2.2 The Proposed Development

The existing carriageway comprises an urban two lane dual carriageway with right turning lanes at each of the three signalised junctions along the proposed development. The road is subject to a 50km/h speed limit throughout the study area. Footways are provided on both sides of the road directly adjacent to the carriageway. There is currently no dedicated cycling infrastructure within the proposed development extents.

The proposed development consists of an upgraded mainline carriageway, increased right-turning provision and improved facilities for pedestrians and cyclists along the mainline and at the three signalised junctions.

The proposed development includes the following elements of infrastructure:

- Carriageway realignment and new/extended turning lanes;
- Junction realignments;
- Pedestrian and cyclist facilities improvements;
- Structures including new retaining walls at Salmon Point and the HSE Facility and a bridge replacement (Copper River Bridge);
- A new road surface water drainage system; and
- Associated new landscaping, planting and boundary treatments.

The drainage system has been produced in accordance with the HD33 of the TII DMRB for the proposed development which comprises drainage kerbs. Petrol interceptors will be provided at all outfall locations. The drainage network will be split into three separate drainage networks which will outfall at three separate locations. The outfalls are located to the west (downstream) of the Copper River Bridge, east (upstream) of the Copper River Bridge and at the Garavogue Estuary/River on the southern side of the R870 Markievicz Road to the east (upstream) of Hughes Bridge. The design of the drainage system has been undertaken to a sufficient level to allow land-take requirements be sufficiently developed. Appropriate pollution control measures have also been developed as part of the design process.

Runoff from the N15 drainage networks will be treated in a new wetland to be constructed as part of the proposed development which will outfall to the Copper River upstream of the Copper River Bridge. The proposed wetland will be situated to the northeast of the Copper River Bridge, i.e. east of the N15 mainline and north of the Copper River.

2.3 The Need for the Scheme

The road improvement aspirations along the N4-N15 route corridor follow on from the implementation of the N4 Sligo Inner Relief Road in 2005, a 4.5km dual carriageway that extends from the Carraroe roundabout south of Sligo to Hughes Bridge. The primary objective of the N4 Inner Relief Road was to remove traffic from the most congested streets in the town centre; after implementation, the scheme was found to have provided

considerable benefits to Sligo in terms of traffic volume reductions on congested city centre streets and improved access to Sligo and its environs.

The section of proposed road development has been part of two previous road development projects which were progressed in recent years to improve the N4-N15 route corridor. In 2006, a preferred route was selected and approved by SCC for the "N4-N15 Sligo to County Boundary" realignment scheme. This project included the widening of Hughes Bridge and the construction of 26km of dual carriageway running from Hughes Bridge to the Leitrim county boundary to the north. The preliminary design, EIS and Compulsory Purchase Order (CPO) for that scheme were prepared however approval to publish and advance the scheme further was not granted by the funding agency, the National Roads Authority (NRA), which has since become Transport Infrastructure Ireland (TII), due to funding constraints in place at that time. This project ran from 2006 to 2011 and, while the road development remains an objective of SCC, there are no plans to undertake any further work on this scheme at this time.

In 2011, SCC proposed the "N4-N15 Sligo to Borough Boundary" scheme, a truncated version of the N4-N15 Sligo to County Boundary realignment scheme. This reduced scheme would also commence at, and include, Hughes Bridge but would terminate at the Sligo Borough administrative boundary. This scheme was some 1.6km in length. The preliminary design, EIS and CPO was finalised in 2011 however the EIS and CPO were not published, the project was has not been progressed any further and, while the road development remains an objective of SCC, there are no plans to undertake any further work on this scheme at this time.

In 2012, SCC received approval from the NRA to progress the design and planning process for the Hughes Bridge widening element of the N4-N15 Sligo to Borough Boundary scheme. Following the successful granting of Part 8 planning permission in January 2013, funding to construct the scheme was approved in 2014. Construction of this scheme was completed in mid-2015.

Also in 2015, TII requested SCC to progress the planning, design, environmental assessments and CPO for the proposed development running from north of Hughes Bridge to north of the R291 Rosses Point Road junction, a distance of some 670m. The proposed development is now therefore being developed as a stand-alone project to address the ongoing traffic congestion, junction capacity and road safety issues at this location. In 2015, Jacobs was appointed by SCC to progress the design of the proposed development including the environmental assessments, CPO, planning and statutory approvals, construction supervision and contract administration through to the handover of works.

The proposed development is consistent and compatible with the following national, regional and local policy documents:

- Trans-European Transport Networks;
- Building on Recovery: Infrastructure and Capital Investment Plan 2016-2021;
- National Spatial Strategy for Ireland;
- The Northern & Western Regional Assembly: Regional Planning Guidelines (2010-2022);
- Smarter Travel, 2009;
- Sligo County Development Plan 2011-2017; and
- Sligo and Environs Development Plan 2010-2016.

2.3.1 Scheme Objectives

The main objectives of the proposed development are:

- To improve capacity in the road network to cater for existing and future traffic; and
- To improve road safety and reduce accidents.

The proposed development originates due to concerns regarding deficiencies in the existing road network in terms of capacity and safety. Its development is supported by national, regional and local government policy. Its

objectives are furthermore consistent with those of the N4 Sligo Inner Relief Road which sought to remove traffic from the congested city centre and improve access to Sligo and its environs.

The proposed development will provide an appropriate level of service for all modes including improved facilities for pedestrians and cyclists, which will lead to associated improvements in overall road safety. This will have a positive net benefit to the regional and national economy and wider community in terms of savings on time, fuel and improved safety and community health benefits. The provision of the proposed development as part of a modern and efficient transport network will facilitate continued economic development of the area by maintaining strong connectivity between Sligo and the wider strategic national road network.

3. EIA Screening Process

3.1 Introduction

This EIA Screening Report has been prepared to document the consideration of whether the proposed development would require EIA and it has been prepared having regard to the following guidance documents:

- Department of the Environment, Heritage and Local Government (DEHLG), Environmental Impact Assessment (EIA) Guidelines for Consent Authorities regarding Sub-threshold Development (2003);
- NRA, Environmental Impact of National Road Schemes – A Practical Guide (2008); and
- European Commission (EC), Guidance on EIA Screening (2001).

3.2 Relevant Legislation

3.2.1 EU legislation

The requirements to undertake EIA derive from EU Directive 85/337/EEC (as amended) on the assessment of the effects of certain public and private projects on the environment. This directive along with three amendments was amalgamated into Directive 2011/92/EU in December 2011. Proposed changes to the directive were adopted by the Council of the European Union in May 2014 however each member state has a three year period to transpose the changes. Ireland is due to transpose the new 2014 EU EIA directive by May 2017.

3.2.2 Irish Legislation

In relation to roads projects, the requirements of these EU Directives up to 2011 have been transposed into Irish Law through the Roads Act, 1993 to 2007 (as amended by the European Communities (Environmental Impact Assessment) Regulations, 1989 to 2006 and the Planning and Development Acts, 2000 to 2006) and the Roads Regulations, 1994 to 2000.

This results in the categorisation of all road projects into one of two categories:

- Those that exceed the thresholds laid down and therefore have a mandatory requirement to undertake EIA and prepare an EIS; or
- Those projects that are sub-threshold and must be assessed on a case-by-case basis to determine whether or not they are likely to have significant effects on the environment and thus require EIA.

3.3 Methodology

3.3.1 Introduction

Screening is the term used to describe the process of ascertaining whether a proposed development requires an EIA and is determined by reference to the mandatory and discretionary provisions set out in the Roads Act, 1993 to 2007 (as amended).

The overriding consideration in determining whether a proposed development should be subject to EIA is the likelihood of significant environmental effects. Significant effects may arise by virtue of the type of the proposed development, the scale or extent of the proposed development and the location of the road scheme in relation to sensitive environments.

A methodology was developed to formally screen the proposed development, which was based on Environmental Impact Assessment (EIA), Guidance for Consent Authorities regarding Sub-threshold Development (DEHLG, 2003), the NRA Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008) and the EC Guidelines on EIA Screening (EC, 2001). The screening process to ascertain whether a road development requires EIA is determined by reference to mandatory and discretionary

provisions set out in the Roads Act, 1993 to 2007 (as amended). The screening exercise is divided into a section on mandatory EIA and another on sub-threshold or discretionary EIA. In each section below a screening matrix is presented which examines the requirement for EIA according to the criteria set out in the relevant legislation.

3.3.2 Mandatory EIA

Section 50 of the Roads Act, 1993 to 2007 (as amended) and Article 8 of the Roads Regulations, 1994 outline the legislative requirements that determine whether an EIA is mandatory for a proposed road development.

Table 3-1 provides an overview of the relevant legislation (in accordance with the NRA guidelines) and identifies its applicability to the proposed development. The proposed development is not a Motorway, Busway or Service Area, does not involve the provision of four or more lanes, and does not involve the provision of a bridge or tunnel greater than 100m in length.

Therefore, the proposed development does not exceed any of the thresholds that trigger the mandatory requirement for an EIA, as shown in Table 3-1.

3.3.3 Sub-Threshold Development

The Roads Act, 1993 to 2007 (as amended) outlines three circumstances under which an EIA for a subthreshold road project may be required. These are summarised in

Table 3-2.

Where a decision is being made on whether a proposed development would or would not be likely to have significant effects on the environment, regard must be given to the criteria specified for the purposes of Article 27 of the European Communities (Environmental Impact Assessment) Regulations, 1989.

The Article 27 screening criteria is grouped into three categories:

1) Characteristics of the Proposed Development;
2) Location of the Proposed Development; and
3) Characteristics of Potential Impacts.

The criteria associated with each category (i.e. the criteria that must be taken into account when making screening decisions on a case-by-case basis) will be considered in the context of the proposed development in the following paragraphs.

In addition, the Environmental Impact Assessment (EIA), Guidance for Consent Authorities regarding Sub-threshold Development (DEHLG, 2003) provides checklists to aid the decision making process. In particular, the 'Screening Checklist' (completed and included in Table 3-3) and the complementary 'Checklist of Criteria for Evaluation of the Significance of Environmental Effects' were used to inform the Article 27 screening criteria.

Table 3-1 EIA Screening Matrix – Mandatory Requirement

Mandatory Threshold		Regulatory Reference[1]	Response
Construction of a motorway.		S. 50(1)(a)(i) of the Roads Act, 1993, as substituted by S.9(1)(d)(i) of the Roads Act, 2007.	**Mandatory Threshold Trigger not reached.**
Construction of a busway.		S. 50(1)(a)(ii) of the Roads Act, 1993, as substituted by S.9(1)(d)(i) of the Roads Act, 2007.	**Mandatory Threshold Trigger not reached.**
Construction of a service area.		S. 50(1)(a)(iii) of the Roads Act, 1993, as substituted by S.9(1)(d)(i) of the Roads Act, 2007.	**Mandatory Threshold Trigger not reached.**
Any prescribed type of proposed development consisting of the construction of a proposed public road or the improvement of an existing public road, namely:	The construction of a new road of four or more lanes, or the realignment or widening of an existing road so as to provide four or more lanes, where such new, realigned or widened road would be eight kilometres or more in length in a rural area, or 500 metres or more in length in an urban area;	S. 50(1)(a)(iv) of the Roads Act, 1993, as substituted by S.9(1)(d)(i) of the Roads Act, 2007. Article 8 of the Roads Regulations, 1994 (Road development prescribed for the purposes of S.50(1)(a) of the Roads Act, 1993).	The proposed development is greater than 500m in length in an urban area however this traffic management and road safety improvement scheme does not involve the provision of four or more lanes. **Mandatory Threshold Trigger not reached.**
	The construction of a new bridge or tunnel which would be 100 metres or more in length.	Article 8 of the Roads Regulations, 1994 (Road development prescribed for the purposes of S.50(1)(a) of the Roads Act, 1993).	**Mandatory Threshold Trigger not reached.**

[1] It should be noted that sections 50 and 51 of the Roads Act, 1993, have been amended by the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999; the Planning and Development Act, 2000; the Planning and Development (Strategic Infrastructure) Act, 2006; and the Roads Act, 2007

Table 3-2 EIA Screening Matrix – Sub-Threshold Requirement

Sub-Threshold Requirement		Regulatory Reference[2]	Response
Where An Bord Pleanála (ABP) considers that a proposed road development would be likely to have significant effects on the environment it shall direct the road authority to prepare an EIS.		S. 50(1)(b) of the Roads Act,1993.	ABP has not directed the road authority (SCC) to prepare an EIS for the proposed development
Where a road authority considers that a proposed road development would be likely to have significant effects on the environment it shall inform ABP in writing and where ABP concurs it shall direct the road authority to prepare an EIS.		S. 50(1)(c) of the Roads Act,1993.	The proposed development is not anticipated by the road authority (SCC) to have significant effects on the environment (see the following Section 3.4 and the Screening Checklist included in Table 3.3).
Where a proposed development would be located on certain environmental sites the road authority shall decide whether the proposed development would be likely to have significant effects on the environment. The sites concerned are: If the road authority considers that significant environmental effects are likely, it shall inform ABP in accordance with section 50(1)(c).	(i) Special Area of Conservation (SAC)	S. 50(1)(d) of the Roads Act, 1993, as inserted by Art. 14(a) of the EIA (Amendment) Regulations, 1999.	The N4-N15 Sligo Urban Improvement Natura Impact Statement (NIS), dated December 2016 confirmed that "Following implementation of the proposed mitigation, the construction and operation of the proposed development would have no adverse effects on the integrity of any European sites, either alone or in combination with other plans or projects". The NIS is included in Appendix B.
	(ii) A site notified in accordance with Regulation 4 of the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997)		
	(iii) Special Protection Area		
	(iv) A site where consultation has been initiated in accordance with Article 5 of Council Directive 92/43/EC of 21 May, 1992, on the conservation of natural habitats and of wild flora and fauna.		
	(v) A Nature Reserve within the meaning of sections 15 or 16 of the Wildlife Act, 1976.		
	(vi) Refuge for Fauna under section 17 of the Wildlife Act, 1976.		
Where a decision is being made pursuant to this subsection on whether a proposed road development would or would not be likely to have significant effects on the environment, the Minister or the road authority concerned (as the case may be) shall have regard to the criteria specified for the purposes of Article 27 of the European Communities (Environmental Impact Assessment) Regulations, 1989.		S. 50(1)(e) of the Roads Act, 1993.	The proposed development is not anticipated by the road authority (SCC) to have significant effects on the environment (see the Section 3.4) and the Screening Checklist included in Table 3-3).

[2] It should be noted that sections 50 and 51 of the Roads Act, 1993, have been amended by the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999; the Planning and Development Act, 2000; the Planning and Development (Strategic Infrastructure) Act, 2006; and the Roads Act, 2007

3.4 Characteristics of the Proposed Development

3.4.1 Size of the Project

The N4/N15 is an existing dual carriageway of four or more lanes. The proposed development extends over a distance of approximately 670m along the existing N4-N15 and is a traffic management and road safety improvement scheme which involves reconfiguring existing junctions, provision of new pedestrian and cycle facilities and provision of new turning lanes.

3.4.2 Potential Cumulative effects with other Projects

There are no known proposals for development within the study area. There are two road projects under active consideration by SCC at present, namely the N16 Sligo to County Boundary Realignment and the N4 Collooney/Castlebaldwin Proposed Road Development. There are no anticipated cumulative impacts with these other developments due to their current phase (the N16 Sligo to County Boundary Realignment is at route selection phase) and distance from the proposed development (the N4 Collooney/Castlebaldwin Proposed Road Development has received planning permission but is some 10 km away). There are no plans at present to progress the N4-N15 Sligo to Borough Boundary scheme. These projects will be subject to planning requirements and where required, EIA and Appropriate Assessment (AA) to address any potential future impacts associated with their development.

3.4.3 Use of Natural Resources

It is anticipated that approximately 6,500m^3 of imported fill material will be used during construction, but none during operation aside from ongoing maintenance. Periodic maintenance and resurfacing will be required in the future but will only utilise a small proportion of the quantity used in initial construction. Based on the scale and nature of works proposed it is not likely that there will be any significant effects on the environment.

3.4.4 Production of Waste

The proposed development will result in approximately 6,200m^3 of material being excavated as part of the site clearance works. It is likely that this material will be unacceptable for reuse in the development, therefore it is anticipated that all of this material will be disposed of off-site. There will also be approximately 850m^3 of waste material generated through the demolition of the existing road or structures, including structural material and surrounding backfill and pile arisings.

3.4.5 Pollution and Nuisances

During the estimated twelve month construction period, there are likely to be additional delays to traffic using the N4/N15 as a result of temporary traffic management measures required to facilitate construction. On average, one lane of the existing N4/N15 will be closed during the construction period, rising to more than one lane for short periods for certain elements of the construction. In addition there will be associated noise and air emissions during construction. Dust and noise minimisation measures will be put in place during construction.

As a result of an increase in noise levels at the HSE Primary Care Centre, during the operation of the proposed development, the current wall of the property will be extended by approximately 70m along the western boundary adjacent to the HSE Sligo Primary Care Centre and will be constructed to a height of 2.5m from its existing height of between 0.8m - 1.5m. This measure is embedded in the proposed development design.

The proposed development will not result in a significant change in air or vibration emissions during the operation of the scheme.

3.4.6 Risk of Pollution Incidents

There is potential for pollution of the Garavouge Estuary and Copper River associated with the transport of sediment or accidental release during construction. Prior to construction a detailed Erosion and Sediment Control Plan (dESCP) will be developed for the proposed development and implemented in conjunction with

construction best practice. This will be based on the preliminary ESCP included in the NIS for the proposed development, see Appendix B.

Measures to attenuate and treat the carriageway runoff in order to avoid significant impacts have been incorporated into the drainage design of the proposed development for the outfall prior to discharge of run-off to the Copper River.

There is a risk of hydrocarbon and other dangerous substance contamination as a result of accidental spillage by vehicles using the proposed development during the operational phase however the likelihood of a serious pollution incident is low. A penstock, handstop, or an orifice that can be readily blocked in the event of accidental spillage will be provided on the attenuation/treatment pond.

3.5 Location of Project

3.5.1 Existing Land Use

The proposed development is part of the existing N4 and N15 national roads. It is located in Sligo City and therefore much of the proposed development's land-take comprises existing built lands and other urban habitats. There are a small number of private accesses onto the proposed development and therefore disruption to local access will be minimal.

3.5.2 Abundance, Quality and Regenerative Capacity of Natural Resources

It is anticipated that approximately 6,500m^3 of imported fill material will be required for the proposed development.

The current Water Framework Directive (WFD) status of the Garavogue River and its estuary is "good".

3.5.3 The Absorption Capacity of the Natural Environment

3.5.3.1 Wetlands and Coastal Zones

There are no wetlands affected by the proposed development.

The proposed development is situated adjacent to the Garavogue Estuary, and the Garavogue River, and crosses the Copper River. It is partially located in and directly abutted by the Cummeen Strand SPA and the Cummeen Strand/Drumcliff Bay SAC and pNHA. The proximity to water courses and protected areas means that good construction practices will be required in order to prevent pollution to those waters during the construction phase. See Appendix B for the N4-N15 Sligo Urban Improvement Scheme NIS.

3.5.3.2 Mountain and Forest Areas

There are no mountain and forested areas affected by the proposed development.

3.5.3.3 Nature Reserves and Parks

There are no Nature Reserves or Parks affected by the proposed development.

3.5.3.4 Areas classified or protected under legislation, including special protection areas designated pursuant to Directives 79/409/EEC and 92/43/EEC

The proposed development is situated adjacent to the Garavogue Estuary, and the Garavogue River, and crosses the Copper River. It is partially located within and directly abutted by the Cummeen Strand SPA and the Cummeen Strand/Drumcliff Bay SAC and pNHA. See Appendix B for the N4-N15 Sligo Urban Improvement Scheme NIS.

3.5.3.5 Areas in which the environmental quality standards laid down in legislation of the EU have already been exceeded

A treatment pond is included as part of the proposed development design for one outfall prior to discharge of run-off to the Copper River. With the treatment pond in place the Environmental Quality Standards (EQS) in the European Communities Environmental Objective (Surface Water) Regulations 2009 will not be exceeded.

3.5.3.6 Densely Populated Areas

The proposed development is situated in the northern section of Sligo City. According to the 2011 census data Sligo City has a population of over 17,000.

There are a number of commercial and residential properties within 500m of the proposed scheme including a small number directly adjacent to the proposed scheme.

3.5.3.7 Landscapes of Historical, Cultural or Archaeological Significance

Whilst archaeological sites are known in the wider area, within the study area no known archaeological sites have been identified. Two areas of archaeological potential have been identified.

3.6 Characteristics of the Potential Impact

3.6.1 Extent of the Impact (geographical area and the size of the effected population)

The circa 670m long proposed development represents an upgrade of an existing heavily trafficked urban road corridor, see Figure 1, Appendix A. The overall effect is to provide for improved road safety and traffic management, and provision of appropriate turning lanes and enhanced footpaths and cycle facilities. These works will necessitate local widening of the road corridor which will have direct effects on various roadside boundaries and immediately adjacent lands.

3.6.2 Transfrontier Nature of the Impact

There are no transfrontier impacts associated with the proposed development.

3.6.3 Magnitude and Complexity of the Impact

Human Beings: The construction phase of the proposed development is likely to result in a number of direct construction employment jobs.

There are likely to be minor traffic delays to traffic using the N4/N15 as a result of temporary traffic management measures required to facilitate the construction of the proposed development. There is a small number of private houses accesses directly on the Rosses Point Road affected by the proposed development and therefore disruption to access will be minimal. The overall area of land to be compulsorily acquired is some 3.7 hectares in total however this includes public road, footpaths, verges and public green areas; the net area of third party land affected is 0.46 hectares. This acquisition of land is compensated through the Compulsory Purchase Order (CPO) process and new boundary walls and accesses provided.

The improvement in journey times, access and connectivity are considered to be a positive improvement for people and economic development prospects in and around Sligo.

Flora and Fauna: Impacts and mitigation associated with designated sites are contained within the N4-N15 Sligo Urban Improvement Scheme NIS, see Appendix B.

The prosed development is anticipated to result in the local loss of wet grassland and dry meadow habitat, small losses of scrub, woodland, and hedges. Landscape planting included within the design will reduce any potential effects.

Surface Water: There will be general construction works on the Copper River Bridge and the provision of retaining walls and an outfall in the vicinity of Garavogue River and the Garavogue Estuary which form part of the Cummeen Strand/Drumcliff Bay SAC/pNHA and the Cummeen Strand SPA. The Copper River discharges to the Cummeen Strand/Drumcliff Bay SAC/pNHA and the Cummeen Strand SPA. Any potential impacts associated with increased sediment release during construction could have an impact on these watercourses. A preliminary Erosion and Sediment Control Plan (pESCP) has been drafted and is included in the NIS for the Scheme, see Appendix B.

The inclusion of an attenuation pond upstream on one of the outfalls on the Copper River and the provision of an oil interceptor on all outfalls will reduce potential impacts of road runoff into the watercourse and the estuary.

Soils and Geology: The proposed development design does not propose any areas of cutting with most of the route being constructed at grade. Therefore any impacts to the subsurface will be limited to shallow excavation works linked to clearance activities which are not anticipated to be significant. Made ground will be disturbed during the construction works.

Hydrogeology: The attenuation / treatment pond which will be incorporated into the proposed development design will mitigate against any groundwater pollution by reducing the potential for pollutant release and preventing contaminated runoff produced by the works from entering groundwater via the unsaturated zone.

Air Quality and Climate: Construction activities such as excavation, earth moving and backfilling may generate quantities of dust, particularly in dry and windy weather conditions. Dust minimisation measures will be implemented during the construction phase. Air pollutants are not expected to significantly increase as a result of the proposed development.

Noise and Vibration: Noise minimisation measures will be implemented during the construction phase.

An increase in noise emissions at the HSE primary Care Centre as a result of the operation of the proposed development, require that the current wall of the property be extended by approximately 70m along the western boundary to a height of 2.5m from its existing height of between 0.8m - 1.5m.

Landscape and Visual: Impacts associated with the construction phase and relating to widening of the road corridor onto landscape areas at Salmon Point, the HSE Care Centre and Kilronan residential property will be reduced through landscape planting as part of the proposed development design.

Archaeology and Cultural Heritage, and Architectural Heritage: Two areas of archaeological potential have been identified. Archaeological investigation or monitoring shall be undertaken on the areas of archaeological potential at the Garvogue River and Copper River, enabling the recording of any archaeological remains identified during construction works.

Markievicz House is a Protected Structure adjacent to the proposed scheme. The removal of a section of the modern boundary wall associated with this protected structure will be required as part of the proposed development, however the wall will be re-instated. Temporary intrusion on the building's setting would also result from construction activities.

The masonry arch structures that form the western side of the existing Copper River Bridge will be retained in the proposed development. The twin corrugated concrete structures that form the eastern side of the existing bridge will be demolished and replaced as part of the proposed development, however, resulting in temporary intrusion on the setting of the masonry arch structure and the potential for accidental damage during construction.

Waste Management: The proposed development will result in approximately 6,200m^3 of material being excavated as part of the site clearance works. It is likely that this material will be unacceptable for reuse in the development, therefore it is anticipated that all of this material will be disposed of off-site. There will also be approximately 850m^3 of waste material generated through the demolition of the existing road or structures, including structural material and surrounding backfill.

Material Assets: 6,500m^3 of imported fill material will be required for the proposed development. Impacts associated with the transport of these primary raw materials include increased HGV movements to and within the proposed development. The source(s) of the imported fill materials will be selected from local and regional approved and licenced suppliers where practicable, thereby reducing the length of vehicle trips required.

3.6.4 Probability of the Impact

The potential impacts of all aspects of the proposed development have been considered. There is an increased probability of impacts on air quality, noise, human beings, ecology (widening of the road resulting will result localised habitat loss) and landscape during construction of the proposed development. However, these effects will be temporary in nature and the probability of them occurring will be minimised through the development of the project in accordance with construction best practice.

It is not anticipated that there will not be any significant effects during operation on the receiving environment with embedded design features in place such as;

- The inclusion of an attenuation pond upstream of one of the outfalls on the Copper River and the provision of an oil interceptor on all outfalls which will reduce potential impacts of fine sediment input into the channel and excessive flows discharging from the outfall treatment system and pollution control measures;
- Landscape planting/design, particularly at Salmon Point, the HSE Primary Care Centre and at the Kilronan residential property; and
- The proposals for increasing the length and height of the existing wall at the HSE facility in relation to noise levels.

As these features are inherent in the design, there is no uncertainty regarding their implementation.

Impacts and mitigation associated with designated sites are contained within the N4-N15 Sligo Urban Improvement Scheme NIS this includes the pESCP, see Appendix B.

3.6.5 Duration, Frequency and Reversibility of the Impact

The construction period is expected to be twelve months duration. Construction phase impacts are anticipated to be temporary in nature, of short duration, will not reoccur once construction has been completed and the effects will be reversible over time.

The local loss of small areas of habitat where the existing road is widened is not reversible, but landscape treatment will partially mitigate this local impact.

Table 3-3 EIA Screening Checklist - Determining Significance with respect to Sub Threshold Development

Questions to be Considered	Y/N - Brief Description	Likely to Result in a Significant Effect? Y/N - Why?
Could the size of the proposed development be considered significant?	Yes The proposed development It extends over a distance of approximately 670m.	No The proposed development is located in Sligo city, extends over a distance of approximately 670m along the existing N4-N15 and is considered a road safety improvement and traffic management scheme to an existing road corridor. Much of the proposed development's land-take comprises existing built lands and other urban habitats.
Are there any other factors which may lead to potential for cumulative impacts with other existing or planned activities in the locality?	Yes There are two road projects under active consideration by SCC at present, namely the N16 Sligo to County Boundary Realignment and the N4 Collooney / Castlebaldwin.	No There are no anticipated cumulative impacts with these other developments due to their current phase (the N16 Sligo to County Boundary Realignment is at route selection phase) and distance from the proposed development the N4 Collooney / Castlebaldwin (planning permission received) is some 10 km away. There are no foreseeable plans at present to progress the N4-N15 Sligo to Borough Boundary scheme. These projects will and have been subject to planning requirements and where required, EIA and AA to address the impacts.
Will the proposed development involve the use of natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?	Yes It is anticipated that approximately 6,500m^3 of imported fill material will be required for the proposed development.	No The source(s) of the imported fill materials will be selected from local and regional approved and licenced suppliers where practicable. Where granular fill is required for the proposed development, local or regional virgin sources, or recycled materials held at waste management/transfer facilities that meet the required specification will be sourced.
Will the proposed development produce solid wastes during construction or operation or decommissioning?	Yes The proposed development will result in approximately 6,200m^3 of material being excavated as part of the site clearance works. It is likely that this material will be unacceptable for reuse in the development, therefore it is anticipated that all of this material	No All waste generated in any phase of the proposed development will be handled, transferred and disposed of appropriately in accordance with the relevant waste management regulations/guidelines.

Questions to be Considered	Y/N - Brief Description	Likely to Result in a Significant Effect? Y/N - Why?
	will be disposed of off-site. There will also be approximately 850m^3 of waste material generated through the demolition of the existing road or structures, including structural material and surrounding backfill, and pile arsings.	
Will the proposed development create a significant amount or type of pollution during its construction or operation?	**No** Significant air, noise, water, or groundwater pollution is not anticipated.	**No** Construction management best practices will be implemented. The design of the proposed development will include drainage attenuation and treatment, landscape planting and increased length and height of the boundary wall of adjacent sensitive noise receptors (HSE Care Centre). On this basis, it is anticipated that the proposed development will not result in the creation of a significant amount or type of pollution during the construction or operational phases.
Will the proposed development create a significant amount of nuisance during its construction or operation?	**Yes** There are likely to be minor additional delays to traffic using the N4/N15 as a result of temporary traffic management measures required to facilitate the construction of the proposed development. HGV movements to and within the proposed development will increase during construction.	**No** Effects will be temporary in nature at the construction phase is anticipated to be 12 months in duration. The improvement in journey times, access and connectivity are considered to be a positive improvement for people and economic development prospects in and around Sligo.
Could the risk of accidents, having regard to substances or technologies used be considered significant?	**Yes** There is a risk of hydrocarbon and other dangerous substance contamination during construction and operation as a result of accidental spillage by vehicles using the proposed development.	**No** The likelihood of any accidents during construction and operation will be managed in accordance with relevant health and safety legislation and by the implementation of best practice construction management. The likelihood of an operational phase serious pollution incident is low. However, a penstock, handstop, or an orifice that can be readily blocked in the event of accidental spillage will be provided on the attenuation/treatment pond.
Are there any areas on or around the location, which are protected under international or national or local legislation for their	**Yes** The proposed development is partially located in and directly abutted by the Cummeen Strand SPA and the Cummeen	**No** The N4-N15 Sligo Urban Improvement NIS, December 2016 report confirmed that "Following implementation of the proposed

Questions to be Considered	Y/N - Brief Description	Likely to Result in a Significant Effect? Y/N - Why?
ecological, landscape, cultural or other value, which could be affected by the project?	Strand/Drumcliff Bay SAC and pNHA.	mitigation, the construction and operation of the proposed development would have no adverse effects on the integrity of any European sites, either alone or in combination with other plans or projects". The NIS is included in Appendix B.
Are there any other areas on or around the location, which are important or sensitive for reasons of their ecology, e.g. wetlands, the coastal zone, mountains, forests or woodlands, which could be affected by the project?	Yes There are no wetlands mountains, forests or woodlands, which could be affected by the proposed development. The proposed development is partially located in and directly abutted by the Cummeen Strand SPA and the Cummeen Strand/Drumcliff Bay SAC and pNHA.	No The N4-N15 Sligo Urban Improvement NIS, December 2016 report confirmed that "Following implementation of the proposed mitigation, the construction and operation of the proposed development would have no adverse effects on the integrity of any European sites, either alone or in combination with other plans or projects". The NIS is included in Appendix B.
Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora, e.g. for breeding, nesting, foraging, resting, overwintering, migration which could be affected by the project?	Yes The potential for nests to occur within the footprint of the proposed development. No bat roosts were recorded but foraging bats were recorded in the study area. The nest of a single pair of breeding grey wagtail (High conservation concern) and a small breeding colony of house sparrow (Medium conservation concern) are located is potentially located within the proposed development study area. Wintering Birds are present within the Zone of Influence of the proposed development.	No Vegetation including scrub and grassland will not be removed, where practicable, between March and August inclusive. Wintering birds are likely habituated to the high levels of existing disturbance on the bridge. The installation of temporary lighting during the construction works for the Copper River Bridge works will be monitored by a suitably qualified ecologist prior to continuous use to ensure that any light spill into dark areas especially near the river is minimised. There are no protected flora, flora listed in the Red Data Book or flora species noted as important in the Sligo County Development Plan recorded within the Zone of Influence of the proposed development. There is no evidence of badger, otter, or other mammals using the Copper River to commute or feed. No badger setts or otter holts were recorded. No bat roosts are recorded within the potential Zone of Influence.

Questions to be Considered	Y/N - Brief Description	Likely to Result in a Significant Effect? Y/N - Why?
Are there any inland, coastal, marine or underground waters on or around the location, which could be affected by the project?	Yes The Copper River traverses the study area whilst the Garavogue River/Estuary runs directly to the south. Sligo Harbour and the Garavogue Estuary are directly adjacent to the west.	No The inclusion of an attenuation pond upstream of one of the outfalls on the Copper River and the provision of an oil interceptor on all outfalls as part of the proposed development design will reduce potential impacts of fine sediment input into the channel and excessive flows discharging from the outfall treatment system and pollution control measures.
Are there any areas or features of high landscape or scenic value on or around the location, which could be affected by the project?	No There are no protected views or high landscape value areas.	No Impacts associated with the construction phase and relating to widening of the road corridor onto landscape areas at Salmon Point, the HSE Care Centre and at the Kilronan residential property will be reduced through landscape planting as part of the proposed development design.
Are there any routes or facilities on or around the location, which are used by the public for access to recreation or other facilities, which could be affected by the project?	Yes The Salmon Point amenity area is located adjacent to the existing N4 at the R870 Markievicz Road junction. It is a green space with footpaths, seating and viewing points across Sligo Harbour. There is also a slipway here that provides access to the foreshore.	No Landscape planting at Salmon Point is included as part of the proposed development design.
Are there any transport routes on or around the locations which are susceptible to congestion or which cause environmental problems, which could be affected by the project?	Yes The proposed development is being developed to address the ongoing traffic congestion, junction capacity and road safety issues at this location.	No Reducing traffic congestion is a primary objective of the proposed development. Associated socio-economic benefits such as improved journey times in tandem with environmental benefits like improved air quality and noise pollution can also be realised as a direct result of a local road improvement such as the proposed development.
Is the project in a location where it is likely to be highly visible to many people?	Yes The proposed development is situated in Sligo City, which 2011 census data showed has a population of over 17,000.	No The circa 670m proposed development represents an upgrade of an existing heavily trafficked urban road corridor.
Are there any areas or features of historic or cultural importance on or around the location, which	Yes Two areas of archaeological potential have been identified at the	No Archaeological monitoring should also be undertaken on the areas of

Questions to be Considered	Y/N - Brief Description	Likely to Result in a Significant Effect? Y/N - Why?
could be affected by the project?	Garavogue River and Copper River. Markievicz House is a Protected Structure adjacent to the proposed scheme. The removal of the modern boundary wall associated with this protected structure will be required as part of the proposed development.	archaeological potential at the Garvogue River and Copper River, enabling the recording of any archaeological remains identified during construction works. The wall around Markievicz House (a Protected Structure) will be re-instated to match the existing wall.
Is the project located in a previously undeveloped area where there would be a loss of greenfield land?	No The proposed development is part of the existing N4 and N15 national roads.	No The proposed development is part of the existing N4 and N15 national roads. The footprint of the development is primarily within existing hardstanding.
Are there existing land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?	Yes Residential landtake is required from the edge of two properties namely the Kilroman property and the Suncroft Villas as a result of the proposed development. The provision of a treatment/attenuation pond in an area zoned as "open space" and "C2-commercial and mixed landuse" to the south east of the scheme. There is some limited landtake required at the HSE Primary Care Facility.	No The design of the proposed development has incorporated access arrangements and new boundary walls/arrangements Landowners affected by land acquisition will be compensated through the Compulsory Purchase Order (CPO) process.
Are there any plans for future land uses on or around the location, which could be affected by the project?	No There are no known future land use plans in the vicinity of the proposed development.	No There are no known future land use plans in the vicinity of the proposed development.
Are there any areas on or around the location, which are densely populated or built-up, which could be affected by the project?	Yes The proposed development is situated in Sligo City, which 2011 census data showed has a population of over 17,000.	No The circa 670m proposed development represents an upgrade of an existing heavily trafficked urban road corridor.
Are there any areas on or around the location that are occupied by sensitive land uses, e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project?	Yes A HSE Primary Care Facility is located adjacent to the proposed development.	No HSE Primary Care Facility is currently located adjacent to the existing N4-N15. The proposed development will include extend by approximately 70m the existing western boundary wall adjacent to the HSE Care Centre, together with an increase in its height of 2.5m from its existing 0.8m and

Questions to be Considered	Y/N - Brief Description	Likely to Result in a Significant Effect? Y/N - Why?
		1.5m to negate any potential noise level increases.
Are there any areas on or around the location that contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project?	Yes The Copper River traverses the study area whilst the Garavogue River/Estuary runs directly to the south. Sligo Harbour and the Garavogue Estuary are directly adjacent to the west. The proposed development is partially located in and directly abutted by the Cummeen Strand SPA and the Cummeen Strand/Drumcliff Bay SAC and pNHA.	No The inclusion of an attenuation pond upstream of one of the outfalls on the Copper River and the provision of an oil interceptor on all outfalls as part of the proposed development design will reduce potential impacts of fine sediment input into the channel and excessive flows discharging from the outfall treatment system and pollution control measures. The N4-N15 Sligo Urban Improvement NIS (December, 2016) confirmed that "Following implementation of the proposed mitigation, the construction and operation of the proposed development would have no adverse effects on the integrity of any European sites, either alone or in combination with other plans or projects". The NIS is included in Appendix B.
Are there any areas on or around the location, that are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?	No There are no areas known of where the legal environmental standards have been exceeded.	No A treatment pond is included as part of the proposed development design for outfall of run-off to the Copper River. With the treatment pond in place the Environmental Quality Standards (EQS) in the European Communities Environmental Objective (Surface Water) Regulations 2009 will not be exceeded.
Is the project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs severe winds, which could cause the project to present environmental problems?	Yes Flooding	No A Flood Risk Assessment concluded that both flood risks and impacts associated with the proposed development are low and negligible. It recommends that any possible impacts to the fluvial, estuarine flood risk and groundwater be mitigated in the design of the Copper River Bridge. It is recommended that any possible impacts to the ground water be mitigated through the use of appropriate design of the required earthworks.

4. Conclusion

The proposed development does not exceed any of the thresholds that trigger the mandatory requirement for EIA.

The proposed development was considered for sub–threshold EIA requirements and was therefore assessed in accordance with the criteria for determining whether or not a development would or would not be likely to have significant effects on the environment as specified in Article 27 of the European Communities (Environmental Impact Assessment) Regulations, 1989, in accordance with S. 50(1)(e) of the Roads Act,1993.

Due to the proximity of the Natura 2000 sites to the N4-N15 Sligo Urban Improvement Scheme, the likely effects of the proposed works on the designated sites have been assessed in the NIS (see Appendix B) which concluded that "Following implementation of the proposed mitigation [outlined within the NIS], the construction and operation of the proposed development would have no adverse effects on the integrity of any European sites, either alone or in combination with other plans or projects".

Based on the information it has been determined that the proposed development would not be likely to have significant impacts on the environment and the N4-N15 Sligo Urban Improvement Scheme does not require an EIA.

Notwithstanding this, an Environmental Assessment Report (EAR) will be prepared setting out proposed mitigation to be incorporated into the design and implemented during construction, to ensure that potential environmental effects are avoided or reduced in line with the findings of both this Screening Report and the EAR. This EAR will inform the final design of the proposed development and the measures contained therein, including any measures proposed to alleviate or mitigate potential impacts, will be carried through to the scheme design and construction.

Appendix A. Figures

Appendix B. Natura Impact Statement

See EAR Volume 4 Appendix 5.9

Appendix 5.1 Zones of Influence informing the Assessment

Ecological feature		Protected and/or significant examples	Potential source (s) of effect from proposed development	Potential effect pathways	ZoI (m beyond proposed road)	Rationale
Features sensitive to pollution	Various	Various.	Discharge of silt, oil, or other contaminants into surface water	Pollution during construction or operation.	Not determined based on rationale in Section 5.	Worst-case assumptions have informed the development of design and mitigation features (Section 5.2.1.3).
Habitats and flora	Terrestrial habitats or plant species. *(no significant water dependency)*	Limestone pavements lowland meadows, Killarney fern *Trichomanes speciosum.*	Vegetation clearance, access routes.	Habitat loss.	0m (i.e. proposed development footprint)	Only habitat loss in footprint will pose risk of significant effect.
	Surface water dependent habitats or plant species	Estuaries, saltmarsh, mudflats	Instream works	Habitat loss.	0m (i.e. proposed development footprint)	Only habitat loss in footprint will pose risk of significant effect.
	Ground-water dependent habitats/species.	Alluvial woodlands, dune slacks, peatlands, lagoons, whorl snails (three *Vertigo* species), turloughs.	Earthworks, piling, access routes.	Interference with groundwater supply or quality.	250m	Radius within which further survey of groundwater-dependent habitats recommended where foundations or burrow pits proposed (SEPA, 2014).
Mammals	Mammal crossing points.	Otter, badger, pine marten *Martes martes,* stoat.	Replacement of Copper River culvert	Altered or decreased routes for safe crossing of roads.	300m upstream and downstream of watercourses from works	Radius within which surveys recommended to detect otter crossing points in the UK design Manual for Roads and Bridges (Highways Agency, 2001).
	Underground breeding or resting sites.	Otter holts, badger setts, stoat warrens, pine marten dens.	Vegetation clearance, earthworks, piling, access routes, instream works	Direct disturbance or vibration causing chamber collapse.	150m	Distance to underground otter sites within which disturbing works are likely to require licencing (NRA, 2006b).
	Marine mammals using terrestrial 'haul-out' sites.	Harbour seal *Phoca vitulina*	Piling and construction operations	Noise and human presence causing disturbance to haul-out sites.	500m	Precautionary based on professional judgement given characteristics of development

Ecological feature		Protected and/or significant examples	Potential source (s) of effect from proposed development	Potential effect pathways	ZoI (m beyond proposed road)	Rationale
	Bats (roosting).	All bats are Annex IV European-protected species in Ireland (Lesser horseshoe is also Annex II and is treated separately below)	Vegetation clearance, works to Copper River culvert, lighting	Loss or damage to roosting features in trees or structures	0m for direct impacts (i.e. proposed development footprint) up to 50m from development to account for indirect light spill impacts	Based on professional judgement given characteristics of development e.g. no loss of trees or buildings and impacts from lighting considered unlikely as little or no change form baseline conditions (e.g. existing lighting to be retained or upgraded).
	Bats (foraging)	As above	Vegetation clearance. lighting	Loss or deterioration of foraging habitat.	0m (i.e. proposed development footprint)	Precautionary based on professional judgement given characteristics of development e.g. majority of the footprint is within existing built development.
Birds	Breeding Birds (highly sensitive species)	European-protected birds of prey, chough	Vegetation clearance, noise and physical human presence	Disturbance to breeding sites	100m up to a maximum of 500m.	Worst-case, upper limit of disturbance to white-tailed sea eagle, from all Irish species study by Whitfield et al., (2008).
	Breeding Birds (kingfisher)	European-protected kingfisher	Vegetation clearance earthworks, piling, visible human presence	Disturbance to breeding sites	150m	Distance within which ground vibration from piling or earthworks may result in collapse of banks potentially containing nest sites (as per NRA, 2009 for underground mammal resting sites).
	Breeding Birds (less sensitive species; often urban/suburban areas)	Nationally-protected passerines, crows, and gulls	Vegetation clearance, and construction works including earthworks and piling.	Noise and human presence causing disturbance to breeding sites	100m	Precautionary based on professional judgement given characteristics of development

Ecological feature		Protected and/or significant examples	Potential source (s) of effect from proposed development	Potential effect pathways	ZoI (m beyond proposed road)	Rationale
	Wintering birds	European-protected wading birds, gulls, duck, geese, swans	Noise and physical human presence, and machinery in intertidal habitats.	Noise and human presence causing disturbance to feeding and roosting sites	500m	Precautionary based on published distances for anthropogenic disturbance to wintering wetland species (Madsen, 1985; Smit & Visser, 1993; Rees *et al.,* 2005)
Invertebrates (where not highly dependent on groundwater habitats)	Butterflies, odonatan (dragonflies, damselflies), beetles, bees etc.	Marsh fritillary (Ireland's only European-protected butterfly), nationally protected butterflies and red-listed bees and odonata	Vegetation clearance, access routes	Direct injury or loss of habitat	50m	As outlined above for habitats. Indirect barrier effects to dispersal will not apply as the existing road already poses a barrier and the proposed road widening will not significantly increase the barrier
Aquatic species	In estuarine habitats/life cycle stage	Sea and river lamprey, Atlantic salmon	Instream works, tracking of machinery over intertidal areas	Direct injury or loss of habitat	0m (i.e. proposed development footprint)	Works will only be undertaken within the footprint. Mitigation inherent in design has excluded risk of pollution
	In estuarine habitats/life cycle stage	Sea and river lamprey, Atlantic salmon	Over-pumping or from changes to culvert design	Migratory barriers	Any sites upstream with spawning populations	Based on species' lifecycles
	Species sensitive to underwater noise disturbance	Atlantic salmon , marine mammals.	None	None	None – scoped out from assessment	Earthworks in terrestrial habitats only (e.g. sheet-piling when constructing retaining wall) and therefore no significant underwater noise generated
Mammals	Lesser horseshoe bat	N/A	None	None	None – scoped out from assessment	The works are outside the range for the species (NPWS, 2013a).

Appendix 5.2 Legislation, Policy and Guidelines

The following legislation was of relevance to the assessment:

- The European Commission (EC) Habitats Directive 92/43/EEC (as amended);
- The EC Birds Directive 2009/147/EC;
- The European Communities (Birds and Natural Habitats) Regulations 2011-2015 hereafter referred to as the Birds and Habitats Regulations;
- The Roads Act s1993-2015, as amended;
- The Planning & Development Act 2000 & the Planning and Development (Amendment) Act, 2010 (as amended) hereafter referred to as 'the Planning Acts';
- The Wildlife Act 1976 as amended by the Wildlife (Amendment) Act, 2000 (as amended) hereafter referred to as 'the Wildlife Acts';
- The Flora (Protection) Order, 2015 S.I. 356/2015;
- The Environment (Miscellaneous Provisions) Act No. 20 of 2011; and
- The Fisheries Consolidation Act 1959 (No. 14 of 1959) and the Inland Fisheries Act 2010 (No 10 of 2010).
- The Local Government (Water Pollution) Act, 1990 A number of land-use plans and strategic policy documents were relevant to the ecological assessment, because they overlapped the potential zones of influence for different ecological features. No Local Area Plans (or draft plans), had been adopted for the lands within the footprint of the proposed development or the various zones of influence radiating beyond it:
- The Sligo and Environs Development Plan 2010-2016;
- The National Biodiversity Plan, 2011-2016; and
- The Draft Sligo Biodiversity Action Plan 2011-2015 (revised plan not available at time of writing.

The key guidance relevant to ecology was the full suite of the NRA's planning and construction guidance (NRA 2001-2009), and the Chartered Institute of Ecology and Environmental Management's *Guidelines for Impact Assessment in the United Kingdom and Ireland* (CIEEM. 2016). These are listed in the References in Section 5.13, and referenced throughout the assessment. Other guidance included:

- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA, 2003).
- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002).
- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011).
- A Guide to Habitats in Ireland (Fossitt, 2000).
- Bat Mitigation Guidelines for Ireland (National Parks and Wildlife Service, 2006).
- Bat Surveys: Good Practice Guidelines (Bat Conservation Trust, 2016).

Appendix 5.3 Example of Ecological Valuation from NRA Guidelines

Examples of Ecological Valuation

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.9
• 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)10 of the following:
  ○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and / or
  ○ 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).[11]

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)12 of the following:
  ○ Species protected under the Wildlife Acts; and / or
  ○ Species listed on the relevant Red Data list.
Site containing 'viable areas'13 of the habitat types listed in Annex I of the Habitats Directive.

[9] See Articles 3 and 10 of the Habitats Directive.

[10] It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[11] Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

[12] It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Examples of Ecological Valuation
County Importance: • Area of Special Amenity.[14] • 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)15 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 Biodiversity Action Plan (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)16 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.

[13] A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

[14] It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

[15] It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County importance where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[16] It is suggested that, in general, 1%of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Examples of Ecological Valuation
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.

Appendix 5.4 Parameters Used to Assessment Potential Significance

Potential Impacts are characterised with reference to the following parameters:

- Extent;
- Duration; and
- Frequency.

The terms used to define duration are provided in Box C.1 below.

Box C.1 Parameters used to define Duration of Potential Impact occurrence

Duration of potential impacts is defined in accordance with definitions in the EPA (2002) as follows:

- Temporary – ≤ 1 year
- Short-term – 1 to 7 years
- Medium-term – 7 to 15 years
- Long-term – > 15 years

Based on the above parameters, an impact is considered to be either significant or not significant. An impact is considered to be significant if it has the potential to affect the integrity of a habitat or the conservation status of a species.

Technical definitions of integrity and conservation status follow CIEEM guidance.

With respect to ecology, best practice guidance advises that significance should not be defined as 'high', 'moderate' or 'low' due to the complexities of ecological processes. Therefore, all impacts defined as 'significant' are considered to be significant in the context of the EIA Directive.

In response to the above, and to ensure significant impacts on ecological features are still placed within an appropriate context, a geographical approach is adopted to determine the ecological value of a feature. Significance is then considered at the same geographical scale.

For example, when a significant impact is predicted on a feature of Local Ecological Value, it may be considered to be significant 'at a local level'. However, in some cases, where only a small part of an ecological feature is affected, the geographical scale at which the significant impact will occur may be lower, for example an ecological feature of Local Ecological Value may be subject to an impact that is significant 'at a site level'.

Appendix 5.5 Flora Species List

BL1 - STONEWALLS AND OTHER STONEWORK	
Common name	**Scientific name**
Red valerian	*Centranthus ruber*
Ivy-leaved toadflax	*Cymballaria muralis*
Ivy	*Hedera helix*
Pellitory-of-the-wall	*Parietaria* judaica
Intermediate polypody	*Polypodium interjectum*
Wall-rue	*Asplenium ruta-muraria*
White stonecrop	*Sedum album*
Wall-screw moss	*Tortula muralis*
Frizzled crisp-moss	*Tortella tortuosa*
False beard-moss	*Didymodon fallax*
Silky wall Feather-moss	*Homalothecium sericium*

CM1 - LOWER SALT MARSH	
Common name	**Scientific name**
Hemlock water-dropwort	*Oenanthe crocata*
Sea-milkwort	*Glaux maritima*
Sea arrowgrass	*Triglochin maritimum*
Common scurvygrass	*Cochlearia officinalis*
Sea club-rush	*Bolboschoenus maritimus*
Sea plantain	*Plantago maritima* (D)

ED 3 - RECOLONISING BARE GROUND	
Common name	**Scientific name**
Spiral Extinguisher-moss	*Encalypta streptocarpa*
	Fissidens sp. (F. incurvus/bryoides
Oxeye daisy	*Leucanthemum vulgare*
Annual meadow-grass	*Poa annua*
Dandelion	*Taraxacum officinale agg.*

CM2 - UPPER SALT MARSH	
Common name	**Scientific name**
Carnation sedge	*Carex panicea*
Common scurvygrass	*Cochlearia officinalis*
Greater plantain	*Plantago major ssp. intermedia*
Red fescue	*Festuca rubra*
Sea plantain	*Plantago maritima*
Sea arrowgrass	*Triglochin maritimum*
Sea club-rush	*Bolboschoenus maritimus*
Spear-leaved orache	*Atriplex prostrata*
Sea rush	*Juncus maritimus*
Sea-milkwort	*Glaux maritima*
Autumn hawkbit	*Leontodon autumnalis*
Distant sedge	*Carex distans*
Couch grass	*Elytrigia repens*
Creeping bent	*Agrostis stolonifera*
False Fox-sedge	*Carex otrubae*

GS4 - WET GRASSLAND	
Common name	**Scientific name**
Beet	*Beta vulgaris*
Carnation sedge	*Carex panicea*
Common couch	*Elytrigia repens*
Cuckooflower	*Cardamine pratensis*
Field horsetail	*Equisetum arvense*
Pendulous sedge	*Carex pendula*
Pointed spear-moss	*Calligeronella cuspidata*
Sheep's-fescue	*Festuca ovina*
Sweet vernal-grass	*Anthoxanthum odoratum*
Tufted hair-grass*	*Deschampsia cespitosa*
Velvet feather-moss	*Brachythecium velutinum*
Autumn hawkbit	*Leontodon autumnalis*
Common couch	*Elytrigia repens*
Common reed	*Phragmites australis*
Curled dock	*Rumex crispus*
False fox-sedge	*Carex otrubae*
False oat-grass	*Arrhenatherum elatius*
Hairy sedge	*Carex hirta*
Hard rush	*Juncus inflexus*
Hedge woundwort	*Stachys sylvatica*
Hogweed	*Heracleum sphondylium*
Lesser celandine	*Ranunculus ficaria*
Lesser spearwort	*Ranunculus flammula*
Meadow fescue	*Festuca pratensis*
Meadowsweet	*Filipendula ulmaria*
Neat feather-moss	*Pseudoscleropodium purum*
Purple moor-grass	*Molinia caerulea*
Red fescue	*Festuca rubra*
Reed canary-grass	*Phalaris arundinacea*
Ribwort plantain	*Plantago lanceolata*
White clover	*Trifolium repens*
Wild angelica	*Angelica sylvestris*
Wild leek	*Allium ampeloprasum*
Yellow iris	*Iris pseudacorus*
Yorkshire-fog	*Holcus lanatus*

LS3 MIXED SEDIMENT /LR3 SHELTERED LR3 ROCKY SHORES / MW4 - ESTUARIES	
Common name	**Scientific name**
Bladder-wrack*	*Fucus vesiculosus*
Channelled wrack	*Pelvetia canaliculata*
Sea lettuce	*Ulva lactuca*

GS2 - DRY MEADOWNS AND GRASSY VERGES	
Common name	**Scientific name**
A mint hybrid	*Mentha spicata x villosa*
Bent grass	*Agrostis gigantea x stolonifera*
Broad-leaved dock	*Rumex obtusifolius*
Bush vetch	*Vicia sepium*
Canadian fleabane	*Conyza canadensis*
Colt's-foot	*Tussilago farfara*
Common ragwort	*Senecio jacobaea*
False oat-grass	*Arrhenatherum elatius*
Field horsetail	*Equisetum arvense*
Glittering wood-moss*	*Hylocomium splendens*
Hedge bindweed	*Calystegia sepium*
Hybrid bluebell	*Hycainthoides x. massartiana*
Large bindweed	*Calystegia silvatica*
Perennial sow-thistle	*Sonchus arvensis*
Red fescue	*Festuca rubra*
Ribwort Plantain	*Plantago lanceolata*
Spear-leaved orache	*Atriplex prostrata*

Appendix 5.6 Bat Report and Assessment

UPDATE OF BAT SECTION OF ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED N4-N15 SLIGO URBAN IMPROVEMENT SCHEME, SLIGO

PREPARED FOR JACOBS ENGINEERING

Rev.	Status	Author	Reviewed By	Approved By	Issue Date
D01	DRAFT	DB	PS	PS	8/4/16
Rev0	Final	DB	PS	PS	6/5/16

1.0 Introduction

Currently there are nine species of bat known to breed in Ireland, while two other species have been recorded on a single occasion.

All species and their roost sites are protected under both European and Irish legislation including:

- Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna 1992 (Council Directive 92/43/EEC) (as amended);
- European Communities (Birds and Natural Habitats) Regulations, 2011. (S.I. No. 477 of 2011) (as amended and referred to throughout this report as the Birds and Habitats Regulations 2011 – 2015); and
- Wildlife Act 1976 and Wildlife (Amendment) Act, 2000 (S.I. No. 38 of 2000) (as amended and together referred to throughout this report at the Wildlife Acts 1976 – 2012).

It is an offence under Section 23 of the Wildlife Acts 1976-2012 and under Section 51 of the Birds and Natural Habitats Regulations 2015 to kill a bat or to damage or destroy the breeding or resting place of any bat species. Under the Birds and Habitats Regulations 2011-2015 actions that intentionally or unintentionally harm, damage or destroy a bat or its roosting site are considered an offence. In addition, if it is possible to establish a clear cause-effect relationship between one or more human-induced activities and the deterioration of a breeding site or resting place of a European protected species, then an offence is likely under the legislation. This places an onus of due diligence on anyone proposing to carry out works that might result in such damage, deterioration or destruction to breeding sites or resting places of bats.

As a signatory to the European Bats Agreement (Agreement on the Conservation of Bats in Europe) 1993, Ireland is required to protect bat habitats, requiring the identification and protection from damage or disturbance, of important feeding areas. All Irish bat species are listed in Appendix II of the Bern Convention (1979), as species requiring protection.

In the Irish Red Data List, Common, Soprano and Nathusius' Pipistrelle, Brown Long-eared bat, Lesser Horseshoe, Daubenton's, Natterer's and Whiskered bats are listed as "least Concern", while Leisler's bat is listed as "Near Threatened" and Brandt's bat is listed as "data deficient" (Marnell et al., 2009). The Greater Horseshoe Bat status is not yet determined in Ireland as only one record has been confirmed.

1.0.1 Background

As part of the N4-N15 Sligo Urban Improvement Scheme, 500 m of road will be upgraded. This section of road was previously part of two larger proposed schemed (26km and 2km) and was subject to unpublished EIS in 2009 and 2011. The aim of this report is to update the bat section of the EIS for this Scheme following additional survey work and in light of the reduced design of the Proposed Road Development.

2.0 Bat Survey Methodology

2.0.1 Desktop Survey

A review of the Bat Conservation Ireland Online Database was conducted on the 8th of December, 2015 in order to collate roost records and bat detector records of bats within 3 km of the Proposed Road Development as per the NRA guidelines (NRA, 2006). This distance was also regarded to be reasonable considering that many bat species found in Ireland would have their core foraging ranges within this distance from their roosts (Dietz et al, 2009).

All data previously generated as part of the fieldwork undertaken in 2009 and 2011 in the same location that were relevant to the current Proposed Road Development were incorporated into this assessment.

In summary, bats survey work for the previous EIS consisted of the following:

- Windscreen surveys of buildings and trees that could be suitable for bats to roost in within 1km of the Proposed Road Development
- Windscreen surveys of suitable woodland foraging habitat for bats in within 1km of the Proposed Road Development
- Internal/external surveys of buildings and trees within the Zone of Influence for the Proposed Road Development
- Dusk/dawn surveys for all properties within the land take of the Proposed Road Development
- Evening surveys of potential bat foraging habitat were carried out in areas around potential roosts.
- Point counts and car transect surveys with an Anabat detector and GPS to map and quantify the commuting routes and foraging habitats of bats in the study area

2.0.2 Field Surveys

Bat surveys were undertaken with regard to the following guidelines:

- *Bat Surveys: Good Practice Guidelines (Bat Conservation Trust (UK), 2012)*
- *Bat Mitigation Guidelines for Ireland (NPWS, 2006)*
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA, 2006)*
- *Design Manual for Roads and Bridges: Nature Conservation Advice in Relation to Bats (Highways Agency, 2001)*

2.0.2.1 Building and Bat Activity Survey

Dusk and dawn bat activity surveys were conducted on the 24th / 25th July 2015 along the section of the N15 where the proposed works are to take place using both a Pettersson D240X time expansion detector and a Pettersson D200 heterodyne detector. A dusk/dawn survey was conducted on the Copper River Bridge to assess its potential as a bat roost. Bat foraging and commuting activity was monitored along the road route and bats emerging from buildings and trees at dusk or swarming around buildings and trees at dawn.

Bat activity along the section of the Copper River in proximity to the existing road was monitored using two static bat detectors (Anabat SD1: Titley Electronics) in July (24th -31st) 2015 and August (21st-28th) 2015. The detectors were placed at the Copper River Bridge; one immediately upstream and one immediately downstream of the bridge.

2.1 Approach to Ecological Evaluation and Impact Assessment

2.1.1 Ecological Evaluation Criteria

The criteria used to assess the ecological value and significance of habitats are shown in Appendix 7.1 Volume 3 of this EIS, which follow *Guidelines for assessment of Ecological Impacts of National Road Schemes* (NRA, 2009a) and are consistent with the approach recommended in the *Guidelines for Ecological Impact Assessment in the United Kingdom* (IEEM, 2006).

2.1.2 Impact Assessment Criteria

The impact significance has been assessed using the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009a). This categorises ecological features as being of:

- International importance;
- National importance;
- County importance;
- Local importance (higher value) [hereafter referred to as Local (high)]; and,

- Local importance (lower value) [hereafter referred to as Local (low)].

Detailed Ecological Impact Assessment was undertaken for all 'key ecological receptors' (defined as those valued as Local (high) and above). Based on the above guidelines, the criteria used to characterise impacts are outlined in Table 1.

An impact is considered to be ecologically significant if it impacts upon the integrity or conservation status of a key ecological receptor within a specified geographical area. If impacts are not found to be significant at the highest geographical level at which the Ecological Receptor has been valued, then the impacts may be significant at a lower level. For instance there may be a significant impact at a local level on a species which is valued at an International level. The highest levels of impact significance for each key ecological receptor 'value' rating are shown in Table 2.

Table 1. Characterisation of Impacts

Parameter	Categories
Magnitude of impact	Size or amount of impact
Extent	Area over which impact occurs (may be the same as magnitude if whole habitat impacted)
Duration	Time over which impact is expected to last. For example, described as Short-term, Medium-term or Long-term in relation to relevant species/ habitat time-scales.
Reversibility	Temporary/ Permanent
Timing and frequency	Timing of impacts in relation to relevant life-stages or seasons
Chance of impact occurring as predicted	Near-certain: >95% Probable: 50-95% Unlikely 5-50% Extremely unlikely: <5%

Table 2. Maximum Level of Impact Significance for Key Ecological Receptors

Key ecological receptor 'value' rating	Highest significance level
International	Significant Positive/ Negative impact at International level
National	Significant Positive/ Negative impact at National level
County	Significant Positive/ Negative impact at County level
Local (high)	Significant Positive/ Negative impact at Local level

3.0 Results

3.0.1 Desktop Survey Results

3.0.1.1 *Bat Conservation Ireland Database*

A data search was conducted on the Bat Conservation Ireland database, whereby all roost records and bat detector records within 3 km of the Proposed Road Development were collated (see Table 3 and 4).

Table 3. Bat Conservation Ireland Database Results for Roosts

Structure type	Year Surveyed	Distance from the Proposed Road Development	Species observed
House	2006	1.2 km	Soprano pipistrelle bat
House and outbuildings	2006	1.2 km	Soprano pipistrelle bat, Brown long-eared bat
House	2009	1.2 km	*Myotis* spp., Soprano pipistrelle bat Brown long-eared bat
Agricultural outbuilding	2009	1.2 km	Common pipistrelle bat, Soprano pipistrelle bat
Agricultural outbuilding	2009	1.2 km	Natterer's bat, Brown long-eared bat
Agricultural outbuilding	2009	1.2 km	Soprano pipistrelle bat
Agricultural outbuilding	2009	1.2 km	Soprano pipistrelle bat
Building	2009	1.2 km	Brown long-eared bat
House and outbuildings	2009	1.2 km	Soprano pipistrelle bat
House and outbuildings	2009	1.2 km	Brown long-eared bat
House	2009	1.2 km	Soprano pipistrelle bat
Other building	2009	1.2 km	Soprano pipistrelle bat
House	2009	1.2 km	Soprano pipistrelle bat
House	2009	1.2 km	Soprano pipistrelle bat
House	2009	1.2 km	Common pipistrelle bat, Soprano pipistrelle bat
House	2009	1.2 km	*Pipistrellus* spp.
Tree	2009	1.2 km	Leisler's bat
House	2008	1.2 km	Brown long-eared bat
Agricultural outbuilding	2009	1.2 km	Soprano pipistrelle bat
Agricultural outbuilding	2009	1.2 km	*Myotis* spp.
Tree	2009	1.2 km	Soprano pipistrelle bat
Tree	2009	1.2 km	*Pipistrellus* spp.
House	2008	1.4 km	*Pipistrellus* spp.
Bridge	2009	1.5 km	Unidentified bat
House	2008	2.4 km	Daubenton's bat
Agricultural outbuilding	2005	2.5 km	Soprano pipistrelle bat, Brown long-eared bat, Unidentified bat
House	2005	2.5 km	Soprano pipistrelle bat, Brown long-eared bat
House	2007-2008	2.5 km	Natterer's bat, Brown long-eared bat, Unidentified bat
Agricultural outbuilding	2007	2.5 km	Soprano pipistrelle bat
House	2008	2.74 km	Soprano pipistrelle bat

Table 4. Bat detector Records within 3 km of the Proposed Road Development

Year Surveyed	Distance from the Proposed Road Development	Species observed
2009	1.2 km	Pipistrellus spp. Soprano pipistrelle bat, Myotis spp
2006	1.4 km	Natterer's bat, Common pipistrelle bat, Soprano pipistrelle bat
2006	1.4 km	Daubenton's bat, Soprano pipistrelle bat
2008	2 km	Common pipistrelle bat Soprano pipistrelle bat, Brown long-eared bat
2008	2.4 km	Whiskered bat/Brandt's bat, Common pipistrelle bat Soprano pipistrelle bat, Brown long-eared bat
2008	2.4 km	Daubenton's bat, Natterer's bat, Myotis spp., Leisler's bat, Common pipistrelle bat, Soprano pipistrelle bat, *Pipistrellus* spp., Brown long-eared bat
2006	2.4 km	Soprano pipistrelle bat
2007	2.4 km	Daubenton's bat, Natterer's bat, Leisler's bat, Soprano pipistrelle bat, Brown long-eared bat
2008	2.4 km	Daubenton's bat, Natterer's bat, Leisler's bat, Common pipistrelle bat, Soprano pipistrelle bat
2008	2.4 km	Leisler's bat, Soprano pipistrelle bat
2005	2.8 km	Whiskered bat/Brandt's bat, Common pipistrelle bat
2010-2014	670 m	Daubenton's bat, Leisler's bat, Soprano pipistrelle bat, Unidentified bat
2004-2008	765 m	Leisler's bat, Common pipistrelle bat, Soprano pipistrelle bat, *Pipistrellus* spp.

3.0.1.2 Data from Constraints Report, Route Selection Report and 2009 and 2011 EIS Report

Records from the Constraints Report, Route Selection Report (Cotton, 2004; 2005) and the 2009 and 2011 EIS are summarised in Tables 5-6. Note that all roosts currently are located outside the land take of the Proposed Road Development as the previous scheme was longer.

Activity surveys described in the 2011 EIS recorded Leisler's bats commuting and foraging along the road and along the Garvogue River within the land-take of the Proposed Road Development. The Constraints Report noted Daubenton's and Natterer's bats using the Drumcliff River and Grange River for foraging and roosting in bridges as well as Pipistrelle bat species and Brown long-eared bats.

Table 5. Confirmed bat Roosts in Trees and Woodlands for the EIS in 2009 and 2011 within 3 km of the Proposed Road Development.

Distance to land take	Survey Results	Species Observed
1.8 km	Small tree roost in land adjacent to house and outbuildings.	Soprano pipistrelle bat

Table 6. Confirmed and Potential Bat Roosts Identified During Desk and Field Surveys for the EIS in 2009 and 2011 within 3 km of the Proposed Road Development.

Distance to land take	Survey Results	Species Observed
1.2 km	Several buildings with high bat roost potential, small Pipistrelle roost found in barn.	Soprano pipistrelle bat
1.9 km	Pipistrelles observed swarming outside the house	Soprano pipistrelle bat / Common pipistrelle bat
2.4 km	Small roost of ~5 bats in house	Soprano pipistrelle bat
2.6 km	Small roost in house.	Soprano pipistrelle bat
3.4 km	Pipistrellus spp roosting in barn and commuting along adjacent road	Soprano pipistrelle bat / Common pipistrelle bat
3.4 km	Stone outbuildings confirmed as Natterer's bat, and Brown long-eared bat roost	Natterer's bat, Brown long-eared bat

3.0.2 Survey Results

The surrounding environment within the land take of the Proposed Road Development is highly urban in nature and is of limited suitability for bats due to the presence of public lighting and limited amount of semi-natural habitat, apart from the Copper River, which is a highly modified urban river.

3.0.2.1 Bat roosts

No bat roosts were identified within the land take of the current Proposed Road Development both from the activity surveys conducted in 2015 or from previous surveys conducted for the 2011 EIS for the N4-N15 Sligo Urban Road Improvement Scheme. The nearest known roosts to the scheme are 1.2 km away.

3.0.2.2 Bat activity

Weather during the dusk and dawn activity surveys on the 24th and 25th July, 2015 was dry and calm with temperatures ranging from 4-10°C. Only two records of foraging *Soprano pipistrelle bat* were recorded during the dusk survey foraging within the land-take of the

proposed road development, while Leisler's bat was recorded foraging over the estuary only. No bat activity was recorded during the dawn survey.

Table 7. Bat activity records recorded within the land take of the Proposed Road Development during activity surveys in 2015

Species	Date	Grid Reference
Soprano pipistrelle bat	24th July 2015	G6919536795
Soprano pipistrelle bat	24th July 2015	G69139 36814

Results for the two static bat detectors left out on the Copper River are detailed in Tables 8 and 9. During the July 2015 monitoring period, bat activity was recorded on five out of seven nights at the upstream location and one out of seven nights at the downstream location, with the only species recorded being Soprano pipistrelle bat.

During the August 2015 monitoring period, bats were recorded on all seven nights at both upstream and downstream locations. In addition to Soprano pipistrelle bat, Leisler's bat and a *Myotis* spp. were recorded during this survey period. *Myotis* species of bats were only recorded at the downstream location on the 25th August 2015 at 02:44 am and on the 27th August 2015 at 02:24 am. Whilst there are only two records this group of bats is likely to be under recorded due to their quieter echolocation calls.

Table 8: Static bat detector results from the Copper River for July 2015

Date	*Species Recorded* Anabat SC01(upstream)	*Species Recorded* Anabat SC02 (downstream)
24th July 2015	Soprano pipistrelle bat	Soprano pipistrelle bat, Leisler's bat
25th July 2015	Soprano pipistrelle bat	No bats recorded
26th July 2015	Soprano pipistrelle bat	No bats recorded
28th July 2015	Soprano pipistrelle bat	No bats recorded
29th July 2015	Soprano pipistrelle bat	No bats recorded

Table 9: Static bat detector results from the Copper River for August 2015

Date	Species Recorded Anabat SC01(upstream)	Species Recorded Anabat SC02 (downstream)
21st August 2015	*Soprano pipistrelle bat*	*Soprano pipistrelle bat, Leisler's bat*
22nd August 2015	Soprano pipistrelle bat, Leisler's bat	Soprano pipistrelle bat, Leisler's bat
23rd August 2015	Soprano pipistrelle bat	Soprano pipistrelle bat
24th August 2015	Soprano pipistrelle bat	Soprano pipistrelle bat
25th August 2015	Soprano pipistrelle bat	Soprano pipistrelle bat, Leisler's bat, Myotis spp
26th August 2015	Soprano pipistrelle bat	Soprano pipistrelle bat
27th August 2015	No bats recorded	Soprano pipistrelle bat, Leisler's bat, *Myotis* spp

4.0 Summary of ecological evaluation

Given the absence of any roosts within the zone of influence of the Proposed Road Development and the relatively low bat activity recorded, the area within the land take is classified as being of Local importance (higher level), primarily due to the level of protection assigned to all bat species in Ireland.

5.0 Characteristics of the Proposed Development

The Proposed Road Development consists of the upgrade of N4/N15 to three lanes in either direction between Hughes Bridge or the R291 junction, upgrade works to Markievicz Road, Duck St and R291 junction to accommodate changes in alignment. The N4/N15 vertical alignment will be raised between Duck St and R291 junctions to increase the outfall level of drainage and will include the demolition of the existing culvert and the construction of a new culvert on the Copper River. Existing footpaths will be upgraded to provide cycling and pedestrian facilities. Boundary treatment will replace existing boundary walls affected by the works. The current street lighting will also be replaced as required.

6.0 Potential Impacts of the proposed Road Development

As per NRA guidelines, impacts have been assessed for 'Key ecological receptors' only, as listed in the summary of ecological evaluation.

6.0.1 Construction Phase

The NPWS Threat Response Plan for Vesper[1] Bats (NPWS 2009) states that the principle threats to these species in Ireland are: roost loss, destruction and disturbance; unsympathetic management of commuting and foraging habitats; water pollution; and wind farm developments.

The main potential impact to bats during the construction phase is the temporary disturbance to foraging bats along the Copper River during the construction of the new culvert due to displacement by temporary lighting around the construction site. As the area is in an urban setting, the river is likely already subject to a level of light pollution from existing street lighting. The presence of additional temporary lighting may therefore lead to the site becoming temporarily unsuitable for bats. Leisler's bats are not negatively impacted by artificial lighting (Mathews *et al.* 2015). No buildings or trees confirmed as bat roosts from previous surveys will be destroyed as part of the current Road Scheme. Overall the potential impact would be regarded to be temporary and reversible but significant at a local geographic scale.

6.0.2 Operation Phase

Roads may present a barrier to bat foraging and commuting and lead to direct mortality from collision with vehicles. Since the majority of bat activity appeared to be concentrated along the Copper River, inappropriate culvert design may force bats up and over the road where there is a risk of mortality through vehicle collision. This potential impact would be regarded to be significant at a local geographic scale. Copper River, Inappropriate culvert design may force bats onto the road where there is a risk of mortality through vehicle collision.

[1] Vesper Bats refer to species of the Vespertilionidae family, which make up nine of the ten species of bat in Ireland. The Lesser Horseshoe bat *Rhinolophus hipposideros* is the only non-vesper bat in Ireland.

6.0.3 "Do-nothing" scenario

The NPWS summary report on the conservation of species listed under the Habitats Directive assesses all of Ireland's bat species to be of good conservation status (NPWS 2008). In the absence of the Proposed Road Development there are no predicted changes to the baseline population in the medium to long-term.

7.0 Mitigation Measures

All bat mitigation measures have had regard to international good practice and national guidelines:

- *Guidance on compliance with Regulation 23 of the Habitats Regulations 1997* (NPWS Circular 2/07).
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2005a).
- *Bat Mitigation Guidelines for Ireland* (NPWS, 2006b).
- *Design Manual for Roads and Bridges: Nature Conservation Advice in Relation to Bats* (Highways Agency, 2001b).

7.0.1 Construction Phase

Unless an ecologist experienced in the assessment of lighting impacts to bats can influence the direction or intensity of construction lighting to avoid significant impacts to foraging bats, construction works to the N4 Copper river Bridge should only be undertaken during daylight hours during the time of year when bats are most active (May-September).

7.0.2 Operation Phase

The section of road encompassing the Proposed Road Development goes through an urban area that has existing street lighting. As part of the Proposed Road Development, street lighting will be replaced. There is therefore an opportunity to adjust the current level of street lighting, particularly in proximity to the Copper River through the incorporation of bat-friendly street lighting design, as per Bat Conservation Ireland's Bats recommendations (Bat Conservation Ireland, 2010). The planting of trees along the Copper River will also enhance the river for bats and further reduce the amount of light spill onto the river. The installation of new public lighting should utilise a design that reduces light spill along the scheme but particularly in proximity to the Copper River.

Native trees and shrubs should be planted along the Copper River to help reduce light levels through screening in the long term.

Design measures that can reduce the impacts of the operation of road schemes on bats are focused on reducing the effects of fragmentation and vehicle collision. This is achieved by encouraging bats to cross at 'safe' locations such as underpasses, overpasses and culverts and

discouraging them from crossing the road itself. Planting can be used to guide bats to 'safe' crossing points and avoidance of lighting at the crossing points is essential to encourage bat passage. The dimensions of culverts that bats will use vary between species. A review of available data was undertaken to design suitable culvert design for each species. This is summarised in Tables 12.

Table 12 Dimensions of Culverts Used by Bat Species[1]

Species	Use of underpasses	Dimensions required	Notes
Pipistrellus spp.	Yes	Height 4-5m Width 4-5m	
Natterer's bat	Yes	Height 1-1.5m Width 2.3m	May use long culverts >30m even when small
Daubenton's bat	Yes	Height 1-1.5m Width 1.5-2m	Particularly where water present
Brown long-eared bat	Yes	Height 2-4m Width 3-4m	
Leisler's bat	Less likely	Limited information	May not use underpasses
Whiskered bat	Yes	Height 4m Width 4m	

[1]Data summarised from range of sources including Kerth & Melber (2009), Bach et al (2004) and data from various sources cited in Bickmore (2003) and Altringham (2008).

The existing culvert comprises two parallel pipes upstream 1.7m x 1.7m both of which have metal trash screens obstructing the entrance and therefore limiting its use for bats. The Proposed Road Development will replace these pipes with a masonry box culvert 3m high x 8m wide. This replacement culvert will be significantly more attractive for bats to pass under the road (as suggested by the dimensions quoted in Table 12) and would be expected to reduce the potential risk of mortalities attributed to vehicle collisions.

8.0 Residual Impacts of the Proposed Development

The design of the Proposed Road Development and specified mitigation measures will reduce the likelihood of disturbance impacts and direct impacts caused by road collisions to an insignificant level during both the construction and operational phases of the Proposed Road Development.

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Appendix 5.7 Fisheries Report and Assessment

Aquatic Ecological and Lamprey Assessment for a Proposed Development in the Copper River at the N4 Bridge, Co. Sligo

4th April 2016

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1. INTRODUCTION

Ecofact were commissioned by Jacob's Engineering Ltd. to carry out an aquatic ecology assessment of the Copper River in the environs of the N4. It is proposed to install an upgraded culvert and to widen the existing N4 at this location. Over pumping may be required at the N4 Bridge while works are being carried out. Works may also be required within the Copper River Estuary near Salmon point within Sligo Harbour. Figure 1 shows the location of the Copper River and the proposed development at the N4 Bridge, Co. Sligo.

The current assessment was required in advance of the proposed works, in order to establish baseline ecological conditions and determine the importance of the Copper River for aquatic organisms including fish, particularly in relation to lampreys.

This study was undertaken during March/April 2016 by ECOFACT Environmental Consultants Ltd. on behalf of Jacob's Engineering Ltd.

2. METHODOLOGY

2.1 Desktop review

A desktop review was carried out to collate information on fish in the Copper River and to identify features of aquatic ecological importance within the study area. Natura 2000 sites and records of protected species in the vicinity of the proposed development were identified. This information was obtained by accessing the website of the National Parks & Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government. The database of the National Biodiversity Data Centre was also consulted to assess the presence of rare plant and faunal species and records of protected species from records of the study area.

2.2 Field survey

2.2.1 Habitat assessment

A walkover habitat assessment of the study area was undertaken on the 25th March 2016 to establish the character of the Copper River at proposed development site and environs, and to identify what ecological constraints, if any, were present. The lower reaches of the Copper River were viewed from Sligo Harbour to the N16 Bridge, a stretch of approximately 1.1km that encompassed the estuarine (transitional) and lower freshwater reaches of the river. Along this stretch, shallow parts of the Copper River were viewed with the aid of polaroid sunglasses. The river was photographed at various representative locations throughout the study area.

River habitat assessment was carried out using methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003). Habitat suitability for Salmonids was assessed with reference to the leaflet '*The Evaluation of habitat for Salmon and Trout*' (DANI Advisory leaflet No. 1) and '*Ecology of the Atlantic Salmon*' (Hendry & Cragg-Hine, 2003).

An opinion of lamprey habitats was formed for the lower reaches of the Copper River and at Salmon Point with reference to *Ecology of the River, Brook and Sea Lamprey* by Maitland (2003).

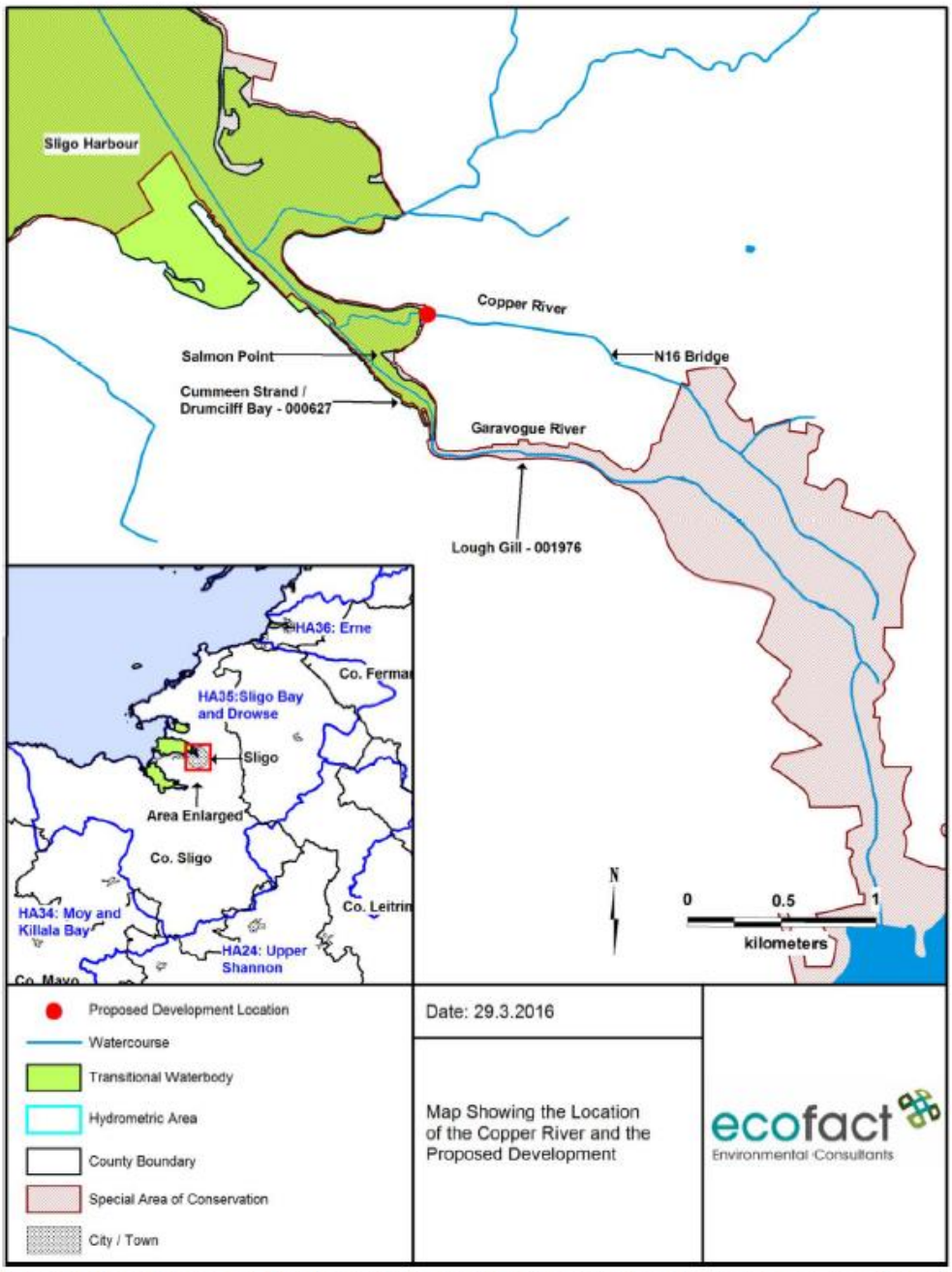

Figure 1 Map showing the location of the Copper River and the proposed development at the N4 Bridge, Co. Sligo.

2.2.2 *Macroinvertebrate sampling*

Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at three locations on the Copper River: 10m downstream of the N4 Bridge (Site 1), 10m upstream of the N4 Bridge (Site 2) and approximately 400m upstream of the N4 Bridge (Site 3). Macroinvertebrates were sampled at these sites using kick / sweep sampling (Toner *et al.*, 2005).

Any fish captured during sampling were noted and identified with reference to the *'Key to British Freshwater Fish with notes on their ecology and distribution'* by Maitland (2004).

2.3 Evaluation

The results of the desktop study and ecological survey were evaluated to determine the significance of identified features located in the study area on an importance scale ranging from international-national-county-local. The scheme used for assessing the significance of impacts is given in Appendix 1.

3. RESULTS

3.1 Desk study results

The proposed works are located in the 2km grid square G63Y. NBDC records do not indicate the presence of any protected fish species in this area. McGinnity *et al.* (2003) give the distribution of Salmon *Salmo salar* and seatrout *S. trutta* in watercourses in Ireland and consider that the Copper River is not a significant producer of Salmonids.

The study area is located in the Copper River catchment in Hydrometric Area 35 (Sligo Bay and Drowse) within the Western River Basin District. The Copper River is referred to as the Sligo River (EPA code 35S23) by the EPA. It has a channel length of approximately 3.2km which lies almost entirely within the Sligo City administrative boundary. Approximately 2km of the channel is a 2nd order watercourse, formed by the confluence of two minor 1st order streams. The Copper River catchment drains an area of approximately 1km^2.

The proposed development is located adjacent to / directly upstream of the Cummeen Strand / Drumcliff Bay (Sligo Bay) Special Area of Conservation (code 000627). Faunal interests of this Natura 2000 site include Sea Lamprey *Petromyzon marinus* [1095] and River Lamprey *Lampetra fluviatilis* [1099]. These are catadromous fish which reproduce and spend their larval life stage in freshwater habitats, out-migrating to estuary / sea for most of their adult life stage.

3.2 Field Study

3.2.1 *Description of the Copper River corridor*

From the visual survey, the Copper River within the study area was found to be a small highly modified stream that flows through an urban area. The part of the river at the proposed development site (the N4 Bridge) and the stretch to approximately 200m upstream of here was considered to be affected by tidal fluctuations, as indicated by the presence of Enteromorpha and luxuriant instream filamentous algae as well as silted vegetation on riparian areas. The existing N4 Bridge over the Copper River comprises two culverts positioned side-by-side. During the current visit which was

undertaken at low tide, there was a depth of ca. 0.5m water in each of the box culverts at the downstream side of the bridge. The two culverts were circular in cross section at the upper side of the bridge and were fitted with coarse-thrash screens. Depth at the entrance to this part of the culvert was minimal and it was partially blocked with woody debris and refuse.

The lower 0.5km or so of the Copper River was largely trapezoidal in cross section. The banks comprised angular rocks and grassy verges sloped at ca. 45°. The bed of this section of the river was typically flat, of even and low gradient, and comprised angular cobbles and deeply embedded silt. The mean wetted width and mean depth of this section of the river was approximately 2m and 20cm respectively while the maximum depth was approximately 30cm. There was little / no physical instream diversity or habitat heterogeneity along this stretch of the Copper River and the riparian areas do not provide shading. From approximately 0.5km to 1km upstream of the N4 Bridge, the Copper River is a sluggish watercourse of varying width and indiscernible depth. It appeared as though this reach of the river had been realigned in the past, probably to facilitate development within Sligo IT campus. The margins of the river along this stretch had a variety of wetland plants and the river corridor seems to have benefitted from implementation of a habitat / biodiversity plan. The upper reach of the current study area was from approximately 1km upstream of the N4 Bridge to the N16 Bridge, a stretch of approximately 200m. This part of the Copper River had medium gradient and was typically 2.2m wide. This stretch of the river was characterised by shallow riffled habitat and a mixed bed of rock, cobble and gravel substrates, with banks mostly of mature trees and scrub. There were some small deposits of silt along the margins of this part of the river. The N16 Bridge over the Copper River comprises two 1m pipe culverts. The stretch of the Copper River upstream of the N16 has been deeply drained in the past and is set well below the surrounding terrain.

3.2.2 Fish habitats and records

The physical characteristics of a watercourse will influence the aquatic species that can live in the fluvial habitats of that watercourse. In the case of the Copper River, the tide will also affect the occurrence and distribution of aquatic species in the lower reaches of the river, as saline water will restrict the presence of some species.

The stretch of the Copper River affected by the proposed development is not considered an important area for juvenile lampreys or salmonids as the ecological requirements of these fauna, a prerequisite for survival, are not present in this part of the river. Juvenile lampreys require a substrate composed of silt, or silt and sand. The substrate in the environs of the N4 Bridge comprises rock and compacted clay so is not suitable for juvenile lampreys, and none were found during sweep sampling. Salmon fry and parr occupy shallow, fast-flowing water with a moderately coarse substrate with cover (Symons & Heland 1978). Deep or slow-moving water, particularly when associated with a sand or silt substrate, does not support resident juvenile salmonids. The fact that the Copper River is affected by the tide precludes the presence of juvenile Salmon in the lower reaches of the river as the channel is flooded during times of high tide. Moreover, Salmon require very good water quality, and water quality in the lower reaches of the Copper River is considered unsuitable / suboptimal for juvenile Salmon, given its apparent unsatisfactory condition. Likewise, the affected part of the Copper River is not considered an important habitat for juvenile Brown / Sea Trout *S. trutta* based on reasons given above for Salmon. One of the most important factors for egg survival is oxygen supply, which is dependent upon dissolved oxygen concentration and inter-gravel flow. Due to the tidal nature of the lower reaches of the Copper River and associated high concentrations of suspended solids, the affected part of the river would not be used for salmonid and lamprey spawning as these conditions result in infilling of the gravel pores with fine material, resulting in smothering of the spawning gravels and any ova within.

Salmonids were not recorded in the Copper River in the environs of the N4 Bridge. Based on a wetted width of 2m and a channel length of 1km (representing the potential riffled 2nd order reaches), is estimated that there is a maximum of 2000m^2 of suitable juvenile salmonid habitat in the Copper River. The proposed works would not affect this area.

Juvenile Brown Trout were recorded in riffled habitat at Site 3 but in small numbers. The Copper River is regarded as a suboptimal watercourse for Brown Trout and is highly unlikely to support Salmon due to its small size, degraded nature and apparently poor water quality.

Fish recorded in the Copper River in the environs of the N4 Bridge (Site 1 and Site 2) were European eel *Anguilla anguilla,* Flounder *Platyichthys flesus,* Common Goby *Pomatoschistus microps* and Three-spined Stickleback *Gasterosteus aculeatus*. A small number of elvers (juvenile Eel) were also recorded during kick sampling. The European eel is a native fish of significant ecological importance. In recent decades, this species has undergone a dramatic decline throughout its range. In response to the decline in European eel populations European Council Regulation 1100/2007 "Establishing measures for the recovery of the stock of European eel" has now been adopted in member states. European eel is listed as 'Critically endangered' and is now 'Red Listed' according to the recently published 'Red List No. 5: Amphibians, Reptiles & Freshwater Fish' (King *et al.*, 2011). The Copper River is deemed to support a very small population of European Eel, but is not a significant habitat for this species.

Kick sampling was undertaken in a silt deposit in the stretch of the river downstream of the N16 Bridge at a location deemed suitable for lamprey larvae (juveniles). Juvenile lampreys were not recorded within this suitable substrate or in any other part of the Copper River. It is considered that migratory lampreys (Sea and River lamprey) do not occur in the Copper River due to its small size and general lack of soft substrates, a requirement for larvae. If Brook Lamprey occurs in the Copper River, the population is regarded as small, and they are thought to be absent.

The intertidal habitat in Sligo at Salmon Point was mainly a mixed muddy substrate. This habitat was deemed unsuitable for juvenile lampreys due to its transitional nature. It is considered that the proposed works would not impact on lampreys.

The Copper River within the study area is evaluated as being of low ecological importance i.e. Local Importance (lower value).

3.3.2 *Macroinvertebrates and water quality*

Overall macroinvertebrate diversity was low at the two sites examined downstream (Site 1) and upstream (Site 2) of the N4 Bridge. The macroinvertebrate community in this part of the river was dominated by pollution tolerant brackish species. The macroinvertebrate assemblage in this reach of the river included the ubiquitous amphipods *Corophium volutator* and *Gammarus* sp. The lower reaches of the Copper River (encompassing Site 1 and Site 2) are not suitable with regard to assigning a Q-rating using the EPA biological water quality rating system as it is not a truly aquatic stretch of river.

Site 3 was located in a riffled part of the Copper River upstream of the tidal influence. Macroinvertebrates recorded here were dominated by pollution tolerant (Group C) *Gammarus* sp., and *Baetis rhodani*. Very tolerant (Group D) indicators were well represented and included the leech *Glossiphonia complanata* and the Bladder Snail *Physa fontinalis*. There was a paucity of less sensitive (Group B) macroinvertebrates recorded, and limited to cased caddisfly larvae of Limnephilidae. Group A (pollution sensitive) indicators were not recorded at Site 3.

Using the EPA freshwater biological water quality rating system (Toner *et al,* 2003), biological water quality at this site was rated 'Q3, Moderately Polluted' corresponding to Water Framework Directive 'Poor' status.

4. POTENTIAL IMPACTS

4.1 Construction phase

The proposed development works involve widening the existing N4 road over the Copper River and extending the culvert by approximately 10m at the east side. The fluvial habitat of the Copper River under the existing N4 Bridge and to at least 10m upstream side will be disturbed / lost as a result of the proposed works. The impact of the proposed works on this part of the river (locally important, lower value) is assessed as slight negative.

It is intended to carry out the works from May to September inclusive and these may include pumping water from upstream of the works area to downstream. This would involve dewatering the works area with the loss of resident fish, an impact assessed as slight negative and temporary, with macroinvertebrates and fish returning to the area soon after completion of the works. The pumping is not expected to interfere with any fish migrations as it has been established that the Copper River is of limited value to fish and the proposed development site is not important with regard to fish or migration of any species. The impact of the proposed development on fish migration is assessed as imperceptible negative.

This habitat directly affected by the proposed development at the N4 Bridge is of no particular importance to species of conservation interest in the Cummeen Strand / Drumcliff Bay SAC. There is potential for indirect impacts on this SAC via the release of suspended solids and other deleterious substance from the works site to the Copper River, and subsequent transfer to Sligo Harbour by flows in the Copper River and tidal movements. The impact of pollutants on water quality would be minimised considerably due to the dilution provided by transitional waters. Nonetheless, water quality impacts could potentially be moderate - substantial negative in the absence of mitigation, with knock on effects on water quality dependent conservation interest of the SAC.

Salmon Point is located within Cummeen Strand / Drumcliff Bay SAC, an internationally important site. The magnitude of impacts brought about by works at Salmon Point is dependent on the extent and nature of the works here. Impacts on this site are assessed as ranging from none (in the absence of works at this location) to moderate / substantial negative.

4.2 Operation phase

Poorly designed culverts can isolate habitats in river reaches upstream from fish and other aquatic fauna by impeding passage. For example, a perched culvert can prevent the upstream migration of lampreys which are relatively poor swimmers. The proposed development is located at an elevation within the tidal range and the influence of the tide extends to at least 200m upstream of the N4 Bridge over the Copper River. The bed of the new culvert(s) is therefore likely to be flooded at high tide so it is highly unlikely that the new culvert would cause fish passage issues. The impact of a poorly designed culvert would result in a negative impact on fish movements assessed as moderate negative.

5. MITIGATION MEASURES

In advance of any works taking place, a method statement for protecting water quality in the lower reaches of the Copper River and the Cummeen Strand / Drumcliff Bay SAC will be drawn up and agreed with the IFI and NPWS.

In preparation of the method statement and throughout the proposed works period, the following publications will be followed by the contractor to minimise impacts on aquatic ecology;

- *'Guidelines for the crossing of watercourses during the construction of national road schemes'* (NRA, 2005);
- *'Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites'* by Murphy (2004); and
- *'Maintenance and protection of the inland fisheries resource during road construction and improvement works'* (Kilfeather, 2007).

Ideally, the proposed works should be undertaken during a dry spell. An open-bottomed culvert (or box culvert set below the original stream bed level) would be the preferable choice as this option allows for the development of a more natural riverbed.

Any watercourse rehabilitation carried out will be informed by the document '*Channels and Challenges - the enhancement of Salmonid rivers*' (O'Grady, 2006).

Works within the Cummeen Strand / Drumcliff Bay SAC might be damaging and constitute a notifiable action under current legislation. Consent has to be obtained from the Department of Arts, Heritage and Gaeltacht therefore before any works can be undertaken at Salmon Point.

6. RESIDUAL IMPACTS

There are no residual impacts anticipated on aquatic receptors including salmonids and lampreys in relation to the proposed road works and associated culvert installation at the existing N4 Bridge location over the Copper River.

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PLATES

Plate 1 The Copper River as it flows into Sligo Harbour (Cummeen Strand / Drumcliff Bay SAC). This part of the Copper River is just downstream of the N4 (photo taken from the N4 Bridge at low tide).

Plate 2 The N4 Bridge over the Copper River - location of the proposed development.

Plate 3 Elvers recorded from the Copper River in March 2016 during the current site visit in the environs of the N4 Bridge.

Plate 4 Three-spined Stickleback *Gasterosteus aculeatus* recorded from the Copper River.

Plate 5 Upstream view of the N4 Bridge over the Copper River.

Plate 6 Stretch of the Copper River approximately 100m upstream of the N4 Bridge. This part of the river is influenced by the tide.

Plate 7 Bed of the Copper River approximately 100m upstream of the N4 Bridge. The presence of Enteromorpha instream indicates that this part of the river is subject to tidal fluctuations.

Plate 8 Copper River approximately 200m upstream of the N4 Bridge.

Plate 9 Low gradient reach of the Copper River approximately 0.6km upstream of the N4 Bridge.

Plate 10 Copper River approximately 1km upstream of the N4 Bridge.

Plate 11 Stretch of the Copper River adjacent to Sligo I.T. approximately 80m downstream of the N16 Bridge. Suitable habitat for juvenile lampreys was recorded at the location but no lampreys were recorded.

Plate 12 Stretch of the Copper River approximately 30m downstream of the N16 Bridge. This habitat is considered suitable for the early life stages of Salmon.

Plate 13 Copper River immediately downstream of the N16.

Plate 14 Copper River immediately upstream of the N16.

APPENDIX 1 Evaluation of ecological importance and impact significance

A1.1 Evaluation of ecological importance of aquatic environments

Aquatic environments were evaluated on the basis of a number of characteristics and features as outlined below. Table A1.1 presents the primary criteria for assessing ecological importance of aquatic environments. The characteristics are defined as follows:

- Aquatic habitat refers to the in-water conditions of any watercourse or waterbody; including substrate and stream structure (i.e. proportion of riffles, runs and pools).
- The fisheries value of a waterbody refers to its suitability for fish, primarily Salmonids (Salmon and trout), and to the associated value for recreational angling purposes.
- Annex II species are those that are listed under the EU Habitats Directive (92/43/EEC).
- Annex I habitats are those that are listed under the EU Habitats Directive, including Priority Habitats.

Table A1.1 Criteria used to determine the value of ecological resources (taken from NRA, 2009).

Importance	Criteria
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; and/or • 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).
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) of the following:

Importance	Criteria
	• 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 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.

SAC = Special Areas of Conservation; NHA = Natural Heritage Areas

A1.2 Assessment of Impact Type and Magnitude

Localised impacts on lakes and rivers are loosely defined as impacts measurable no more than 250m from the impact source. Extensive impacts are defined as impacts measurable more than 250m from the impact source. Any impact on Salmonid spawning habitat, or nursery habitat where it is in short supply, would be regarded as an extensive impact, as it is likely to have an impact on the Salmonid population beyond the immediate vicinity of the impact source. Criteria for assessing impact type and magnitude are presented in Tables A1.2 and A1.3, respectively.

The following terms are defined when quantifying duration:

- Temporary: up to 1 year;
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years;
- Permanent: over 60 years.

Table A1.2 Criteria for assessing impact type

Impact type	Criteria
Positive impact:	A change to the ecology of the affected feature which improves its conservation status.
Negative impact:	A change to the ecology of the affected feature which reduces its conservation status.

Table A1.3 Criteria for assessing impact magnitude

Impact magnitude	Definition
No change:	No discernible change in the ecology of the affected feature.
Imperceptible Impact:	A change in the ecology of the affected site, the consequences of which are strictly limited to within the development boundaries.
Slight Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary, but these consequences are not considered to significantly affect the distribution and/or abundance of species or habitats of conservation importance[1].
Moderate Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect the distribution and/or abundance of species or habitats of conservation importance.
Substantial Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are

	considered to significantly affect species or habitats of high conservation importance and to potentially affect the overall viability of those species or habitats in the wider area[2].
Profound Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to be such that the overall viability of species or habitats of high conservation importance in the wider area[2] is under a very high degree of threat (negative impact) or is likely to increase markedly (positive impact).

[1] it is not possible to define specific numerical thresholds, as different species/habitat have varying degrees of resilience to ecological perturbation.

[2] i.e. the area relevant to the assessed importance of the feature.

Appendix 5.8 Winter Bird Survey Dates and Conditions

Winter Bird Survey September to December 2015

Date	Tide	Tide Height	Tide Time	Survey Time	Weather
01/09/2015	Low	0.10m	14h07	13h30-14h30	Overcast, mild breezy with light showers.
02/09/2015	High	4.30m	09h07	08h30-09h30	Overcast, calm, mild
20/10/2015	High	3.3m	11h33	11h00-12h00	Slight breeze, cloudy, some sunny spells visibility 500 m-2 km.
20/10/2015	Low	1.3m	17h16	16h30-17h00	Cloudy, moderate breeze, light showers, visibility good – 500 m.
18/11/2015	High	3.5m	10h09	11h00-12hr00	Windy force 4-5 occasional gusts. Rain part of survey visibility good – 500 m.
18/11/2015	Low	1.10m	16h01	15h15-16h15	Windy force 3 sunny, dry (raining prior to survey).
14/01/2016	Low	0.5m	14h35	12h00-13h00	Cold, calm, light rain.
15/01/2016	High	4.10m	09h31	08h30-09h30	Cold, calm, dry.

Appendix 5.9 Natura Impact Statement

JACOBS

JACOBS

N4-N15 Sligo Urban Improvement Scheme

Sligo County Council

Appropriate Assessment Screening & Natura Impact Statement

32106101_NIS | Final

April 2017

N4-N15 Sligo Urban Improvement Scheme

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Contents

1. Introduction

Sligo County Council ("SCC") commissioned Jacobs Engineering Ireland Ltd. ("Jacobs") to prepare an Appropriate Assessment Screening Statement (AASS) and a Natura Impact Statement (NIS) for the proposed N4-N15 Sligo Urban Improvement Scheme ("the proposed development").

1.1 Legal Context

The requirements of the EC Habitats Directive 92/43/EEC ("the Habitats Directive") relating to the consent of the proposed development (i.e. development under Section 51 of the Roads Acts 1993 to 2015 as amended) are transposed in Ireland through the Planning and Development Act 2000 as amended and the Planning and Development Regulations 2001 as amended.

Under Section 177U (1) of the Planning Acts, a Screening for Appropriate Assessment (AA) of the proposed development "*shall be carried out by the competent authority* (in this case, An Bord Pleanála: (ABP)) "*to assess in view of best scientific knowledge, if that proposed development, individually or in combination with another plans or projects, will have a significant effect (s) on any European sites.*"

Under Section 177U (5) of the Planning Acts, "The competent authority shall determine that an appropriate assessment of a draft Land use plan or a proposed development, as the case may be, is required if it cannot be excluded, on the basis of objective information, that the draft Land use plan or proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site".

Under Section 177T (2) of the Planning Acts, the NIS "*shall include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for one or more than one European sites in view of the conservation objectives of the site or sites.*"

1.2 Role of the Competent Authority

An AA is required following Screening for AA, if it could not be excluded on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, would have a significant effect(s) on any European sites. In this case, ABP would be the competent authority and make the determination on the AA as per the Planning Acts, and as informed by an NIS. The alternative scenario, where following Screening for AA, significant effects on European sites *can* be excluded, is not relevant in the context of this NIS.

1.3 Overview of the Programme

If the consent being sought were to be granted, construction of the proposed development could commence in 2017, subject to the relevant consents, permissions and funding being in place.

2. Methodology

2.1 Introduction

The requirement to carry out an AA to assess effects to European sites from a project comes from Article 6(3) of the Habitats Directive. European sites (formerly 'Natura 2000 sites'[1]) comprise Special Areas of Conservation (SACs) designated for non-bird habitats and species, and Special Protection Areas (SPAs) designated for bird habitats and species.

Screening for AA is required to determine whether an AA is required to assess the potential for a project or plan to have adverse effects on the integrity of European sites. Article 6(3) of the Habitats Directive states:

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

2.2 Relevant Guidance

The methodology draws on, and has evolved from EC guidance (EC, 2001), Irish governmental guidance (Department of Environment, Heritage and Local Government, 2010), recommendations from international AA practitioners (Levett-Therivel, 2009; Chvojková *et al.*, 2013), and unpublished recommendations of the National Parks and Wildlife Service (NPWS) at the *Advanced Appropriate Assessment Workshop* hosted by the Chartered Institute of Ecology and Environmental Management at Dublin Port Centre, 17th April 2015. However, some aspects of this guidance are no longer applicable given developments in legislation and case law since their publication. Further details can be found in Appendix A.

The Zone of Influence (ZoI) for the purpose of this NIS is the term used to define the spatial area over which effects are likely to be significant, due to the particular sensitivity and mobility of different features. The Zone of influence can vary for different Qualifying Interests (QI) of the European sites. Guidance on interpreting the ZoI for the proposed development has been drawn from Transport Infrastructure Ireland's (TII) (formerly the National Roads Authority (NRA)) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009a) , which define it *as an "'effect area' over which [biophysical] changes are likely to occur"*. The need to identify receptor-specific ZoIs in AA is supported by Irish Governmental guidance (DEHLG, 2010). Guidance on the specific distances adopted as ZoIs have been drawn from various published studies as per the sources in Appendix B.

The mobility of a particular QI will determine if they could move beyond European site boundaries into the ZoI. The ranging distance or "extent of spatial sensitivity" is considered alongside the ZoI to determine the potential for significant effects to occur. Guidance on determining ZoIs has been drawn from various published studies as per the sources as detailed in Appendix B of this NIS.

2.3 Screening for AA

Screening for AA essentially comprises answering two questions, in response to the wording of article 6(3) of the Habitats Directive.

Q1: Is the project directly to or necessary for the management of the site?

If the answer to this question is yes, then no further assessment is required. In the case of the proposed development, the answer is no, and the requirement for Screening is triggered.

[1] "European site" replaced the term "Natura 2000 site" under the EU (Environmental Impact Assessment and Habitats) Regulations 2011 S.I. No. 473 of 2011 and is applied in the context of Appropriate Assessment in this NIS.

Q2: Are there likely significant effects to European sites?

Screening determines whether AA is required by determining if it can be excluded, on the basis of objective information, that the project or plan, either alone or in combination with other projects / plans, will result in LSEs on any European sites. Under article 6(3) of the Habitats Directive, conservation objectives are only described in relation to AA. However the determination of whether effects to European sites could be considered LSEs is facilitated by analysing the attributes and targets in conservation objectives.

2.3.1 Steps in Screening

Screening for AA involves the following steps (adapted from EC, 2001):

1. Determine if the project is directly connected with or necessary to the management of the site (In the case of the proposed development it is not);
2. Describe the project (refer to Section 3);
3. Describe the baseline environment (refer to Section 4);
4. Identify, using scientific analysis, potential source-pathway-receptor linkages between the project and European sites, with reference to receptor and effect-specific ZoIs supported by best scientific knowledge (refer to Section 2.2 and Appendix B); and
5. Conclude if it can be excluded that linkages give rise to LSEs (refer to Section 5.3).

2.3.2 The Source-Pathway-Receptor Model

A standard 'source-pathway-receptor' conceptual model can be used to identify a preliminary list of European sites (i.e. those which *it may not* be possible to exclude LSEs). This conceptual model is a standard tool in environmental assessment. In order for an effect to occur, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism means there is no likelihood for the effect to occur. An example of this model is provided below:

- Source (s) – e.g. Sheet piling during road construction;
- Pathway (s) – e.g. Vibration; and
- Receptor (s) – e.g. Underground otter *Lutra lutra* resting site at risk of collapse (where such otter populations could be part of designated QI populations of a SAC).

The model is focused solely on the QI's for which sites are designated as per the latest Conservation Objectives (CO) from the NPWS website referenced in this NIS where relevant.

2.3.3 The Interpretation of 'Likely'

Irish case law has established that "likelihood" or "probability" is the appropriate probability test regarding the interpretation of a LSE[2]. However, the 'precautionary principle' prevails (UNESCO, 2005; see Appendix A) where "reasonable scientific doubt" cannot be ruled out.

2.4 Appropriate Assessment Process

In accordance with article 6 (3) of the Habitats Directive, which is transposed by the Irish planning legislature:

"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.

In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained

[2] Rossmore Properties Ltd. and Killross Properties Ltd. v ABP and Others [2014]; (Para 6, p. 8).

that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."

LSEs from the project (i.e. the proposed development), including any in-combination effects, are assessed to determine whether they could adversely affect the "integrity" of any European site(s), with respect to its conservation objectives. The European Court of Justice (ECJ) established (Case C-258/11[3]) that duration of effects is a key consideration in interpreting effects to "integrity", and effects to site integrity must be "lasting". Where adverse effects to integrity are identified (or there is reasonable scientific doubt as to their absence), mitigation measures are proposed to reduce adverse effects below the threshold where they could affect site integrity. This is all documented within the NIS, which informs the AA determination of the competent authority.

European Commission (EC, 2001) and Irish departmental guidance (DEHLG 2010) divide the provisions of Article 6 into four 'stages' in the AA process.

- **Stage One: Screening** - Screening determines whether AA can be excluded, on the basis of objective information, that the project or plan, either alone or in combination with other projects / plans, will not result in significant effects.
- **Stage Two: Appropriate Assessment** - If 'screened-in' the effect of the project / plan on the integrity of the European site(s), with respect to the site structure and function and its conservation objectives either alone or in combination with other projects or plans is assessed. Where there are adverse effects identified, mitigation measures are proposed as appropriate to avoid or remove adverse effects. The AA process is documented within a Natura Impact Statement (NIS) to facilitate an informed assessment of the plan / project.
- **Stage Three: Assessment of Alternative Solutions** - The process of examining alternative ways to complete the plan / project and avoid adverse effects to the integrity of any European sites is likely to have been incorporated into Screening and AA. However, if adverse effects remain after mitigation, alternatives will be revisited at this stage.
- **Stage Four: Imperative Reasons of Over-Riding Public Interest (IROPI)** - In the unlikely event where an Assessment of Alternatives was required, and only if this failed to identify any alternatives which would not adversely affect European sites, Imperative Reasons of Over-Riding Public Interest (IROPI) could potentially be enacted, whereby compensatory measures are implemented to maintain the coherence of the European site network in the face of adverse effects to site integrity. If a plan / project is to be authorised on the basis of IROPI, an application a 'statement of case' is required to serve as the basis for an IROPI decision. Referral to the relevant Minister is also required, in advance of informing or obtaining the opinion of the European Commission. IROPI is highly unlikely to be required.

2.5 Consultation

A meeting was held on site with the National Parks and Wildlife Service (NPWS) and Sligo County Council (SCC) on the 16th November 2016. Both the District Conservation Officer for Sligo and the Divisional Ecologist for the region were in attendance. The length of the proposed development was walked and different aspects of the design and construction methods were discussed in relation to potential impacts on QI species and habitats associated with Cummeen Strand / Drumcliff Bay cSAC and Cummeen Strand SPA. Following on from the site visit a meeting was held in SCC offices to cover all ecological surveys that were undertaken of the scheme and discuss any other issues in relation to potential impacts on the cSAC / SPA. Some aspects discussed included embedded mitigation, best practice construction methods in relation to pollution control and key activities such as the potential for an ecological clerk of works (ECoW) to conduct site visits at construction stage.

[3] Judgment Of The European Court (Third Chamber) on 11 April 2013 in Case C-258/11 (REQUEST for a preliminary ruling under Article 267 TFEU from the Supreme Court (Ireland)) in relation to Peter Sweetman, Ireland, Attorney General, Minister for the Environment, Heritage and Local Government v An Bord Pleanála, para 46 (and others).

2.6 Desktop Survey Sources

Published references used in this report, including government publications, are included in Section 8. Website resources are named within the text, along with unpublished reports such as planning reports, and case references. Websites were accessed throughout 2015 and 2016. The baseline environment as it related to European sites was analysed using the key sources below:

- Mapping of European site boundaries from NPWS (available online at www.npws.ie);
- Mapping of QI habitats for Cummeen Strand / Drumcliff Bay SAC (627) and Cummeen Strand SPA (4035) in NPWS Conservation Objective mapping (NPWS; 2013c);
- Additional records for QI species obtained from the NPWS Research Branch in April 2015;
- Ordnance Survey Ireland mapping and aerial photography (available online from www.osi.ie) and Google Maps (available online at maps.google.ie);
- Land zonings and land-use plans available from the Department of the Environment, Community and Local Government (DECLG; available online at www.myplan.ie);
- National conservation status assessments of QI's from NPWS conservation status assessments for habitats and non-bird species (NPWS, 2013a and b) and the European Topic Centre (2015) for birds;
- Soil, geology, hydrogeology, water quality, and point pollution data (available online from www.gsi.ie and www.epa.ie), as well as mapping for monitoring stations of groundwater level and quality;
- AA Screening Statement for the 'N4 Traffic Improvement Scheme – Hughes Bridge Widening' produced by Scott Cawley Ltd. ecological consultants in 2012 for the area adjacent to the proposed development footprint;
- Report entitled '*Environmental Appraisal Report – Hughes Bridge Widening*' produced by Arup Ltd. consulting engineers in 2012 for the area adjacent to the proposed development footprint;
- Report informed by desktop surveys in addition to field surveys in 2003 and 2004 entitled '*N15 Re-alignment Sligo to Bunduff Bridge Constraints Study: Ecological Report*' , produced by Cotton in 2004 for the proposed development footprint and wider area;
- *'N4/N15 Sligo Urban Road Improvement – Environmental Impact Statement'* produced by Ryan Hanley consulting engineers in 2011 (unpublished) covering the proposed development footprint and wider area;
- Irish Wetland Bird Survey Data (IWeBS): annual peaks 2004-2014 for QIs within Cummeen Strand SPA; and
- Unpublished low tide count data for a single season (2010-2011) for relevant areas within as well as the wider Sligo harbour outside the ZoI.

2.7 Field Survey Methodology

2.7.1 Survey Dates and Types

A suite of additional terrestrial and aquatic surveys were undertaken between May 2015 and March 2016 by Jacobs (and Ecofact Ltd. working on behalf of Jacobs) to inform the screening for AA and the NIS. Relevant surveys are summarised in Table 2.1.

The survey areas shown in Table 2.1 were determined with reference to the Description of the Proposed Development (Section 3) which informed the potential ZoIs of different effects from the proposed development, given the varying spatial sensitivities / ranging distances of different species and habitats (Appendix B).

Table 2.1: Ecology surveys informing the Screening for AA / NIS (Surveys by Jacobs Engineering Ltd. unless otherwise noted)

Surveys of Species / Habitats which could be QIs of European sites	Field Survey Area (m beyond boundary)	Survey Date(s)
Habitat survey of terrestrial and intertidal areas, to include invasive species therein, within the ZoI of LSEs.	50m beyond boundary	13th-14th May 2015 and 31st August -1st September 2015
Habitat survey for ground-water-dependent habitats within the ZoI of LSEs.	250m beyond boundary	
Habitat suitability assessment for QI narrow-mouthed whorl snail *Vertigo angustior* of the Cummeen strand / Drumcliff Bay SAC within the ZoI of LSEs.	250m beyond boundary	
Habitat suitability assessment for marsh fritillary butterfly *Euphydryas aurinia* within the ZoI of LSEs.	50m beyond boundary	
Breeding bird surveys within ZoI of the proposed development.	Up to 1 km (refer to species-specific distances in Appendix B)	13th-14th May and 1st September 2015
Wintering bird surveys to map and count localized high tide roosts and count low-tide feeding birds within the ZoI of LSEs.	500m beyond boundary	1st September, 20th October, 18th November 2015 and January 14th-15th 2016
Otter surveys, focusing particularly on potential underground or above ground breeding or resting sites within the ZoI of LSEs.	150m beyond boundary for resting sites; 300m for watercourse crossing points	20th October, 18th November 2015 and January 14th-15th 2016
Aquatic ecology and lamprey habitat assessment by Ecofact Ltd. in the Copper River and Garavogue estuary within the ZoI of LSEs, focusing on potential spawning or juvenile habitats (and migratory corridors) for Atlantic salmon *Salmo salar* sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, and brook lamprey *Lampetra planeri* of the Lough Gill SAC and Cummeen Strand / Drumcliff Bay SAC, within the ZoI of LSEs.	Copper River from estuary to N16 road bridge 1.1 km upstream, and the Garavogue estuary on the fringe of the proposed development where temporary vehicle movements may be required during construction (note: this area extends beyond the zone of influence per se, with the objective of understanding the aquatic communities upstream, potentially capable of moving downstream through the site)	25th March 2016
Macroinvertebrate kick / sweep sampling (and incidental fish recording) in the Copper River within the ZoI of LSEs	Three locations on the Copper River: 10m downstream of the proposed development / Copper River Bridge; 10m upstream of the proposed development / Copper River Bridge; and approximately 400m upstream of the Copper River Bridge	25th March 2016

The distribution and condition of any potential QIs of European sites were recorded. The Cummeen Strand / Drumcliff Bay SAC and Cummeen Strand SPA (which are adjacent to the proposed development) and Lough Gill SAC (which is a short distance upstream of the proposed development) were a particular, but not exclusive, focus of the field survey programme. Where NPWS CO mapping was available within the ZoI, NPWS mapping

was verified. An iterative process of assessment did not identify the need for further survey work for other sites considered in this report.

2.7.2 Field Survey Methodologies

Survey areas differed for different QI species and habitats, given the varying potential sensitivity to LSEs of different QI features, and the varying ranging distances / extents of spatial sensitivity of mobile species. As recommended by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016), professionally accredited or published studies were used to determine ZoIs. The scientific references which supported the delineation of each survey area / ZoI are provided in Appendix B.

The habitat and species surveys were conducted on the 13th and 14th May, and 1st and 2nd September 2015 to identify all potential QIs of European sites of relevance to the Screening and NIS. Terrestrial surveys focused in particular on the coastal habitats along the Garavogue estuary, to verify NPWS CO mapping for the Cummeen Strand / Drumcliff Bay SAC (NPWS, 2013c) and assess the potential presence of additional localised examples of QI habitats not mapped by the NPWS (e.g. QI petrifying springs). As will be discussed in Section 3, instream works would be required only in the Copper River (during a proposed culvert replacement), and in a local area of the Garavogue estuary where temporary movement of machinery will be required. For this reason, the aquatic ecology surveys conducted by Ecofact Ltd. focused in particular on the Copper River, and the relevant areas of the Garavogue estuary.

Breeding bird surveys on the mornings of the 13th and 14th May 2015 employed the Common Birds census method (Gilbert *et al.*, 1998) to map breeding bird behaviour and potential breeding territories within 100m (as a minimum) increasing to 150m for Kingfisher.' Windscreen' searches by car were additionally conducted to identify if there was any potential breeding or roosting habitat in the wider areas up to 1 km for highly sensitive potential QI bird species such as merlin *Falco columbarius* and white-tailed sea eagle *Haliaeetus albicilla*.

Winter bird surveys were carried out between September 2015 and January 2016. Survey dates, tide, and weather data is provided in Table 2.2. Surveys were carried out within the ZoI of likely significant disturbance effects, estimated to be up to 500m from the proposed development as per the published studies in Appendix B. Surveys focused in particular on the Cummeen Strand SPA to identify low tide feeding sites and high tide roosts within the SPA, in the context of the existing NPWS CO bird mapping for the SPA (NPWS, 2013d). Surveys were undertaken in accordance with the Wetland Bird Survey (WeBS) and Low Tide Count Survey methodologies in Gilbert *et al.*, (1998).

Table 2.2: Wintering bird survey dates and times (winter 2015 / 2016) Garavogue estuary within the ZOI

Date	Tide	Tide Height	Tide Time	Survey Time	Weather
01/09/2015	Low	0.10m	14h07	13h30-14h30	Overcast, mild breezy with light showers
02/09/2015	High	4.30m	09h07	08h30-09h30	Overcast, calm, mild
20/10/2015	High	3.3m	11h33	11h00-12h00	Slight breeze, cloudy, some sunny spells visibility 500 m-2 km
20/10/2015	Low	1.3m	17h16	16h30-17h00	Cloudy, moderate breeze, light showers, visibility good – 500 m
18/11/2015	High	3.5m	10h09	11h00-12hr00	Windy force 4-5 occasional gusts. Rain part of survey visibility good – 500 m

Date	Tide	Tide Height	Tide Time	Survey Time	Weather
18/11/2015	Low	1.10m	16h01	15h15-16h15	Windy force 3 sunny, dry (raining prior to survey).
14/01/2016	Low	0.5m	14h35	12h00-13h00	Cold, calm, light rain
15/01/2016	High	4.10m	09h31	08h30-09h30	Cold, calm, dry

Otter surveys for underground or above-ground breeding or resting sites were conducted within 150m of the proposed development. This is the distance within which intrusive groundworks may be reasonably assumed to potentially affect such sites following the rationale to licencing of disturbing works by the NRA (2006). Information on the characteristics of otter holts in the Irish context was obtained from O'Sullivan (1993) and Sleeman and Moore (2005). Habitat suitability surveys for marsh fritillary comprised searching for the larval food plant devil's-bit-scabious *Succisa pratensis* within the footprint of the proposed development and, if present, categorizing habitat based on suitability from optimal ("Good Condition") through intermediate categories to "Unsuitable" (Fowles, 2003).

Habitat suitability surveys for narrow-mouthed whorl snail *Vertigo angustior,* which is a QI of the Cummeen Strand / Drumcliff Bay SAC, were conducted during surveys for ground water dependent habitats. Surveys searched for suitable habitats as per the NPWS Irish Wildlife Manual (Moorkens & Killeen, 2011); namely dune grassland, fen, marsh, salt marsh and flood plain habitats, and transitional ranker habitats between these habitats and terrestrial zones.

No surveys were required for white-clawed crayfish *Austropotamobius pallipes* because there was no freshwater habitat within the area over which LSEs could occur (i.e. there was no freshwater habitat within the footprint of the proposed development).

NPWS CO mapping for the Cummeen Strand / Drumcliff Bay SPA indicated there were no QI common seal *Phoca vitulina* haul-out sites located within the potential ZoI of LSEs from the proposed development (estimated to be 500m; Appendix B).Potential marine mammal haul-out sites were also assessed during the wintering bird, and spring / summer habitat surveys.

The following text from Ecofact Ltd.'s *Aquatic ecology and lamprey habitat assessment* report describes the field survey methodology:

- *"A walkover habitat assessment was undertaken on the 25th March 2016 to establish the character of the Copper River at the proposed development site and environs, and the portion of the Garavogue estuary (near Salmon Point) over which machinery may track, during construction of the retaining wall for the proposed development.*
- *A river habitat assessment was carried out using methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (Environment Agency, 2003).*
- *Habitat suitability for salmonids was assessed with reference to the leaflet 'The Evaluation of habitat for Salmon and Trout' (DANI Advisory leaflet No. 1) and 'Ecology of the Atlantic Salmon' (Hendry & Cragg-Hine, 2003).*
- *An opinion of lamprey habitats was formed for the lower reaches of the Copper River and at Salmon Point with reference to Ecology of the River, Brook and Sea Lamprey by Maitland (2003).*
- *Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at three locations on the Copper River: 10m downstream of the N4 Bridge, 10m upstream of the N4 Bridge and approximately 400m upstream of the N4 Bridge. Macroinvertebrates were sampled at these sites using kick / sweep sampling (Toner et al., 2005).*
- *Any fish captured during sampling were noted and identified with reference to the 'Key to British Freshwater Fish with notes on their ecology and distribution' by Maitland (2004)."*

3. Description of Proposed Development

The boundary of the proposed development is centred on the existing N4-N15 carriageway, approximately 1 km northwest of Sligo city centre (Figure 1). The proposed development comprises a c. 670 m improvement section that passes adjacent to the Garavogue Estuary and the Garavogue River, and over the Copper River. The proposed development footprint encompasses:

- The shoreline along Garavogue estuary;
- A large abandoned rank grassland field not subject to any current land management;
- Existing roadside grass verges; small areas of existing ornamental plantings in roadside gardens and existing rock armour embankments along the Copper River and the Garavogue River / estuary; and
- The site compound located on existing hardstanding on nearby industrial yard on Ballast Quay.

The development consists of the upgrade of a 670 m section of the existing N4-N15 to three lanes, in both directions, along the N4-N15 between Hughes Bridge and a point just north of the R291 Rosses Point Road junction and associated upgrade works to the junctions with the R870 Markievicz Road, N16 Duck St and R291 to accommodate changes in alignment. The N4-N15 vertical alignment will be raised between N16 Duck St and R291 Rosses Point Road junctions to increase the outfall level of drainage and will include the demolition of most of the existing Copper River Bridge and the construction of a replacement structure.

Existing footpaths will be upgraded to provide cycling and pedestrian facilities. Boundary treatment will replace existing boundary walls affected by the works to construct the proposed development.

Whilst the boundary of the proposed development overlaps the Cummeen Strand / Drumcliff SAC and Cummeen Strand SPA (i.e. the 'red-line' in Figure 1), there is no overlap of the permanent footprint of the proposed road and ancillary infrastructure with designated QI habitats (Figure 2). However, machinery will require temporary access across the intertidal habitats in the foreshore, outside the proposed development boundary, within QI habitats of these European sites during the construction of proposed retaining walls.

There are no freshwater watercourses within the proposed development footprint, or within more than one hundred metres of it (note that the section of Copper River within the development footprint is tidal). Excluding the partial demolition of the Copper River Bridge and part of an existing shoreside footpath structure, there will be no demolition of any structures. There will be no abstraction from groundwater. Although some light fittings will be replaced, there will be no increase in lighting relative to the existing.

3.1.1 Mitigation by Design

The potential effects from the proposed development have been assessed with the following mitigation by design in place ("embedded mitigation"). As this mitigation is inherent in the design, there is no uncertainty regarding its implementation.

Avoidance of European sites within proposed development footprint

The proposed development was designed to avoid habitat loss of QI habitats in the adjacent Cummeen Strand / Drumcliff Bay SAC and Cummeen Strand SPA. Temporary movement of machinery will be required across QI habitat of the SAC, and QI wetland habitat of the SPA during the construction of proposed retaining walls, however there will be no lasting damage or removal of any QI habitat within any European sites.

Pollution Control

The mitigation inherent in the operational surface water treatment system is outlined below. Furthermore a preliminary Erosion and Sedimentation Control Plan (pESCP) has been has been developed and is included in Appendix C of this NIS. This details specific pollution prevention measures to be employed during construction and will be binding on the appointed contractor and actively monitored by SCC and the appointed ECoW. No additional measures are required to mitigate the significance of potential pollution effects. The following measures were incorporated into the design:

- In accordance with the Highways Agency Water Risk Assessment Tool (HAWRAT), water quality in operational carriage-way run-off is predicted to 'pass', for both soluble (heavy metals) and sediment-bound pollutants without attenuation and treatment;
- Petrol interceptors will be provided at all outfall locations between the carriageway drainage outfall and watercourse;
- Although an Accidental Spillage Risk Assessment concluded there is a low risk of an accidental spillage incident (0.5%); a penstock, handstop, or an orifice that can be manually closed in the event of accidental spillage will be provided in the attenuation/treatment pond. The penstock can, if lowered in time potentially retain 100% of spilled material; and
- All drainage outfalls will be flapped to prevent tidal ingress.

4. Baseline Environment (Screening Step 2)

4.1 Area for Baseline

The relevant baseline to the assessment is primarily the ZoI. This is the area within which effects from the proposed development (described in Section 3) could be significant, in the context of Conservation Objectives of European sites. This area was equivalent to the field survey areas identified in Table 2.1. For clarity and completeness, baseline information was provided on European sites or their QIs beyond the area within which LSEs could arise (e.g. for slightly more distant European sites).

4.2 Surface Water

The area of Garavogue estuary in the vicinity of the proposed development is co-designated as the Cummeen Strand / Drumcliff Bay SAC and Cummeen Strand SPA (Figure 1). Both the Copper and Garavogue Rivers are tidal at this location. The Copper River rises on the shore of the Lough Gill SAC (Site Code 1976) upstream of the proposed development, and flows downstream, under the proposed development to discharge into the Cummeen Strand SAC / SPA within the Garavogue estuary.

Pollution during operation has been scoped out of this assessment due to the absence of likely significant effects resulting from the 'embedded mitigation' inherent in the design (see section 3.1.1). However construction-phase run-off of silt, stored fuels or other toxic materials cannot be mitigated through 'embedded mitigation'. A description of the existing condition and potential resilience of aquatic habitats in receiving waters is relevant to the prediction of effects from pollution during construction.

The proposed development is located adjacent to Garavogue Estuary. The high tide water mark is largely coincident with the boundary of the Cummeen Strand / Drumcliff Bay SAC and the Cummeen Strand SPA. The estuary adjoins the proposed development and is fed by the Garavogue River which adjoins the site boundary to the south and the Copper River which flows under the proposed development in the northern part of the site (Figure 1). In their *Aquatic Ecological and Lamprey Assessment* report Ecofact Ltd. reported the following, regarding the existing condition and water quality status of the Copper River, and adjacent intertidal areas of the Garavogue estuary at Salmon Point:

- *"From the visual survey, the Copper River [within the environs of the proposed development] was found to be a small highly modified stream that flows through an urban area. The part of the river within the boundary of the proposed development (the Copper River Bridge) and the stretch to approximately 200 m upstream of here was considered to be affected by tidal fluctuations, as indicated by the presence of Enteromorpha and luxuriant instream filamentous algae.*
- *There was little / no physical instream diversity or habitat heterogeneity along this stretch of the Copper River and the riparian areas do not provide shading. From approximately 0.5 km to 1 km upstream of the N4 Bridge, the Copper River is a sluggish watercourse of varying width and indiscernible depth, appearing to have been realigned in the past, probably to facilitate development within Sligo IT campus.*
- *Overall macroinvertebrate diversity was low at the two [intertidal] sites examined downstream and upstream of the N4 [Copper River] Bridge. The macroinvertebrate community in this part of the river was dominated by pollution tolerant brackish species. The macroinvertebrate assemblage in this reach of the river included the ubiquitous amphipods Corophium volutator and Gammarus sp. The lower reaches of the Copper River are not suitable with regard to assigning a Q-rating using the EPA biological water quality rating system as it is not a truly aquatic stretch of river.*
- *[Another site was surveyed] in a riffled part of the Copper River upstream of the tidal influence. Macroinvertebrates recorded here were dominated by pollution tolerant (Group C) Gammarus sp., and Baetis rhodani. Very tolerant (Group D) indicators were well represented and included the leech Glossiphonia complanata and the Bladder Snail Physa fontinalis. There was a paucity of less sensitive (Group B) macroinvertebrates recorded, and limited to cased caddisfly larvae of Limnephilidae. Group A (pollution sensitive) indicators were not recorded. Using the EPA freshwater biological water quality rating system (Toner et al., 2003), biological water quality at this site was rated 'Q3, Moderately Polluted' corresponding to Water Framework Directive 'Poor' status.*

- *The intertidal habitat in Sligo at Salmon Point was mainly a mixed muddy substrate".*

Photograph 4.1 : Copper River Bridge, upstream side

Photograph 4.2 : Copper River; upstream of existing Copper River Bridge

The next nearest watercourse to the proposed development is the Carton Stream 0.4 km to the north. There were no watercourses connecting the proposed development to the Shannon Eighter River or any other watercourses. At the time of writing:

- The water quality of the Garavogue estuary upstream and downstream of the outfall for the proposed development was "unpolluted" according to the EPA's online database;
- The Water Framework Directive status of the Garavogue Estuary was "Good";
- According to the EPA, the Garavogue River had a Q value of 4 ("Good" quality) in the lowest freshwater reach 0.5 m upstream of the site (data from 2009); and
- According to the Natura Standard Data forms for Cummeen Strand SAC (NPWS, 2014), which is also designated for QI wetland birds in the Cummeen Strand SPA, the conservation status of both estuary and mudflat habitats was "Good".

Lough Gill SAC is designated for aquatic species and habitats located 3.3 km east, and upstream of the proposed development. The Copper River rises on the shore of Lough Gill, but there is no direct hydrological link between the proposed development and the site (i.e. the SAC is upstream of the proposed development).

4.3 Ground Water and Geology

According to the Geological Survey of Ireland (GSI), the bedrock underlying the proposed development is of limestone and calcareous shale; and the underlying aquifer is locally important, the vulnerability of which ranges from "High" close to the Garavogue River to "Moderate" on the margins of the proposed development.

All groundwater bodies in the vicinity of the proposed development are of good quality according to the EPA's Water Framework Directive 2007-2012 monitoring programme. Although of good quality, the groundwater in the vicinity of the proposed development was possibly at risk of not achieving good status according to the EPA.

4.4 Distribution of Potential QIs within the ZoI of the Proposed Development

4.4.1 Habitats

Within the terrestrial areas surveyed, and specifically in relation to the Cummeen Strand / Drumcliff Bay SAC adjoining the proposed development, the surveys recently carried out indicated that:

- There were no QI terrestrial habitats (e.g. dunes or Juniper formations); and
- There were no QI ground-water dependent habitats (e.g. petrifying springs).

In the relevant CO mapping (NPWS, 2013c), the above QI habitats of the Cummeen Strand / Drumcliff Bay SAC are not recorded within at least several kilometres of the proposed development.

Within the particular intertidal areas of the Garavogue estuary, partially within the footprint of temporary machinery access requirements during construction, the fisheries and habitat surveys informing this assessment recorded that:

- NPWS CO mapping for Cummeen Strand / Drumcliff Bay cSAC indicates QI mudflat and sandflat habitat adjoins the proposed development to the west and overlaps with QI estuary habitat over the same area. This has been mapped by the NPWS as estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex (NPWS, 2013c).
- However, habitat and fisheries surveys in the vicinity of the proposed development indicate that the habitat immediately adjacent to the proposed development (where movement of machinery is likely to be required) comprised coarse gravel, small cobbles, bed rock and scattered stable bounders (see Photograph 4.3, Photograph 4.4, and Figure 2); with frequent channel wrack *Pelvetia canaliculata* and bladder wrack *Fucus vesiculosus* seaweeds, amongst sparse thin mixed sediments.
- Fine muddy sediments are present further out in the estuary and to the southwest of the proposed development. This part of the estuary is therefore unlikely to support significant benthic communities associated with QI mudflat habitat.
- Furthermore, keystone marine communities present within the cSAC including Zostera-dominated and Mytilidae-dominated communities are not present within the ZoI of the proposed development, as indicated by habitat surveys and the NPWS CO mapping (NPWS, 2013c). Surveys therefore indicate this habitat, which has been previously mapped as QI mudflat and sandflat habitat, is not in fact QI mudflat and sandflat habitat; the area does nevertheless qualify as QI estuary habitat.
- A narrow zone along the tide line, partially within the proposed development footprint comprised a mosaic of 'lower saltmarsh' and 'upper salt marsh' with some fit to Annex 1 habitat saltmarsh types. However none of these saltmarsh habitats were QI habitats of the Cummeen Strand / Drumcliff Bay SAC, and they are therefore not mapped in Figure 2 to avoid confusion. Furthermore, this habitat will not be impacted by the proposed development.

Despite the above survey findings indicating the area immediately adjacent to the scheme may not comprise QI mudflats and sandflats it does comprise QI estuary habitat. The CO objectives for QI estuary and QI mudflats and sandflats are the same (NPWS, 2013c). To maintain the favourable conservation condition of these QI habitats, which is defined by a list of targets and attributes:

- Target 1: *The permanent habitat area is stable or increasing, subject to natural processes.*

- Target 2: *Maintain the extent of the Zostera-dominated community and Mytilidaedominated community complex, subject to natural processes.*
- Target 3: *Conserve the high quality of the Zostera-dominated community, subject to natural processes.*
- Target 4: *Conserve the high quality of the Mytilidae-dominated community complex, subject to natural processes.*
- Target 5: *Conserve the following community types in a natural condition: Intertidal fine sand with Peringia ulvae and Pygospio elegans community complex; Estuarine mixed sediment to sandy mud with Hediste diversicolor and oligochaetes community complex; Fine sand with crustaceans and Scolelepis (Scolelepis) squamata community complex; Fine sand with Angulus spp. and Nephtys spp. community complex.*

Photograph 4.3: Mixed Sediment / Rocky Shore within Cummeen Strand SAC

Photograph 4.4: Mixed Sediment / Rocky Shore within Cummeen Strand SAC (close up of substrate)

The nearest known terrestrial QI habitat of any European site was the priority QI alluvial woodland habitats on the shores of Lough Gill SAC located at least 1.5 km to the east, and upstream of the proposed development.

4.4.2 Invasive species

The invasive species Japanese knotweed *Fallopia japonica* and hybrid bluebell *Hyacinthoides x massartiana* were both recorded within the footprint of the proposed development (Figure 2).

A small number of hybrid bluebell plants were recorded from the north-western corner of the proposed development footprint. The plants were near amenity grassland beside a stone wall on the Garavogue shoreline. A number of stands of Japanese knotweed were recorded within the proposed development footprint. Several stands were found along the hedged boundary of the existing N4-N15 road with the rank grassland field to the east. Another stand was found near the hybrid bluebell plants on the shoreline to the west. Other stands were recorded in the wider area c. 50 m from the proposed development, and outside the predicted ZoI. No other invasive species were recorded. Neither of these species could affect the estuarine QI habitats adjacent to the proposed development, as they would not become established within the tidal zone.

No construction will take place within any area affected by Japanese knotweed until it has been successfully treated or removed. Treatment of Japanese knotweed by stem injection by SCC has commenced in October 2016. This multi-annual treatment is being managed by SCC and undertaken as part of TII's wider invasive species treatment programme across the national road network. It is estimated that successful treatment will take up to four years. In the event that construction is required to commence earlier than four years within the infested area, or in the event that any invasive species material remains after treatment, the material will be removed under an advance works contract (which shall be subject to a separate invasive species management plan). In any event, specialist with relevant expertise in the area of invasive species will verify the removal of all knotweed-related material prior to any construction commencing.

4.4.3 Birds

During the breeding season surveys, a total of 18 potentially breeding species, and non-breeding waterfowl species were recorded. None of these were QI populations, and there was no suitable habitat for any QI

breeding bird populations. A total of 18 species were recorded during the wintering bird survey. Only two of these species were from QI populations of the Cummeen Strand SPA (see Table 4.1).

Table 4.1: QI Bird Populations of the Cummeen Strand SPA recorded within 500 m of proposed development

Common Name	Latin Name	Peak Count (2015/2016)	% Cummeen Strand SPA Population[1]	Habitat Usage	
				Feeding	Roosting
Oystercatcher	*Haemotopus ostralegus*	4	<1%	✓	✓(1)
Redshank	*Tringa totanus*	3	<1%	✓	✓(2)

Both QI species of the Cummeen Strand SPA were recorded in very small numbers relative to numbers recorded by Birdwatch Ireland in IWeBS data from 2009 to 2014 in the any of the four adjacent subsites. Table 4.2 compares the population sizes of the two Cummeen Strand SPA QI species from the survey area / ZoI, with those in adjacent areas of the bay (i.e. adjacent IWeBS subsites). A direct comparison with the single season of data from the NPWS low tide data cannot be made, as the NPWS count area included areas both within and outside the survey area / ZoI.

Table 4.2: Cummeen Strand SPA QI populations recorded in survey area relative to other parts of SPA

Common name	Survey Are/ZoI (Peak 2015/2016)	Cummeen Strand and East Gibraltar (mean 2009-2014)	Cartron Marsh (mean 2009-2014)	Sligo Docks (mean 2009-2014)	Port-Finisklin (peak 2008/2009)
Oystercatcher	4	423	18	15	76
Redshank	3	169	70	32	127

The low numbers of QI populations within the survey area / ZoI reflects the mixed sediment / rock substrate in the vicinity of the proposed development (Photograph 4.3 and Photograph 4.4) compared to the extensive mudflat further out in the estuary and in the adjacent bay. The existing disturbance from dog walkers around an existing path skirting the estuary near the proposed development also reduces its potential value to wintering birds.

4.4.4 Marsh Fritillary

Although there are records for the species within the 10 km grid squares in which the proposed development is located, site surveys found there to be no potential habitat for the species within the footprint or within at least 200 m of it. The larval food plant devil's bit scabious was absent from the survey area / ZoI. There is no potential for mobile QI populations of marsh fritillary from any European sites to be present in the environs of the proposed development.

4.4.5 Narrow-Mouthed Whorl Snail

There was no suitable habitat for whorl snails within the proposed development footprint based on the known requirements in Moorkens and Killeen (2011). There could be some limited suboptimal habitat for QI narrow-mouthed whorl snails within / adjacent the Cummeen Strand / Drumcliff Bay SAC in the transitional grassland habitat at Salmon Point, which grades from saltmarsh into dry scrub. However, there are no historical records for the species here, and none were recorded by Moorkens in *Vertigo* surveys conducted in March 2009 to inform a previous road development at this location (as part of the unpublished EIS, produced by Ryan Hanley Consulting Engineers and referenced in Section 2.6). A previously unknown population of this species was recorded during the 2009 survey, but this was several kilometres to the north and would not be affected by the proposed development. Furthermore, there are no works proposed on Salmon Point.

4.4.6 Otter

Field surveys recorded otter footprints within 50 m of the proposed development along the Garavogue estuary shoreline. However, importantly, 150 m is the approximate distance from intrusive works, within which collapse of breeding or resting sites could result, and no otter holts were recorded within 150 m of the proposed development. A historical record of an otter holt from a previous assessment by Scott Cawley in 2012, was located 500 m to the north. Resurvey of this area in 2015 and 2016 found the area had been partially cleared, and the holt could not be found. The local ranger of the NPWS had no records indicating otter road kills in the area, when contacted in 2015.

4.4.7 Fish

Ecofact Ltd.'s *Aquatic Ecological and Lamprey Assessment* report concluded that:

- *"The stretch of the Copper River affected by the proposed development is not considered an important area for juvenile lampreys or salmonids as the ecological requirements of these fauna are not present in this part of the river.*
- *Juvenile lampreys require a substrate composed of silt, or silt and sand. The substrate in the environs of the Copper River Bridge comprises rock and compacted clay so is not suitable for juvenile lampreys, and none were found during sweep sampling.*
- *Salmonids were not recorded in the Copper River in the environs of the Copper River Bridge. Salmon fry and parr occupy shallow, fast-flowing water with a moderately coarse substrate with cover (Symons & Heland 1978). Deep or slow-moving water, particularly when associated with a sand or silt substrate, does not support resident juvenile salmonids. The fact that the Copper River is affected by the tide precludes the presence of juvenile Salmon in the lower reaches of the river as the channel is flooded during times of high tide.*
- *Moreover, Atlantic salmon require very good water quality, and water quality in the lower reaches of the Copper River is considered unsuitable / suboptimal for juvenile Salmon, given its apparent unsatisfactory condition.*
- *The Copper River is not important with regard to the migration of any species".*

4.4.8 Marine Mammals

The NPWS' CO mapping for the Cummeen Strand / Drumcliff Bay SAC (NPWS, 2013c) indicates there are no known terrestrial haul-out sites for QI common seal within 5 km of the proposed development. This is supported by site observations.

5. AA Screening Assessment

5.1 Use of Distance in Screening of Sites

The proximity of European sites (and more importantly their QIs) to the proposed development is of primary importance in identifying source-pathway-receptor links which could result in LSEs. Irish departmental guidance on AA states [*emphasis added*]:

"*A distance of 15 km is currently recommended in the case of plans, and derives from UK guidance. For projects, the distance could be much less than 15 km, and in some cases less than 100 m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects*" (DEHLG, 2010; p.32, para 1).

Using a precautionary approach, the following scientifically-supported distance criteria were used to identify a preliminary list of all European sites that could be affected by the proposed development:

- Any SACs within 10 km of the proposed development were listed because highly mobile QI species can move up to 10 km from SACs according to best scientific knowledge (specifically QI otter territories and marsh fritillary dispersal may extend this far according to best scientific knowledge (O'Neill, 2008, cited in Reid *et al*., 2013; Zimmerman *et al*., 2011); and
- Any SPAs within 20 km of the proposed development were listed because some highly mobile QI bird populations specifically certain goose species) can range up to 20 km from SPAs, according to best scientific knowledge (SNH, 2013).

5.2 Source-Pathway Receptor Links

5.2.1 Links with Potential for LSEs

As will be confirmed in the screening exercise that follows in Section 5, potential source-pathway receptor link could result in LSEs on European sites (during construction only):

- Overland run-off or controlled discharge of contaminated surface water to the Copper River, Garavogue River and / or Garavogue estuary during construction, potentially affecting estuarine species and habitats; and
- Disturbance to or displacement of QI winter bird species.

5.2.2 Links with no Potential for LSEs

As will be confirmed in the screening exercise that follows in Section 5, the following potential source-pathway receptor links were not considered further as they could not result in LSEs on European sites:

- The invasive species recorded in the study area could not affect the estuarine QI habitats adjacent to the proposed development, as they would not become established within the tidal zone. On this basis, this NIS does not further assess, or mitigate, effects to European sites from the spread of invasive species. In addition there are existing regulatory regimes whose binding implementation will mitigate the potential risks of the spread of invasive species outside the study area.
- Water pollution effects during operation of the proposed development – excluded due to the attenuation and treatment system inherent in the design.
- The proposed development (excluding impacts from contaminated surface water) does not undermine any of the targets (see section 4.4.1) for maintaining favourable conservation status of QI habitats within the cSAC. For example there are no keystone communities within the ZoI of the proposed development and there will be no loss of QI habitat. Temporary movement of machinery across the cSAC will be required, however, there is no potential for LSE arising from this.

- Instream works in the Copper River culvert affecting QI lamprey or Atlantic salmon populations – Ecofact Ltd.'s *Aquatic Ecological and Lamprey Assessment* recorded no juvenile lamprey or salmonids in sweep sampling; concluded the Copper River is not an important area for juvenile lampreys or salmonids; and concluded that the Garavogue estuary by Salmon Point is not suitable for juvenile lamprey due to its transitional nature;
- Temporary over-pumping of the Copper River during bridge construction works affecting migratory QI fish – excluded because the above aquatic ecology report concluded that the Copper River is not used by lamprey or Atlantic salmon for migration, feeding, or spawning; and
- There will be no significant air pollution impacts arising from operation of the proposed development. The Annual Average Daily Traffic is predicted to increase by 10% from 25,679 in 2015 to 28,278 by 2032 with the proposed development in place. The impact of the proposed scheme is predicted to lead to an increase in NOx concentrations within the Cummeen Strand pNHA / SAC / SPA, and Lough Gill SAC / pNHA of a maximum of 1.01µg/m^3. This is below the 2 µg/m^3 change triggering an ecological assessment in accordance with the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). On this basis, no significant air quality impacts are predicted.

5.3 Screening Tables

5.3.1 Screening of LSEs on (SACs)

The SACs on which LSEs could not be excluded as a result of the proposed development are presented in Table 5.1. The assessment of LSEs in Table 5.1 has taken account of the in-combination assessment in Section 5.4 and the relevant source-pathway-receptor identified in Section 5.2.

Table 5.1: Identification of SACs for which LSE could not be excluded, using preliminary list of all sites within 10 km.

Site and Code	Distance from Proposed Development	Qualifying Interests	Potential Source-~Pathway-Receptor Link?	Potential for adverse effects
Cummeen Strand / Drumcliff Bay SAC (627)	0 m	Estuaries	Yes – Pollutants generated during construction could enter watercourses via overland run-off, or controlled discharge of contaminated surface water. Pollutants could enter the Copper River, Garavogue River and/or Garavogue estuary during construction, potentially affecting estuarine water quality and/or benthic communities, present. The NPWS have ranked pollution as a threat of high importance to this habitat (NPWS, 2013a). In combination with existing or proposed plans or projects (Section 5.4), the construction of the proposed development could result in LSEs on QI *estuary* habitat.	Yes
		Mudflats and sandflats	No – This habitat was not found within the SAC in the immediate vicinity of the proposed development. No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No
		River lamprey	Yes – Pollutants generated during construction could enter overland run-off, or controlled discharge of contaminated surface water. Pollutants could enter the Garavogue River and / or Garavogue estuary during construction, potentially affecting water quality and lamprey populations present. The NPWS have ranked pollution as a threat of medium importance to this species (NPWS, 2013b). In combination with existing or proposed plans or projects (Section 5.4), the construction of the proposed development could result in LSEs on QI estuary habitats.	Yes
		Sea lamprey	Yes – Pollutants generated during construction could enter overland run-off, or controlled discharge of contaminated surface water. Pollutants could enter the Garavogue River and/or Garavogue estuary during construction, potentially affecting water quality and lamprey populations present. The NPWS have ranked pollution as a threat of medium importance to this species (NPWS, 2013b). In combination with existing or proposed plans or projects (Section 5.4), the construction of the proposed development could result in LSEs on QI estuary habitats.	Yes
		Embryonic shifting dunes	No – This habitat does not occur within the vicinity of the proposed development. As a terrestrial habitat, there is no potential for pollution effects by hydrological pathways. No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No

Site and Code	Distance from Proposed Development	Qualifying Interests	Potential Source-~Pathway-Receptor Link?	Potential for adverse effects
		Fixed dunes	No – This habitat does not occur within the vicinity of the proposed development. As a terrestrial habitat, there is no potential for pollution effects by hydrological pathways. No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No
		Juniperus communis communities	No – No source-pathway-receptor linkages identified. This habitat does not occur within the vicinity of the proposed development. As a terrestrial habitat, there is no potential for pollution effects by hydrological pathways. No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No
		Petrifying springs	No – No source-pathway-receptor linkages identified. This habitat does not occur within the vicinity of the proposed development, or within 250 m of it (i.e. the distance within which intrusive works could result in effects to groundwater dependent habitats, according to guidance from the Scottish Environmental Protection Agency (SEPA, 2014). No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No
		Shifting dunes with *Ammophila arenaria*	No – No source-pathway-receptor linkages identified. This habitat does not occur within the vicinity of the proposed development. As a terrestrial habitat, there is no potential for pollution effects by hydrological pathways. No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No
		Common Seal	No – Although the species does feed in the Garavogue estuary within the vicinity of the proposed development, there are no haul-out areas within at least 500 m of the proposed development. There is no potential for LSEs arising by pollution pathways because pollution is not a threat of medium or high importance to the species (NPWS, 2013a), and because the existing water quality in the Garavogue estuary is "unpolluted". No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No
		Narrow-mouthed whorl snail	No – No source-pathway-receptor linkages identified. This species does not occur within the vicinity of the proposed development. The nearest known population is several kilometres to the north in terrestrial habitats not at risk of pollution effects. No LSEs in combination with existing or proposed plans or projects (Section 5.4).	No

Site and Code	Distance from Proposed Development	Qualifying Interests	Potential Source-~Pathway-Receptor Link?	Potential for adverse effects
Lough Gill SAC (1976)	0.4 km (upstream)	Otter	No –. The Copper River was excluded as a potential commuting route for the species due to the absence of field evidence over numerous site visits. There is a low probability that otter use of the Copper River Bridge culvert to access the Garavogue estuary, due to the existing trash screen and the length of the existing culvert. There were no otter breeding or resting sites (or potential habitat for same) in the urbanised environs of the scheme. Temporary disturbance or displacement to small numbers of feeding/commuting animals will not result in LSEs on QI populations associated with Lough Gill upstream, taking account of existing or proposed projects or plans (Section 5.4).	Yes
		Alluvial forests*	No – No source-pathway-receptor linkages identified. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs. The nearest QI habitat is upstream on the Lough Gill shoreline, outside the ZoI of LSEs.	No
		Natural eutrophic lakes	No – No source-pathway-receptor linkages identified. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs, taking account of existing or proposed projects or plans (Section 5.4). The nearest QI habitat is upstream on the Lough Gill shoreline, outside the ZoI of LSEs.	No
		Old sessile oak woods	No – No source-pathway-receptor linkages identified. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs, taking account of existing or proposed projects or plans (Section 5.4). The nearest QI habitat is upstream around the Lough Gill shoreline, outside the ZoI of LSEs.	No
		Atlantic salmon	No - No source-pathway-receptor linkages identified. The SAC is upstream of the proposed development. The potential for migratory populations to use the Copper River to move between the estuary and the freshwater SAC has been ruled out following desk and field surveys (section 4.4.7). These surveys also concluded there is no juvenile or spawning lamprey habitat in the Copper River or Garavogue Estuary within the zone of influence of the proposed development No LSEs, taking account of existing or proposed projects or plans (Section 5.4)	No

Site and Code	Distance from Proposed Development	Qualifying Interests	Potential Source-~Pathway-Receptor Link?	Potential for adverse effects
		River Lamprey	No - No source-pathway-receptor linkages identified. The SAC is upstream of the proposed development. The potential for migratory populations to use the Copper River to move between the estuary and the freshwater SAC has been ruled out following desk and field surveys (section 4.4.7). These surveys also concluded there is no juvenile or spawning lamprey habitat in the Copper River or Garavogue Estuary within the zone of influence of the proposed development. No LSEs, taking account of existing or proposed projects or plans (Section 5.4).	No
		Sea lamprey	No - No source-pathway-receptor linkages identified. The SAC is upstream of the proposed development. The potential for migratory populations to use the Copper River to move between the estuary and the freshwater SAC has been ruled out following desk and field surveys (section 4.4.7). These surveys also concluded there is no juvenile or spawning lamprey habitat in the Copper River or Garavogue Estuary within the zone of influence of the proposed development No LSEs, taking account of existing or proposed projects or plans (Section 5.4).	No
		White-clawed crayfish	No – No source-pathway-receptor linkages identified. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs, taking account of existing or proposed projects or plans (Section 5.4) The nearest potential QI populations are in upstream freshwater outside the ZoI of LSEs.	No
All other SACs were scoped out, because they are not within the ZoI of any likely significant effects, including in-combination effects.				

5.3.2 Screening of LSEs on SPAs

The SPAs on which LSEs could not be excluded as a result of the proposed development are presented in Table 5.2. The assessment of LSEs has taken account of the in-combination assessment in 5.4 and the relevant source-pathway-receptor identified in Section 5.2.

Table 5.2: Identification of SPAs for which LSE could not be excluded, from preliminary list of all SPAs within 20 km

Site and Code	Distance from Proposed Development	Qualifying Interests	Potential Source~Pathway-Receptor Link?	Feature/site scoped into assessment?
Cummeen Strand SPA / (4035)	0 m	Redshank	Yes – Disturbance of roosting and/or feeding birds would arise during construction should it occur during the non-breeding season (i.e. October to April), and could result in LSEs, in-combination with other plans or projects (Section 5.4).	Yes
		Light-bellied brent goose *Branta bernicla hrota*	No – No source-pathway-receptor linkages identified either alone or in combination with other plans or projects. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs. As there are no source-pathway-receptor linkages identified, there is no potential for in-combination effects.	No
		Oystercatcher	Yes – Disturbance of roosting and/or feeding birds would arise during construction should it occur during the non-breeding season (i.e. October to April), and could result in LSEs, in-combination with other plans or projects (Section 5.4).	Yes
		Wetlands	Yes – Pollutants generated during construction could enter overland run-off, or controlled discharge of contaminated surface water could enter the Garavogue River and/or Garavogue estuary. Pollutants could affect water quality and bird invertebrate prey present. In combination with existing or proposed plans or projects (Section 5.4), the construction of the proposed development could result in LSEs on QI wetland habitat.	Yes
Sligo / Leitrim Uplands SPA (4187)	6 km	Chough	No – No source-pathway-receptor linkages identified either alone or in combination with other plans or projects. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs. As there are no source-pathway-receptor linkages identified, there is no potential for in-combination effects.	No
		Peregrine falcon	No – No source-pathway-receptor linkages identified either alone or in combination with other plans or projects. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs. As there are no source-pathway-receptor linkages identified, there is no potential for in-combination effects.	No

Site and Code	Distance from Proposed Development	Qualifying Interests	Potential Source-~Pathway-Receptor Link?	Feature/site scoped into assessment?
Ballintemple and Ballygilgan SPA (4234)	13 km	Barnacle goose *Branta leucopsis*	No – No source-pathway-receptor linkages identified either alone or in combination with other plans or projects. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs, even though the proposed development is within the core foraging range of this species (20 km; Appendix B). As there are no source-pathway-receptor linkages identified, there is no potential for in-combination effects.	No
Ardboline Island and Horse Island SPA (4135)	14 km	Barnacle goose	No – No source-pathway-receptor linkages identified either alone or in combination with other plans or projects. Desktop and field surveys have the shown the QI is not within the ZoI of any LSEs. As there are no source-pathway-receptor linkages identified, there is no potential for in-combination effects.	No
All other sites are scoped out, because they are not within the ZoI of any significant effects, including in-combination effects.				

5.4 In-combination Assessment

It is possible that effects from a project alone may not significantly affect a European site, but that significant effects are triggered by in-combination effects.

5.4.1 Methodology

The in-combination assessment should include approved but uncompleted, or proposed (but not yet approved) plans and projects (DEHG, 2010) and consider both natural and anthropogenic factors (Levett-Therivel, 2009). The potential for "synergistic" effects should also be considered (i.e. when the combined effect of two projects is greater than the sum of the individual effects). DEHG guidance recommends delineating the assessment boundary.

The study area for the in-combination assessment was defined separately for each receptor, using the ZoIs defined for effects from the proposed development. For instance, the potential ZoI from the proposed development to groundwater-dependent habitats was 250 m, and the in-combination assessment study area for these habitats was also 250 m. For wintering bird disturbance, the ZoI was 500 m for the proposed development alone, and therefore this was the distance used for the in-combination assessment. The in-combination assessment identified the types of effects known to threaten the QIs for which source-pathway-receptors were identified (5.2.1), before assessing whether any existing or proposed projects or plans could give rise to these threats.

The cumulative assessment identified any existing or proposed projects or plans that could give rise to the types of effects known to threaten the conservation status of the OI species or habitats (see Table 5.12: Known threats of Key Ecological Receptors to inform the cumulative impact assessment). Existing or proposed projects were identified using online data sources such as county development plans and SCC's planning portal (eplanning.ie/sligo). Furthermore, SCC was consulted on this. There are no known proposals for development within the ZoI. There are two road projects under active consideration by SCC at present namely:

- N16 Sligo to County Boundary Realignment; and
- N4 Collooney / Castlebaldwin.

Table 5.3: Known threats of QIs to inform the in-combination assessment

Ecological Feature Type	Known Threats	Conservation Status (Site-level)
Cummeen Strand SAC (QI mudflats and estuaries) and Cummeen Strand SPA QI wetland habitat	Grazing, coastal defences forestry, aquaculture, fertilisation, outdoor recreation, golf courses, erosion, urbanization, industry, fertilization, leisure fishing	Good
Redshank from Cummeen Strand SPA	Aquaculture, fertilisation, urbanisation, reclamation, industry pollution, roads, shipping lanes	Excellent
Oystercatcher from Cummeen Strand SPA	Aquaculture, fertilisation, urbanisation, reclamation, industry pollution, roads, shipping lanes	Excellent

For individual European sites, activities with positive and negative impacts were reviewed from the relevant Natura Standard Data Forms. For European protected habitats and non-bird species, existing pressures and potential future threats were obtained from the national conservation status assessments (NPWS, 2013 a) and b). Threats to bird species were identified using the Bird Atlas 2007-2011 (Balmer *et al.*, 2013) and the online resources of Bird life International (www.birdlife.org). Information on land zonings, land-use plans, and were sourced from the Department of the Environment, Community and Local Government available online (www.myplan.ie).

5.4.2 Pollution Effects

The potential significance of in-combination pollution effects will depend to a significant degree on the assimilative capacity of the receiving waters. Assimilative capacity may be defined as *"the long-term mass removal capacity per unit area by wetlands, of pollutants including nutrients that is transformed and absorbed into the system with no significant ecosystem changes in internal structure or function or in downstream output"* (Richardson and Qian, 1999). The water quality of the Garavogue estuary upstream and downstream of the proposed outfall for the proposed development is "unpolluted" according to the EPA. The Water Framework Directive status is "Good". There are no dumping at sea sites within 4 km according to the EPA. According to the Natura Standard Data forms for Cummeen Strand SAC (NPWS, 2014), – co-designated as QI wetland bird in the Cummeen Strand SPA – the conservation status of both estuary and mudflat habitats in the receiving environment is "Good". Any proposed transport or industrial projects with significant potential for pollution effects will be subjected to a Screening for AA as a minimum (and potentially an Environmental Impact Statement subject to the scale of the proposed development), in addition to licencing and monitoring of industrial discharges by the bodies such as the EPA. These regulatory processes will impose appropriate protective water pollution mitigation.

5.4.3 Habitat Loss Effects

Existing or proposed projects were identified using online data sources such as county development plans and SCC's planning portal (eplanning.ie/sligo) and SCC was also consulted. There are no proposed developments likely to result in QI habitat loss of the Cummeen Strand / Drumcliff Bay SAC or Cummeen Strand SPA within the vicinity of the proposed development. None of the intertidal area within the Cummeen Strand / Drumcliff Bay SAC / Cummeen strand SPA is zoned for development in the *Sligo and Environs Development Plan 2010-2016* and none was predicted to be lost to future urbanization at the time of writing.

5.4.4 Wintering Bird Disturbance Effects

A fisherman was observed once, over the course of at least ten survey days, line-fishing from the north of Hughes Bridge in September 2015. The fishing was in close proximity to the existing human traffic along the bridge to which local birds are likely to be habituated. There is frequent use of a path along the northern shore of the estuary by pedestrians and dog walkers, and the author observed small numbers of ducks and waders being 'flushed' here in response to disturbance from walkers throughout winter 2015 / 2016. The NPWS recorded an absence of any significant bird disturbance regime in their disturbance assessment of the two bird count sectors overlapping the ZoI (NPWS, 2013d).

There are no known proposals for recreational development of the shoreline in the online planning portal of SCC. The planning permission for a promenade along the southern shoreline dating from 2006 has since expired. There are no 'green corridor', or 'playground' objectives along the Garavogue estuary shoreline in the Sligo and Environs Plan. Bird disturbance could act in combination with the proposed development, should the 'open space' zoning of the southern and eastern shoreline be used to develop public parks and playgrounds. However, any such development would be subject to screening for AA, and if necessary AA, triggering the need for mitigation (e.g. bunds or visual barriers to the estuary), to prevent adverse effects from bird disturbance. There are also a suite of specific policies relating to the standards of assessments, and protection applicable to designated sites in both the Sligo Environs and Sligo County development plan 2011-2017.

5.4.5 Climate Change

According to the International Panel on Climate Changes' *Special Report on Emission Scenarios* (Nakicenovic *et al.*, 2000), sea level is rising at about 4 mm yr^{-1} under certain scenarios. On this basis, it is likely that saltmarsh habitat in the Garavogue estuary will be lost in the medium-long-term, and replaced by estuary habitat, due to the change in inundation regime. There is therefore likely to be an increase in QI estuary habitat of the Cummeen Strand / Drumcliff Bay SPA over time, due to in climate change.

5.5 Summary of AA Screening Results

The European sites and specific QIs for which LSEs could not be excluded are presented in Table 5.4.

Table 5.4: European sites (and specific Qis) for which LSEs could not be excluded

Site and Code	Distance from Proposed Development	QIs for which LSEs could not be excluded
Cummeen Strand / Drumcliff Bay SAC (627)	0m	Estuaries
		River lamprey
		Sea lamprey
Cummeen Strand SPA (4035)	0m	Redshank
		Oystercatcher
		Wetlands

6. Natura Impact Statement

6.1 Introduction

Section 5 outlined the AA Screening process and detailed the LSEs from the proposed development. This section (the NIS) outlines the potential effects and proposed mitigation for the proposed development. The NIS draws on the baseline data as outlined in Section 4 above.

6.2 Steps in AA

Irish departmental guidance (DEHLG, 2010) follows much of the guidance from the European Commission (2001) in distinguishing the following five steps in AA which have been adapted as the basis for this NIS:

- Step 1 – Information Required (including scoping);
- Step 2 – Conservation Objectives;
- Step 3 – Prediction of Effects (including Article 10 considerations);
- Step 4 – Mitigation Measures; and
- Step 5 – Conclusion.

6.3 Step 1 – Information Required

6.3.1 Information Required on the Proposed Development

Detailed information is required on the proposed development, the relevant European sites, and the relevant QIs within those sites to complete the NIS. The following sections have had regard for the recommended information checklists in the European Commission guidance on AA (EC, 2001).

The relevant aspects of the proposed development to the assessment of adverse effects to European site integrity were summarised in Section 3 above.

The proposed development's physical interaction with European sites was analysed by overlaying proposed infrastructure on aerial photographs, European site boundaries, and the known distribution of QIs based on NPWS CO mapping as verified by dedicated habitat and aquatic assessments described in Section 2.7. Information on the characteristics of existing or proposed projects or plans with the potential to act in-combination with the proposed development has been described in Section 5.4. This comprehensive information was reviewed during the production of the NIS, and no additional projects or plans of relevance to the assessment have been identified since that time.

6.3.2 Information Required on Relevant European Sites

Mapping of relevant European sites and the known distribution of relevant QIs are presented in Figure 2.

The reasons for designation of all European sites potentially affected (i.e. the relevant QIs) have been provided (Section 5.3). A summary of the importance of each site is provided in Sections 6.2.3 and 6.2.3. The discursive summary was sourced from relevant NPWS' Natura Standard Data Forms, and/or site synopses to place QIs in the particular context of their own European site(s) (Section 6.2.2).

Table 6.1 and Table 6.2 then provide the following key information applicable to specific QIs 'scoped-in' due to the potential for LSEs identified in Section 5:

- Conservation status of the European site for which the relevant QI is designated in the form of the simple Natura Standard Data Form descriptors ("Excellent", "Good" or "Average / Reduced");
- Overall national conservation status of each relevant QI from latest conservation assessments (NPWS, 2013a and b; European Topic Centre, 2015);

- Existing pressures and future threats of medium or high importance for relevant QI habitats and non-bird species in the Irish context (NPWS, 2013a and b), and threats to relevant QI birds identified by Bird Life International, and the BTO Bird Atlas 2007-2011 (Balmer *et al.*, 2013); and
- Key environmental conditions supporting relevant QIs derived from NPWS conservation status assessments and professional judgement, to comprehensively understand the potential interaction of the proposed development with QIs.

6.3.3 Cummeen Strand / Drumcliff Bay SAC

The Site Synopsis for Cummeen Strand SAC (NPWS, 2013g) was assessed for relevant information on the European site, in the context of the proposed development located as it is in Sligo Town. The following selected excerpts exclude detailed information on QI sand-dune, petrifying spring or other QIs for which LSEs were excluded:

> *"This large coastal site extends from Cullamore in the north-west to Killaspug in the south-west, and from Sligo town in the south-east to Drumcliff village in the northeast. It encompasses two large, shallow bays, Drumcliff Bay and Sligo Harbour, and both Ardboline and Horse Island. Sand dunes and sand hills at Rosses Point, Killaspug, Yellow Strand and Coney Island are included, as are grasslands at Ballintemple and Ballygilgan (Lissadell), along with a variety of other habitats such as woodland, saltmarsh, sandy beaches, boulder beaches, shingle, fen, freshwater marshes, rocky sea cliffs and lakes".*
>
> *The dominant habitats on the site are estuaries and intertidal sand and mud flats. Sligo Harbour receives the waters of the Garavogue River, which flows from Lough Gill, while Drumcliff Bay receives the Drumcliff River which flows from Glencar Lough. At low tide extensive areas of intertidal flats are exposed in both of these sheltered estuarine bays. The intertidal flats support a diverse macrofauna, with invertebrate species such as lugworm (Arenicola marina), common cockle (Cerastoderma edule), sand mason worm (Lanice conchilega), Baltic tellinspire shell (Hydrobia ulvae) and common mussel (Mytilus edulis) being frequent. Of particular note is the presence of the eelgrasses Zostera noltii and Z. angustifolia beds in both bays. Areas of saltmarsh fringe both bays in places.*
>
> *At least five species listed on Annex II of the E.U. Habitats Directive are found within this site. Drumcliff Bay is important for the presence of a breeding population of Common Seal. Ardboline and Horse Islands on the western side of the site are also important as haul-out areas for this species.*
>
> *Sea Lamprey and River Lamprey have been recorded in the Garavogue River, and River Lamprey are also known from further upstream in the tributaries of Lough Gill. The Marsh Fritillary butterfly is found at Rosses Point".*

6.3.3.1 Data Availability

The NPWS have mapped all COs for the SAC. However, the absence of a particular QI from NPWS maps was not assumed to provide evidence for the absence of any QI. All NPWS mapping was verified with site walkovers as per the surveys detailed in Section 2.7. There were no significant additional data sets to the NPWS mapping.

6.3.3.2 Condition of Relevant QIs

The conservation status of relevant QIs at national and site level, key conditions underpinning favourable conservation status and threats to key conditions are presented in Table 6.1. This information ensures the analysis does not overlook subtle or far-field effect pathways.

Table 6.1: Cummeen Strand / Drumcliff Bay SAC: conservation status key condition and treat to relevant QIs

Relevant QI	National Conservation Status	Site-Level Status (NPWS, 2014d)	Key conditions supporting favourable conservation status	Primary threats to key conditions	Mapping for QI in COs
Estuaries	Unfavourable (Inadequate)	Good	Supply of riverine freshwater. Unimpeded tidal flow. Shelter from open coasts. Diversity of invertebrate communities	Aquaculture, recreational fishing, housing development, sewage outflow, industrialisation, roads, ports/marinas, water pollution, reclamation of land, drainage, dredging, invasive species	Yes
Lampetra fluviatilis (River Lamprey)	Favourable	Reduced	Riverine habitat. Water quality. Riverbed breeding gravels and silt nursery substrate. Unhindered migratory channels	Pollution, barriers to upstream migration, canalisation	No
Petromyzon marinus (Sea Lamprey)	Unfavourable (Bad)	Reduced	Riverine habitat. Water quality. Riverbed breeding gravels and silt nursery substrate. Unhindered migratory channels	Pollution, barriers to upstream migration, canalisation	Yes

6.3.4 Cummeen Strand SPA

The Site Synopsis for Cummeen Strand SPA (NPWS, 2002) was assessed for relevant information as described above for the SAC. The following selected excerpts exclude detailed information on non-QI birds or birds for which LSEs were excluded:

> *"Cummeen Strand is a large shallow bay stretching from Sligo town westwards to Coney Island. It is one of three estuarine bays within Sligo Bay, with Drumcliff Bay to the north and Ballysadare Bay to the south. The Garavogue River flows into the bay and forms a permanent channel. At low tide, extensive sand and mud flats are exposed. These support a diverse macro-invertebrate fauna which provide the main food supply for the wintering waterfowl".*

6.3.4.1 Data Availability

The following additional data to the NPWS mapping already identified as a key desktop source in Section 2.6 were of specific relevance to the NIS in the context of the Cummeen Strand SPA:

- Winter bird surveys carried out between September 2015 and January 2016 within the ZoI;
- Irish Wetland Bird Survey Data (IWeBS): annual peaks 2004-2014; and
- Unpublished low tide count data for a single season (2010-2011) for relevant areas within as well as the wider Sligo harbour outside the ZoI.

6.3.4.2 Condition of Relevant QIs

The conservation status of relevant QIs at national and site level, key conditions underpinning favourable conservation status and threats to key conditions are presented in Table 6.2.

Table 6.2: Cummeen Strand SPA: conservation status key condition and treat to relevant QIs

Relevant QI	National Conservation Status	Site-Level Status (NPWS, 2014d)	Key conditions supporting site integrity	Primary threats to key conditions	Mapping for QI in COs
Oystercatcher (non-breeding)	Favourable (Moderate to Good)	Excellent	Invertebrate food availability (intertidal / pasture). Flooding regime of coastal grasslands. Undisturbed coastal roosting sites close to feeding areas.	Aquaculture, fertilisation, urbanisation, reclamation, industry pollution, roads, shipping lanes.	Yes
Redshank (non-breeding)	Favourable (Good)	Excellent	Invertebrate food availability (intertidal / pasture). Flooding regime of coastal grasslands. Undisturbed coastal roosting sites close to feeding areas.	Aquaculture, fertilisation, urbanisation, reclamation, industry pollution, roads, shipping lanes.	Yes
Wetlands	Not assessed	Not assessed	Hydrological regime maintaining freshwater and / or saltwater inputs.	Discharges, urbanization, industry, fertilization, habitat loss from reclamation.	Yes

6.5 Step 2 – Conservation Objectives

There were detailed COs available for both European sites for which LSEs could not be excluded.

6.5.1 Cummeen Strand / Drumcliff Bay SAC

The CO attributes for the relevant QIs of the SAC for which LSEs could not be excluded, were taken from the latest CO version available from the NPWS at the time of writing (Version 1; NPWS, 2013h). These are presented in Graphic 6.3, Graphic 6.4 and Graphic 6.5, to inform the assessment of adverse effects to site integrity.

Graphic 6.3: CO Attributes and Targets for Estuaries (Relevant QIs of Cummeen Strand / Drumcliff Bay SAC)

Conservation Objectives for : Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC [000627]

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1258ha using OSI data and the defined Transitional Water Body area under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community and the Mytilidae-dominated community complex, subject to natural processes. See map 5	Based on intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012) and subtidal survey in 2010 (Aquafact, 2011). See marine supporting document for further information
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Estimated during intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012). See marine supporting document for further details
Community structure: *Mytilus edulis* density	Individuals/m²	Conserve the high quality of the Mytilidae-dominated community complex, subject to natural processes	Estimated during intertidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012) and subtidal survey in 2010 (Aquafact, 2011). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex; Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex; Fine sand with *Angulus* spp. and *Nephtys* spp. community complex; Sand to mixed sediment with amphipods community; Intertidal reef community. See map 5	Based on intertidal and subtidal surveys undertaken in 2007 and 2010 (ASU, 2007, 2012; Aquafact, 2011) and an intertidal walkover undertaken in 2013. See marine supporting document for further information

Graphic 6.4: CO Attributes and Targets for River Lamprey (Relevant QIs of Cummeen Strand / Drumcliff Bay SAC)

Conservation Objectives for : Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC [000627]			
1099	**River Lamprey *Lampetra fluviatilis***		
To maintain the favourable conservation condition of River Lamprey in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:			
Attribute	**Measure**	**Target**	**Notes**
Distribution: extent of anadromy	% of estuary accessible	No barriers for migratory life stages of lamprey moving from freshwater to marine habitats and vice versa	This SAC only covers marine/estuarine habitat and it is not anticipated that it contains suitable spawning or nursery habitat. Migrating adult lamprey pass through the site en route to/from the Garavogue River, which flows out of Lough Gill. Lough Gill SAC (site code: 1976), which is adjacent to this SAC, encompasses the freshwater elements of river lamprey habitat. Potential barriers for migrating lamprey include anthropogenic physical barriers and chemical barriers e.g. oxygen depletion or discharge of noxious pollutants

Graphic 6.5: CO Attributes and Targets for Sea Lamprey (Relevant QIs of Cummeen Strand / Drumcliff Bay SAC)

Conservation Objectives for : Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC [000627]			
1095	**Sea Lamprey *Petromyzon marinus***		
To restore the favourable conservation condition of Sea Lamprey in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets:			
Attribute	**Measure**	**Target**	**Notes**
Distribution: extent of anadromy	% of estuary accessible	No barriers for migratory life stages of lamprey moving from freshwater to marine habitats and vice versa	This SAC only covers marine/estuarine habitat and it is not anticipated that it contains suitable spawning or nursery habitat. Migrating adult lamprey pass through the site en route to/from the Garavogue River, which flows out of Lough Gill. Lough Gill SAC (site code: 1976), which is adjacent to this SAC, encompasses the freshwater elements of sea lamprey habitat. Potential barriers for migrating lamprey include anthropogenic physical barriers and chemical barriers e.g. oxygen depletion or discharge of noxious pollutants

6.5.2 Cummeen Strand SPA

The CO attributes for the relevant QIs of the SPA for which LSEs could not be excluded, were taken from the latest CO version available from the NPWS at the time of writing (Version 1; NPWS, 2013i). These are presented in Table 6.6, Table 6.7, and Table 6.8 to inform the assessment of adverse effects to site integrity.

Table 6.6: CO Attributes and Targets for Redshank (Relevant QIs of Cummeen Strand SPA)

Conservation Objectives for : Cummeen Strand SPA [004035]			
A162	**Redshank *Tringa totanus***		
To maintain the favourable conservation condition of Redshank in Cummeen Strand SPA, which is defined by the following list of attributes and targets:			
Attribute	**Measure**	**Target**	**Notes**
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by redshank, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Table 6.7: CO Attributes and Targets for Oystercatcher (Relevant QIs of Cummeen Strand SPA)

Conservation Objectives for : Cummeen Strand SPA [004035]			
A130	**Oystercatcher *Haematopus ostralegus***		
To maintain the favourable conservation condition of Oystercatcher in Cummeen Strand SPA, which is defined by the following list of attributes and targets:			
Attribute	**Measure**	**Target**	**Notes**
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing and intensity of use of areas by oystercatcher, other than that occurring from natural patterns of variation	Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part four of the conservation objectives supporting document

Table 6.8: CO Attributes and Targets for Wetlands (Relevant QIs of Cummeen Strand SPA)

Conservation Objectives for : Cummeen Strand SPA [004035]			
A999	**Wetlands**		
To maintain the favourable conservation condition of wetland habitat in Cummeen Strand SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:			
Attribute	**Measure**	**Target**	**Notes**
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than 1732 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 1732ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

6.7 Step 3 – Prediction of Effects

6.7.1 Cummeen Strand / Drumcliff Bay SAC

The predicted effects from the proposed development on the Cummeen Strand / Drumcliff Bay SAC and Cummeen Strand SPA are presented in Table 6.9 and Table 6.10. The in-combination assessment referenced in the table below can be found in Section 5.4.

The prediction of effects excludes assessment of any source-pathway receptor links which were scoped out at Screening stage, including the potential for migratory barriers to Atlantic salmon and lamprey during instream works to the Copper River (refer to Section 5.2.2).

Table 6.9: Predicted Pollution Effects on Cummeen Strand / Drumcliff Bay SAC

QIs for Which LSEs not excluded (*Priority habitat)	Pathway (s) and relevant CO Attributes	Predicted Effects on Integrity (Construction)	Predicted Effects on Integrity (Operation)
Estuaries	**Pollution** *CO Attributes affected:* *Community extent* *Community structure (Density of Mytilus edulis)*	*Pollutants generated during construction could enter the SAC indirectly via the Copper River or directly overland into the Garavogue estuary. In combination with existing or proposed plans or projects (Section 5.4), pollution or siltation could interfere with the objective to maintain Favourable Conservation Status (FCS) for Estuary habitat, specifically by altering community structure through reducing abundance of M.edulis or altering its distribution.* ***Adverse effects on integrity of Cummeen Strand / Drumcliff Bay SAC in combination with other projects / plans, in the absence of mitigation***	The design of the proposed development includes: - Petrol interceptors at all outfall locations between the carriageway drainage outfall and watercourse; - An attenuation treatment pond for one outfall, prior to discharge of run-off to the Copper River; to mitigate it's 'failure' of the HAWRAT model of soluble (heavy metal) pollutants; and - Also, the Accidental Spillage Risk Assessment concluded there is a low risk of an accidental spillage incident (0.5% probability). A penstock, handstop, or an orifice that can be manually closed in the event of accidental spillage will be provided in the attenuation/treatment pond. The penstock can, if lowered in time, potentially retain 100% of spilled material. No pollution effects are predicted during operation. *No adverse effects on integrity of SAC in-combination with other projects/plans.*

QIs for Which LSEs not excluded (*Priority habitat)	Pathway (s) and relevant CO Attributes	Predicted Effects on Integrity (Construction)	Predicted Effects on Integrity (Operation)
Sea lamprey and River lamprey	**Pollution** *CO Attributes affected:* *None*	*Pollutants generated during construction could enter the SAC indirectly via the Copper River or directly overland into the Garavogue estuary. In combination with existing or proposed plans or projects (*Section *5.4), pollution could affect non-spawning adult lamprey of either species in estuarine areas by reducing water quality. However, the only attribute listed in the CO for both species is "Extent of anadromy", measured as the % of estuary accessible, and pollution is not a threat of high importance according to the NPWS (2013b).* *No adverse effects on integrity of SAC in-combination with other projects/ plans.*	No pollution effects are predicted during operation due to inclusion of petrol interceptors and an attenuation pond in the design, and because there is a low risk of accidental spillage (refer to estuaries above). *No adverse effects on integrity of SAC in-combination with other projects/plans.*

Table 6.10: Predicted Effects on Cummeen Strand SPA

QIs for Which LSEs not `excluded	Pathway (s) and relevant CO Attributes	Predicted Effects on Integrity (Construction)	Predicted Effects on Integrity (Operation)
Redshank	**Disturbance** *CO Attributes affected:* *Population trend* *Distribution*	*If construction works overlap the non-breeding season (September to April), noise, physical disturbance, and human presence could temporarily displace birds in adjacent intertidal areas. Displacement of birds from a high tide roost could lead to birds vacating the Garavogue estuary to feeding areas elsewhere in the SPA. However this species does not roost at high tide within the ZoI of displacement from construction activity (500 m). Temporary displacement of the small numbers (peak 3 birds) feeding in the rocky estuary nearby could arise, but such birds are likely to resettle and continue to feed in the immediate vicinity, because there is an existing disturbance regime locally associated with light industry, shipping, and traffic to which birds are likely to be habituated. Movement of machinery across the SAC / SPA will be up to 6 vehicle movements per day for 8 weeks on average for setting up / removing shuttering.* *Populations within the site are in "Excellent status", according to the Natura standard data form. Numbers in the SPA have fluctuated consistently between 2004 and 2014, but have increased over the last three years since the population crash of 2010-2012. No lasting decline in population trend or distribution will result from displacement connected with construction of the proposed development. There are no significant in-combination effects that threaten populations locally or in the wider area. The construction of the development will not alter the long-term population trend or*	*There will be no increase in disturbance regime from the operation of the development. The cycleway introduced above the Garavogue estuary shoreline will not displace birds as there is existing pedestrian and dog-walker disturbance along the shoreline to which birds will be accustomed. Although the design of the proposed cycleway leaves the shoreline potentially accessible by future users, this area is a 'dead-end', and better views of the estuary are afforded from the elevated ground along the existing road bridge. No significant increase in users of the shoreline, and no significant change to the existing disturbance regime are predicted.* *No adverse effects on integrity of Cummeen Strand SPA in combination with other projects / plans.*

QIs for Which LSEs not `excluded	Pathway (s) and relevant CO Attributes	Predicted Effects on Integrity (Construction)	Predicted Effects on Integrity (Operation)
		decrease the range or intensity of use of any areas within the SPA. There will be no interference with the objective to maintain FCS. *No adverse effects on integrity of Cummeen Strand SPA in combination with other projects / plans.*	
Oystercatcher	**Disturbance** *CO Attributes affected:* *Population trend* *Distribution*	*A single individual of this species roosted at high tide within the ZoI of displacement from construction activity (500 m). Temporary displacement of this individual, and small numbers (peak 4 birds) feeding in the rocky estuary nearby could arise, but such birds are likely to resettle and continue to feed in the immediate vicinity, as per the rationale above for Redshank. Movement of machinery across the SAC / SPA will be up to 6 vehicle movements per day for 8 weeks on average for setting up / removing shuttering. Populations within the site are in "Excellent status", according to the Natura standard data form. Numbers in the SPA have followed similar patterns to redshank, and have similarly increased over the last three years since the population crash of 2010-2012. There are no significant in-combination effects that threaten populations locally or in the wider area. The construction of the development will not alter the long-term population trend or decrease the range or intensity of use of any areas within the SPA. There will be no interference with the objective to maintain FCS.* *No adverse effects on integrity of Cummeen Strand SPA in combination with other projects / plans.*	*See rationale under redshank above.* *No adverse effects on integrity of Cummeen Strand SPA in combination with other projects / plans.*

QIs for Which LSEs not `excluded	Pathway (s) and relevant CO Attributes	Predicted Effects on Integrity (Construction)	Predicted Effects on Integrity (Operation)
Wetlands	**Pollution** *CO Attributes affected:* *None*	*Pollutants generated during construction could enter the SPA indirectly via the Copper River or directly overland into the Garavogue estuary. The only CO attribute for this CO is wetland area. There will be no reduction in wetland area. Therefore construction of the development will not interfere with the objective to maintain FCS.* *No adverse effects on integrity of Cummeen Strand SPA in combination with other projects/plans.*	The design of the proposed development includes: -- - Petrol interceptors at all outfall locations between the carriageway drainage outfall and watercourse; and - An attenuation treatment pond for one outfall, prior to discharge of run-off to the Copper River; to address the findings of the HAWRAT assessment for soluble (heavy metal) pollutants. Also, the Accidental Spillage Risk Assessment concluded there is a low risk of an accidental spillage incident (0.5% probability). A penstock, handstop, or an outfall that can be readily blocked in the event of accidental spillage will be provided in the attenuation/treatment pond. The penstock can, if lowered in time, potentially retain 100% of spilled material. No pollution effects are predicted during operation. *No adverse effects on integrity of SPA in-combination with other projects / plans.*

6.8 Step 4 – Mitigation Measures

6.8.1 Mitigation Inherent in the Design

As described in Section 3.1.1, mitigation by design has already been incorporated into the preferred option selection by virtue of:

- Designing the proposed development to avoid any loss of QI habitat of European sites; and
- Designing the operational surface water attenuation and treatment design to avoid any significant effects from road run-off on the water quality of receiving waters in the Garavogue estuary and Copper River during road operation.

6.8.2 Pollution Mitigation during Construction

This mitigation measure is required to avoid adverse effects to QI Estuary habitat of the Cummeen Strand / Drumcliff Bay SAC.

To avoid the pollution of watercourses during the construction phase all construction works will be completed in line with the recommendations of the following guidelines:

- 'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes' (NRA, 2005);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane *et al.*, 2006);
- 'Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA, 2001);
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016); and
- UK Environment Agency:
  - PPG5 Pollution Prevention Guidelines Works and Maintenance in / or near Water;
  - PPG21 Incident Response Planning;
  - PPG22 Dealing with Spills; and
  - PPG26 Drums and Intermediate Bulk Containers.

A preliminary Erosion and Sedimentation Control Plan (pESCP) has been developed for the proposed development and is detailed in Appendix C of this NIS. This details specific pollution prevention measures to be employed during construction and will be binding on the appointed contractor and actively monitored by SCC and the appointed ECoW.

An updated and detailed ESCP will be drafted by the appointed contractor. The contractor will prepare the dESCP prior to commencing the construction works and it will form part of the contractor's Environmental Operating Plan (EOP) for the construction of the proposed development. To prevent or reduce the amount of sediment released into watercourses, the ESCP will include the following measures to be implemented by the contractor:

- Constructing structures during periods of low flow (typically during summer months) to reduce the risk of scour and erosion around a structure or to the disturbed river bed;
- Provision of measures to prevent the release of sediment concentrations over baseline conditions to during the construction works will include but not be limited to silt fences, silt curtains, settlement lagoons and filter materials;
- Provision of measures to prevent the displacement and subsequent erosion and release of large volumes of soft sediment, particularly from works to the Copper River. These measures will include but not be limited to an over pump regime, silt curtains, settlement lagoons, filter materials and stockpile seeding;

- Temporary construction surface drainage and sediment control measures will be in place before earthworks commence;
- Provision of exclusion zones and barriers (sediment fences) between earthworks, stockpiles and temporary surfaces and watercourses to prevent sediment washing into the watercourses;
- Measures will be provided to ensure that all works associated with the Copper River Bridge construction are protected against the 1:100 year return period flood event to ensure that there is no hydraulic connectivity between the temporary works and the Copper River during construction;
- Limiting the extent of vegetation clearance and thereby minimising the potential release of sediment from bare ground following clearance;
- Precast concrete will be used in preference to pouring concrete where possible;
- Where required, pouring of concrete will be carried out in the dry and allowed to cure for 48 hours before re-flooding. Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to surface water;
- No storage of hydrocarbons or any toxic chemicals will occur within 50 m of any watercourse. Fuel storage tanks will be bunded to a capacity at least 110% of the volume of the storage tank. Re-fuelling of plant will not occur within 50 m of any watercourse and only in bunded refuelling areas. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures; and
- The contractor shall ensure that the construction methodologies used will ensure no wastes will be discharged to the watercourses.

The contractor shall consult with SCC, the NPWS and IFI in relation to the dESCP and shall include their requirements in this regard. The IFI will be notified prior to any instream works including advanced works.

Following consultation with the NPWS and to ensure that intertidal habitats are protected during construction the following is proposed:

- The contractor will develop a method statement in relation to the movement of machinery in the SAC / SPA. This will include the use of timber bogmats in intertidal habitats to enable construction machinery to safely move across the SAC / SPA while limiting impacts on these intertidal habitats. These provide an effective method of ensuring heavy plant and equipment can traverse soft or boggy terrain without being impeded or causing excessive damage to the habitats underfoot.

6.8.3 Monitoring during Construction Works

An ecological clerk of works (ECoW) will be appointed during the construction phase to:

- review the contractor's method statements (including the dESCP) relating to environmental protection (e.g. relating to pollution control, movement of machinery across the SAC / SPA);

- site visit at the start of construction phase (and once every two months thereafter) to ensure all elements of environmental protection outlined in method statements are adhered to; and

- supervise pilling works/movement of machinery across SAC / SPA (at the start of these works) to ensure timber bogmats are in place and tracking of machinery is kept as close as possible to the shore.

6.8.4 Inland Fisheries Ireland Mitigation

Although no LSEs were identified on any QI fish of European sites, IFI have requested best-practice culvert design in accordance with *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters* (IFI, 2016). This would improve potential fish passage conditions up the Copper River Bridge in future. Accordingly, a method statement for instream works will be agreed with IFI. As per IFI's requirements, and the NRA Guidelines for crossing of watercourses during construction, the culvert will be designed:

- Without trash screens or with types of screen which permit fish passage;
- With the level of the culvert bottom (invert) about 500 mm below the level of the natural stream bed;
- With a constant slope throughout its length which does not exceed 1%; and

- With a grade allowing the upstream invert to remain drowned (by back-watering) under low-flow conditions, to a depth suitable for the easy passage of the largest species frequenting the stream.

6.8.5 Implementation

All mitigation measures proposed would be binding on the Contractor (s) procured to construct the road and would be actively monitored by SCC under the contract.

7. NIS Conclusion

Following implementation of the proposed mitigation, the construction and operation of the proposed development would have no adverse effects on the integrity of any European sites, either alone or in-combination with other plans or projects.

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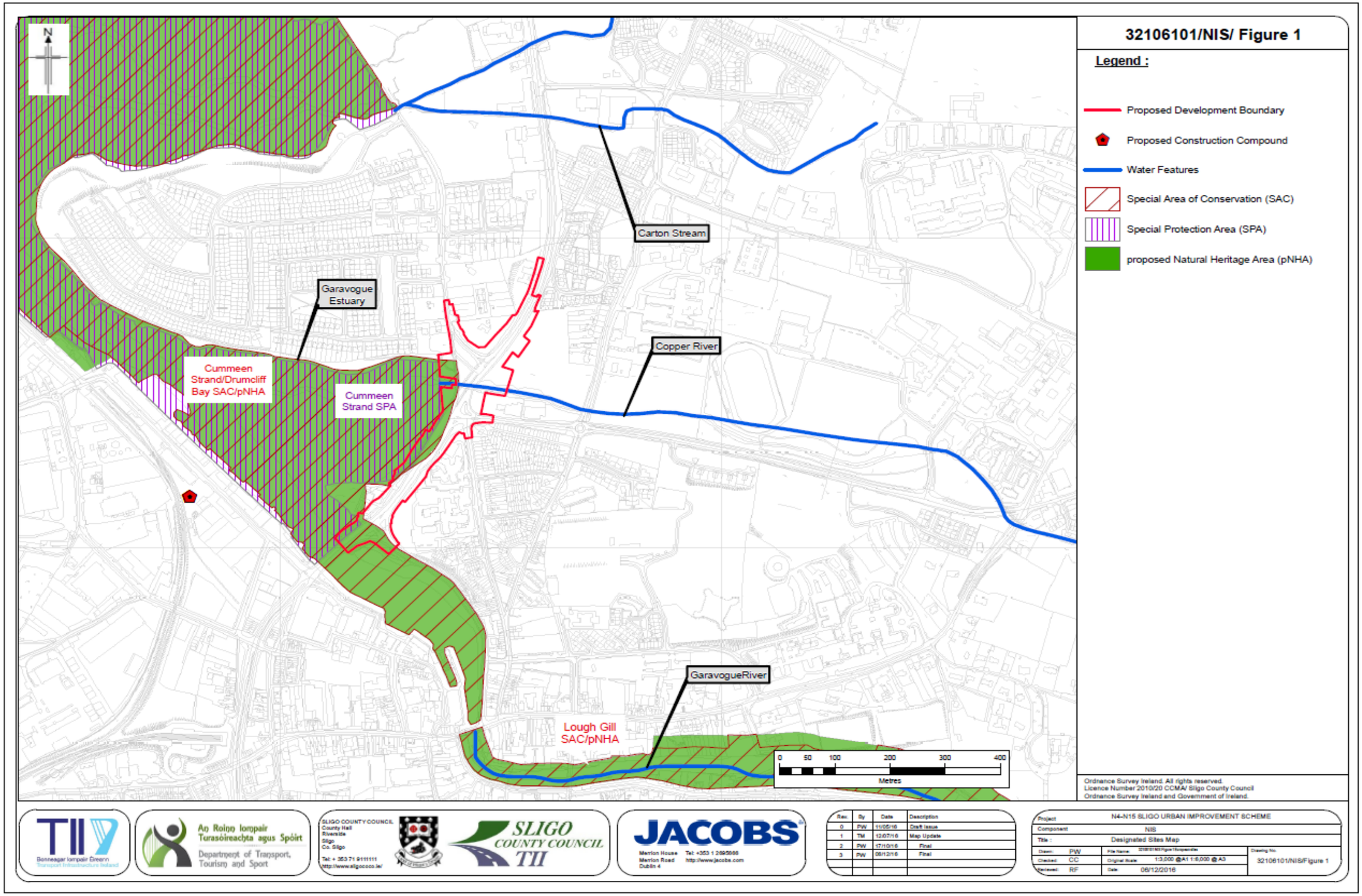
Figures and Appendices

Figure 1: European sites


N
Carton Stream
Garavogue Estuary
Copper River
Cummeen Strand/Drumcliff Bay SAC/pNHA
Cummeen Strand SPA
GaravogueRiver
Lough Gill SAC/pNHA
0 50 100 200 300 400
Metres
32106101/NIS/ Figure 1
Legend :
Proposed Development Boundary
Proposed Construction Compound
Water Features
Special Area of Conservation (SAC)
Special Protection Area (SPA)
proposed Natural Heritage Area (pNHA)
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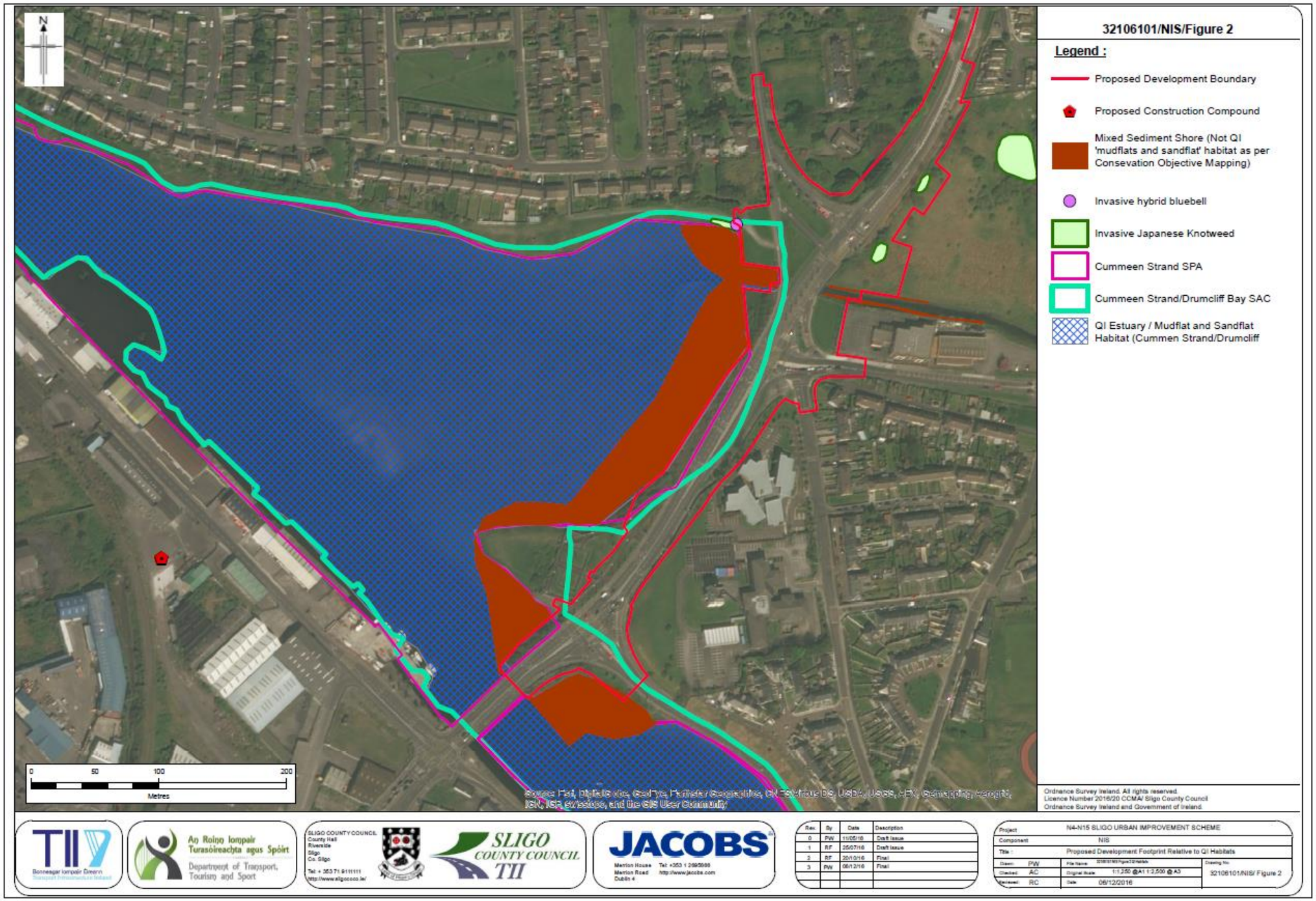
Rev. By Date Description
0 PW 11/05/16 Draft Issue
1 TM 12/07/16 Map Update
2 PW 17/10/16 Final
3 PW 06/12/16 Final
Project N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
Component NIS
Title : Designated Sites Map
Drawn: PW
Checked: CC
Reviewed: RF
Original Scale: 1:3,000 @A1 1:6,000 @ A3
Date: 06/12/2016
Drawing No: 32106101/NIS/Figure 1

Figure 2: Distribution of Qualifying Interests


N
32106101/NIS/Figure 2
Legend :
Proposed Development Boundary
Proposed Construction Compound
Mixed Sediment Shore (Not QI 'mudflats and sandflat' habitat as per Consevation Objective Mapping)
Invasive hybrid bluebell
Invasive Japanese Knotweed
Cummeen Strand SPA
Cummeen Strand/Drumcliff Bay SAC
QI Estuary / Mudflat and Sandflat Habitat (Cummen Strand/Drumcliff
0
50
100
200
Metres
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Department of Transport, Tourism and Sport
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Rev. By Date Description
0 PW 11/05/16 Draft Issue
1 RF 25/07/16 Draft Issue
2 RF 20/10/16 Final
3 PW 06/12/16 Final
Project N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
Component NIS
Title : Proposed Development Footprint Relative to QI Habitats
Drawn: PW
Checked: AC
Approved: RC
Original Scale: 1:1,250 @A1 1:2,500 @ A3
Date: 06/12/2016
Drawing No.: 32106101/NIS/ Figure 2

Appendix A. Specific Application of Guidance

A.1 European Commission and DEHLG Guidance

The following principles, adapted from both EC (2001) and DEHLG guidance (2010) were adopted in this NIS:

- All European sites overlapping or adjacent to the proposed development are described. Other European sites are described on a case-by-case basis subject to the predicted effects from the proposed development and the sensitivities of specific QIs concerned;
- Any effect to the conservation objectives of a site is considered significant;
- Indicators help determine if there are effects to conservation objectives (e.g. if duration of fragmentation , disturbance, or population trend change);
- Plans or projects that are completed, approved but uncompleted, or proposed (but not yet approved) are considered in the in-combination assessment.

The following non-exhaustive list of specific requirements may conflict with current law and/or NPWS requirements and were not applied in this NIS. Asterisked items (*) appear in both EC and DEHLG guidelines:

- Reference to Screening and AA as stages one and two of the AA process*;
- Suggestion, by virtue of the inclusion of % of habitat loss as a significance indicator that some habitat loss of QIs may not constitute a significant effect to European site(s)*;
- Prohibition on mitigation in Screening*;
- Significance of effects can often be resolved by consulting the relevant nature conservation body.

A.2 International and National Workshops on AA

Four International AA workshops have been organized by private and public practitioners. There were no outputs from the 2011 workshop in Pilsen (Czech Republic) or Dublin in 2012, but recommendations were published online for the Oxford (Levett-Therivel, 2009), and Mikolov workshops (Chvojková, 2013). The Oxford recommendations applied to plans only, but the following were considered equally applicable to projects:

- If effect significance is ambiguous, final assessment should be underpinned by expert consensus;
- Use of fixed distances to guide screening can be a useful starting point but distances should relate to site integrity and be substantiated by evidence or reasoning, where clear evidence is not available;
- The in-combination assessment should consider both natural and anthropogenic factors, and both proposed and consented plans and;
- Monitoring of mitigation measures should only be proposed where an effective management response can be identified to ensure adverse effects can be avoided [author's note - i.e. adaptive management].

The following unpublished recommendation of the NPWS at the Advanced Appropriate Assessment Workshop hosted by the Chartered Institute of Ecology and Environmental Management at Dublin Port Centre, 17th April 2015 was also incorporated into the NIS:

- The NPWS within the Department of Arts, Heritage and the Gaeltacht provide observations but do not undertake the analysis required to undertake or complete the appropriate assessment.

A.3 The Precautionary Principle

The Precautionary Principle has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as:

When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis.

The Precautionary Principle prevails in Screening, because the potential for effects must be excluded on the basis of objective information. However, international AA practitioners (Levett-Therivel, 2009) have cautioned that: "*reasonableness should be commensurate with the level of risk to the integrity of the site and the level of uncertainty concerned.*

A.4 Defining "Significant" Effects

In accordance with EC and Department guidance (Appendix B), significance was defined by any effect to the conservation objectives of a site. Such effects were assessed with reference to significance indicators such as the duration of fragmentation, disturbance, or population density.

Appendix B. Zones of Influence

A pathway for potentially significant effects between sources and receptors can be described an effect area, or 'zone of influence' (ZoI). The ZoI was of primary importance in:

- Informing the limit of the study area for field and desktop studies of the baseline environment; and
- Determining which European sites could be significantly affected.

The distance over which effects may be significant will vary by source and receptor. Scientifically-supported analyses have informed the identification of the distances used in the assessment. The number of zones identified has been reduced by grouping QIs into 'guilds' based on shared ecological dependencies and sensitivities. For instance, pollution may affect two different species (e.g. larvae of brook lamprey *Lampetra planeri* and river lamprey *Lampetra fluviatilis*) over a similar area because they share a similar ecological niche (i.e. muddy riverbanks into which larvae burrow), and because pollution is a threat of medium importance to both species (NPWS, 2013a). Some effects have large potential zones of influence e.g. wetland bird disturbance can extend up to 500m. The mobility of a particular QI will determine if they could move beyond European site boundaries into the ZoI. The ranging distance or 'extent of spatial sensitivity' is read with the ZoI to determine the potential for significant effects to occur.

B.1 ZoI for Pollution Effects

The proximity of European sites, and more importantly their QIs, to the proposed development is of primary importance in identifying source-pathway-receptor models which could result in significant effects. In the case of, for instance, measures disturbing breeding fauna via physical vibration, increasing the distance between the disturbance source and the animal will eventually lower the magnitude of the disturbance effect to a level where it is imperceptible to the animal, and the source-pathway-receptor link no longer results in a significant effect.

The use of distance to determine potentially significant pollution effects is more complex. For instance, the potential ZoI of a fuel spill incident into a coastal stream during construction will depend on numerous unpredictable factors including but not restricted to the volume of fuel spilt; the type of fuel spilt; the time of year; the type, abundance, and physical condition of mobile aquatic populations within the plume at the time; the assimilative capacity of the receiving watercourse at the time, and in coastal areas the stage of tidal cycle. Modelling could be undertaken to estimate the effect area for change in water-borne pollutants. However, the magnitude of effects would vary over the same distance for different aquatic species in accordance with their sensitivity to pollutants, such that a single ZoI would be inaccurate. In addition, in the case of silt, particles may be remobilised throughout a catchment several times over extended period of time, meaning the ZoI will vary in time as well as space. An arbitrary and highly precautionary fixed distance ZoI could be applied, but this distance would not be scientifically supported and could necessitate lengthy analysis of distant receptors in the impact assessment.

B.2 ZoI for Other Effects

QIs may be limited to the European site boundary, as in the case of habitats and plant species or may range far beyond the site boundary in the case of bird and other mobile QI animal species. Scientifically supported data on maximum dispersal or foraging ranges was used to identify the potential ranging behaviour of mobile fauna species. As recommended by international AA practitioners (Levett-Therivel, 2009), professional judgement was be required where specific distances were not available in the literature (e.g. for distance over which vibration could significantly affect white-clawed crayfish *Austropotamobius pallipes*).

The ZoI applied in the Screening for AA and NIS are presented in the Table overleaf.

QIs		Examples	Potential source (s) of effect from proposed development	Potential effect pathways	ZoI (m beyond proposed development)	Rationale
QIs sensitive to pollution	Various	Various.	Discharge of silt, oil, or other contaminants into surface water	Pollution during construction or operation.	Not determined based on rationale above.	Worst-case assumptions have informed the development of design and mitigation features so the determination of ZoI is not required
QI habitats and flora	Terrestrial habitats or plant species. *(no significant water dependency)*	Limestone pavements lowland meadows, Killarney fern *Trichomanes speciosum*	Vegetation clearance, access routes	Habitat loss	50m	Only habitat loss in footprint will pose risk of significant effect. However, precautionary ZoI of 50m to account for any additional land take/access required (e.g. construction compound).
	Ground-water dependent habitats/species.	Alluvial woodlands, dune slacks, peatlands, lagoons, whorl snails (three *Vertigo* species), turloughs.	Earthworks, piling, access routes.	Interference with groundwater supply or quality	250m	Radius within which further survey of groundwater-dependent habitats recommended where foundations or burrow pits proposed (SEPA, 2014)
QI Otter	Otter crossing points	N/A	Replacement of Copper River culvert	Altered or decreased routes for safe crossing of roads	300m upstream and downstream of watercourses from works	Radius within which surveys recommended to detect otter crossing points in the UK design Manual for Roads and Bridges (Highways Agency, 2001)
	Otter underground breeding or resting sites	N/A	Vegetation clearance, earthworks, piling, access routes, instream works	Direct disturbance or vibration causing chamber collapse	150m	Distance to underground otter sites within which disturbing works are likely to require licencing (NRA, 2006b)

QIs		Examples	Potential source (s) of effect from proposed development	Potential effect pathways	ZoI (m beyond proposed development)	Rationale
Marine mammals	Marine mammals using terrestrial 'haul-out' sites	Common seal *Phoca vitulina*	Piling and construction operations	Noise and human presence causing disturbance to haul-out sites	500m	Precautionary based on professional judgement given characteristics of development
Birds	Breeding Birds (highly sensitive species)	Chough , white-tailed sea eagle	Vegetation clearance, noise and physical human presence	Disturbance to breeding sites	100m up to a maximum of 1000m.	Worst-case, upper limit of disturbance to white-tailed sea eagle, from all Irish species study by Whitfield *et al*., (2008).
	Non-breeding birds	Wading birds, gulls, duck, geese, swans	Noise and physical human presence, and machinery in intertidal habitats.	Noise and human presence causing disturbance to feeding and roosting sites	500m	Precautionary based on published distances for anthropogenic disturbance to wintering wetland species (Madsen, 1985; Smit & Visser, 1993; Rees *et al.*, 2005)
Marsh fritillary	N/A.	N/A	Vegetation clearance, access routes	Direct injury or loss of habitat	50m	As outlined above for habitats. Indirect barrier effects to dispersal will not apply as the existing road already poses a barrier and the proposed road widening will not significantly increase the barrier
Aquatic species	In estuarine habitats/life cycle stage	Sea and river lamprey, Atlantic salmon	Instream works, tracking of machinery over intertidal areas	Direct injury or loss of habitat	0m	Works will only be undertaken within the footprint.
	In estuarine habitats/life cycle stage	Sea and river lamprey, Atlantic salmon	Over-pumping or from changes to culvert design	Migratory barriers	Any sites upstream with spawning populations	Based on species' lifecycles

QIs		Examples	Potential source (s) of effect from proposed development	Potential effect pathways	ZoI (m beyond proposed development)	Rationale
	Species sensitive to underwater noise disturbance	Atlantic salmon, marine mammals	Instream works for Copper River culvert replacement	Vibration causing injury or displacement	At least 100m from any significant populations	Precautionary based on professional judgement given characteristics of development
	Species or habitats sensitive to siltation[4]	Freshwater pearl mussel, Atlantic salmon (spawning/juveniles in freshwater)	Instream works for Copper River culvert replacement	Smothering of juvenile fish, gravel spawning beds, or mussel beds	Any populations downstream of siltation event, in freshwater, within the same river catchment	Professional judgement based on habitat where instream works are to be undertaken (Copper River only) Mitigation inherent in design has excluded risk of pollution

[4] All species and habitats for whom siltation (Threat J02.11) was ranked as a medium or high threat by the NPWS (2013)

B.3 Spatial sensitivities of Highly mobile species

The tables overleaf identify the spatial sensitivities (or ranging distances) of certain highly mobile species. These distances are read with the zones of influence to assess the potential for QIs to be significantly affected.

Non-bird fauna species: Ranging Distance or 'spatial extents of sensitivity' for relevant QIs to the NIS

QI Feature (s)	Sensitivity Extent and Potential Mobility	Scientific Rationale
Otter breeding or resting sites	QI is highly mobile and territories can extend 10 km from designated areas.	10 km is likely maximum ranging of Irish otters outside SACs (O'Neill, 2008, cited in Reid *et al.*, 2013).
Marsh fritillary individuals or their habitat	QI is highly mobile and butterflies could establish metapopulations up to 10 km beyond designated areas, as this corresponds to their potential dispersal range.	10 km is maximum dispersal range of Irish populations of the species (Seale, 2010) and Zimmerman *et al.* (2011).
Atlantic salmon, Lamprey spp. (river, brook, sea), Freshwater Pearl Mussel	QIs are highly mobile, but spawning grounds are not.; effects only where spawning habitats within footprint of works	No habitat loss/damage predicted beyond this area.
	Silt is highly mobile and can be dispersed throughout a river catchment.	Once released, silt could be remobilised over time potentially reaching any downstream gravels or mussel beds within the same river catchment.

Non-breeding bird species: ranging distance or 'spatial extents of sensitivity' for relevant QIs to the NIS

Wintering Bird QI (s)	Sensitivity Extent and Potential Mobility	Scientific Rationale
Wading Birds	Up to **5 km** for birds feeding at inland sites	Professional judgement, expert opinion from consultation exercise, and preliminary oystercatcher resighting data from Birdwatch Ireland from Dublin Bay
Barnacle Goose	**15-20 km** from core designated areas	SNH, 2013
Greenland white-fronted goose	**8 km** from core designated areas	SNH, 2013
Greylag goose	**12 km** from designated roosts/feeding sites.	Bell 1988 and Hearn, personal communication cited in JNCC (2007)
Light-bellied goose	**15 km** from designated roosts/feeding sites.	Benson (2009)
Whooper Swan	**5 km** from core designated areas	SNH, 2013

Appendix C. Preliminary Erosion and Sediment Control Plan

See EAR Volume 4 Appendix 6.6

Appendix 6.1 Flood Risk Assessment

JACOBS

JACOBS

N4-N15 Sligo Urban Improvement Scheme

Sligo County Council

Flood Risk Assessment

August 2016

Flood Risk Assessment

N4-N15 Sligo Urban Improvement Scheme

Project no: 32106101
Document title: Flood Risk Assessment
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Document history and status

Revision	Date	Description	By	Review	Approved
Original	Aug 2016	Issue for Planning	Jessica Dale	Mairéad Conlon Kevin Macken	Ciarán O'Keeffe

Contents

Appendix E. Historic Flood Maps: OSI Historic 6" Map
Appendix F. Western CFRAM Study - Flood Risk Review for Sligo Town: Site Assessment Report
Appendix G. Proposed Development Drainage Layout
Appendix H. Long Section of Finished Road Levels

1. Introduction

Sligo County Council proposes to construct the N4-N15 Sligo Urban Improvement Scheme which comprises upgrade works to a section of the N4-N15 corridor and involves the provision of additional traffic lanes and enhanced pedestrian and cyclist facilities. In accordance with the relevant guidelines and legislation, a flood risk analysis is required to be carried out to assess the impact that the proposed development will have on flooding in the area and to proposed mitigation measures, if any, that may be required as a result.

The proposed development comprises the upgrade of approximately 550m of urban National Primary Road to provide three lanes in both directions between Hughes Bridge and the junction with the R291, as shown in Figure 1.

Figure 1: N4 Sligo Urban Improvement Scheme Site Location Plan

The proposed development does not alter the line of the existing road on the seaward side and therefore will not have any impact on the existing coastline. It will not affect the Garavogue River as the development commences on the north side of the crossing of the river at Hughes Bridge. The proposed development crosses the Copper River and will require the extension of the existing Copper River culvert on the upstream face to provide adequate width and ensure structural consistency.

The increase in hardstanding area associated with the online widening and junction improvement and the extension of the Copper River culvert may create issues with flood risk, hence these are the main elements to be considered in this Report.

2. Flood Risk Assessment Methodology

This section provides an overview of the legislative background covering flood risk and development control in Ireland. It is intended to provide a basic understanding of the reasons for, and the objectives of, the Flood Risk Assessment process.

For full details of how flood risk is considered by Irish planning legislation, reference should be made to 'The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009).

2.1 The Flooding Problem

Flooding is a natural process with many potential sources including rivers, the sea, artificial drainage systems, overland flow and groundwater flooding. In the future, current scientific studies predict that the frequency, pattern and severity of flooding will increase.

In the past, poor planning decisions have increased the level of flood risk by allowing new developments to be constructed in flood prone areas without the necessary mitigation and resilience measures. Presently, the planning system plays a major role in ensuring development is promoted and guided in a manner that is sustainable in economic, social, and environmental terms.

2.2 Methodology

The methodology used for the flood risk assessment for the proposed development is based on the Flood Risk Management (FRM) Guidelines which require the planning system at national, regional and local levels to:

- **Avoid** development in areas at risk from flooding, particularly floodplains, unless there are proven wider **sustainability grounds** that justify development. Where this is the case development must be **appropriate** and flood risks must be effectively **managed** to reduce the level of risk.
- Adopt a **Sequential Approach** to flood risk management when assessing the locations for new development based on **avoidance**, **reduction**, and **mitigation** of flood risk.
- Incorporate flood risk assessment into planning application decisions and appeals.

The sequential approach (Figure 2) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.

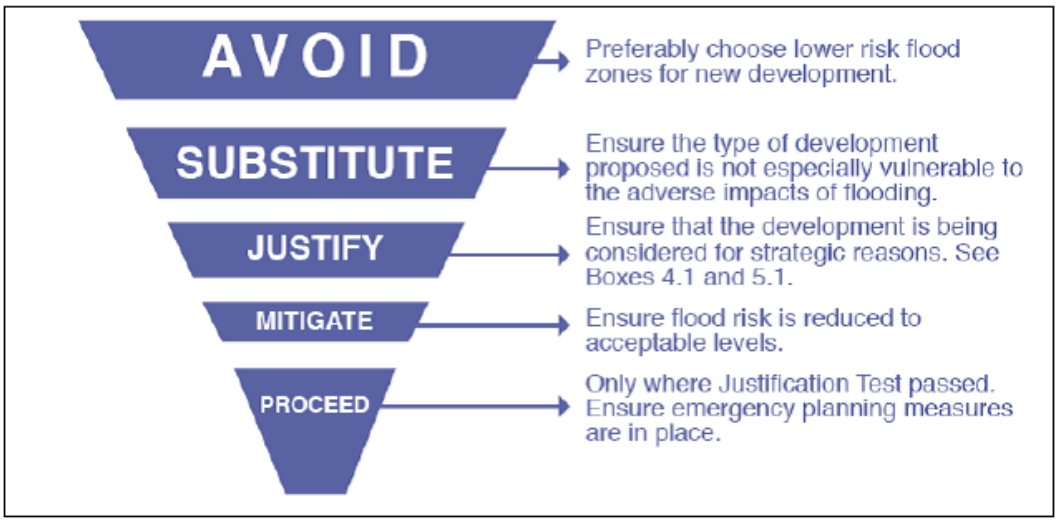


Figure 2: Illustration of the sequential approach (The Planning System and Flood Risk Management, Guidelines for Planning Authorities (2009))

The FRM guidelines outline the key principles that should be used to assess flood risk to proposed development sites. It is recommended that a staged approach to flood risk assessment should be used:

- **Stage 1: Flood risk identification** – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.
- **Stage 2: Initial flood risk assessment** – to confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies, to assess flood risk and to assist with the development of FRM measures.
- **Stage 3: Detailed flood risk assessment** – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

This report represents a **Flood Risk Identification (Stage 1 Assessment)** and **Initial Flood Risk Assessment (Stage 2 Assessment)** and provides an overview of the potential flood risks to the proposed site and assesses the potential impact of the proposed development. In addition it proposes mitigation principles that should be pursued as the design is progressed. A Stage 3 Assessment is not proposed as the results from the Stage 1 And 2 Assessments, as outlined in this report, indicate a Stage 3 Assessment is not required.

3. Flood Risk Identification (Stage 1)

3.1 General

As part of the Stage 1 Assessment (Flood Risk Identification), all readily available data was reviewed (as per the list referenced in Table 6 – Appendix A) to identify whether there may be any flooding or surface water management issues relating to the proposed site that may warrant further investigations.

3.2 Flood History of the Site

The aim of this section is to outline the flood history of this site. The main historical flood events in the area were identified, assessed and are described below.

3.2.1 OPW National Flood Hazard Mapping

With reference to the OPW National Flood Hazard Mapping (www.floodmaps.ie), five historical flood events were identified within the Sligo area and are tabulated in Table 1 below.

Ref. No.	Date of Flood Event	Address	Description of Event / Comments
1	Recurring	Fish Street, Sligo	Occurs during periods of extreme spring tides and high onshore winds
2	Recurring	Lower Quay Street, Sligo	Occurs during periods of extreme spring tides and high winds
3	Recurring	Near Sligo Hospital	Road flooding during periods of heavy rain due to low point in the road combined with lack of capacity in surface water network
4	Recurring	Near Sligo Institute of Technology	Land flooding during high tides combined with debris build backing up
5	Recurring	Sligo Institute of Technology	Historical flooding of college due to blockage in discharge to the sea

Table 1: Flood events recorded within the area from the OPW Flood Hazard Mapping Report

It is noted that the level of detail for the events referenced above is quite poor and that the exact locations of the events are, in some cases, unknown.

3.2.2 Western CFRAM Study – Sligo Flood Risk Review Report

The Western River Basin District Flood Risk Review was carried out as part of the CFRAM process to help validate the findings of the OPW draft Preliminary Flood Risk Assessment (PFRA), informing decisions on which sites were to be taken forward for a more detailed assessment within the CFRAM Programme.

The Sligo Flood Risk Review Report (Appendix G) indicates that there is limited evidence of frequent fluvial flooding in the Sligo area but there is evidence of tidal flood risk.

The report references that the Sligo River (Copper River) is more prone to flooding than the Garavogue River. Historically flooding on the Copper River occurs on the left bank upstream of the N4 as a result of a blockage in the culvert beneath the road, as shown in Figure 1. In terms of tidal flooding, the report identifies the downstream limits of the Garavogue and Copper rivers, and areas along the coastline, as the areas of flood concern.

3.2.3 Flood Risk Maps

The OPW Preliminary Flood Risk Assessment (PFRA) (Appendix B) indicates that the extreme north and south sections of the site lie within an area at risk of flooding from a 0.5% AEP (1 in 200 year) coastal event.

The Irish Coastal Protection Strategy Study (ICPSS): Phase 5 – North West Coast Flood Extent and Flood Depth maps (Appendix C and Appendix D) indicate that the site lies within an area at risk of flooding from a 0.5% AEP coastal event.

The OSI Historic 6" maps (Appendix E) do not show any areas within the region of the proposed development, or within the Sligo region in general, designated as being 'liable to flooding'.

The Western CFRAM Study Flood Extent and Depth Maps are available online (http://www.westcframstudy.ie/map/sligo-baydrowes-(35).aspx#Sligo). They are currently in draft format to be used solely for consultation purposes. Regard has been taken to the maps for the purposes of this assessment.

4. Initial Flood Risk Assessment (Stage 2)

This section assesses the risk of flooding to the proposed development as a whole from a range of different sources, which is then used to develop a broad understanding of the risk characteristics of the site.

4.1 Potential Sources of Flooding

Due to the location of the site, there is a potential risk from several sources of flooding, as listed below:

- **Coastal** - flooding from the sea;
- **Fluvial** - flooding from rivers and watercourses;
- **Estuarine** - flooding from a combination of fluvial and coastal;
- **Pluvial** – flooding that is caused by runoff during high rainfall events;
- **Artificial Drainage Systems** – flooding that occurs as a result of surcharging or blocking of drainage networks;
- **Groundwater** – flooding when water normally stored below the ground rises above surface level or into below ground spaces (such as basements).

4.2 Coastal Flood Risk

The road development runs parallel and in close proximity to the Garavogue Estuary and Sligo Harbour. The site is therefore potentially affected by coastal flooding mechanisms.

Coastal flooding is caused by higher sea levels than normal, resulting in the sea overflowing onto the land. Coastal flooding is influenced by three main factors, which often work in combination. These are:

- **High tide levels** – caused by normal, and predictable, astronomical factors.
- **Storm surges** – where sea levels are artificially raised by areas of low barometric pressure such as depression weather systems.
- **Wave action** – this is dependent on wind speed and direction, as well as local topography and exposure.

Available historical flood data indicates that no flooding has occurred in this area as a result of wave action or wave overtopping. With regard to the CFRAM maps it has been illustrated that the site is not at risk of flooding from wave overtopping. Therefore it is considered that flooding as a result of wave action is not a risk to the site and will not be considered further within the FRA.

The Irish Coastal Protection Strategy Study (ICPSS): Phase 5 was produced in January 2014 by RPS and OPW. As shown in Figure 3 and Figure 4 the development is situated within an area at risk of flooding from a 0.5% AEP coastal event. The ICPSS provides values for predicted extreme water levels associated with combined tide and surge for the North West Coast (Appendix C and Appendix D).

The predicted extreme water level at this point relating to a 0.5% AEP is 3.12mOD. The proposed finished road levels for the site range from 4.190mOD to 6.604mOD (Appendix I). This means that the finished road level at every point in the site is at least 1m above the predicted extreme water levels. Therefore, the risk of coastal flooding to the proposed development is considered to be low.

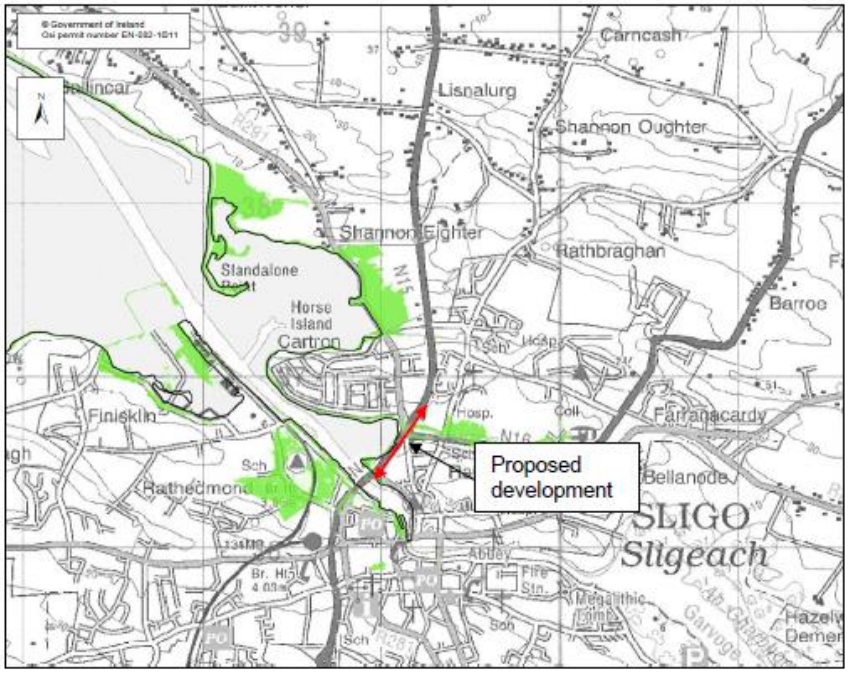


Figure 3: Irish Coastal Protection Strategy Study (ICPSS): Phase 5 – North West Coast Flood Extent Map

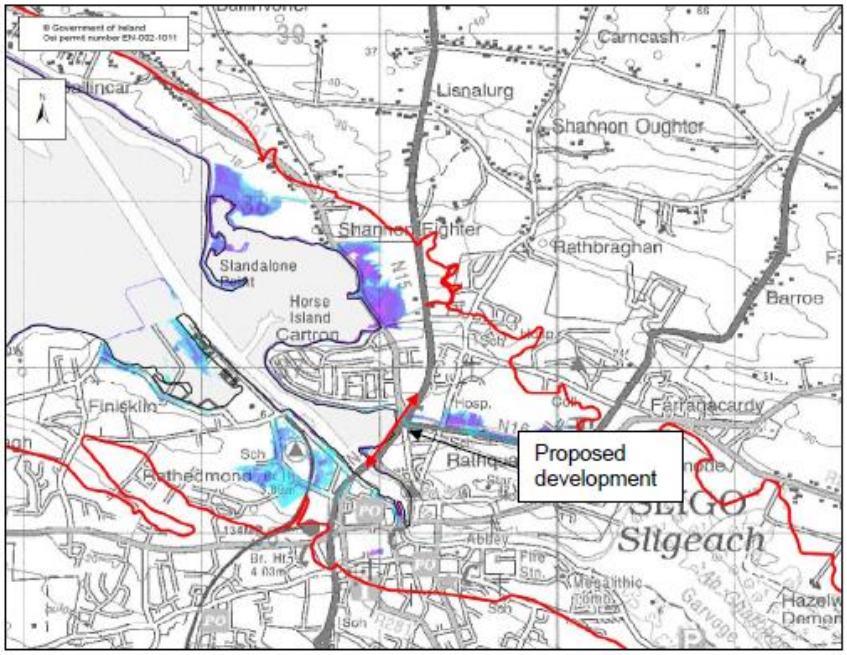


Figure 4: Irish Coastal Protection Strategy Study (ICPSS): Phase 5 – North West Coast Flood Depth Map

4.3 Fluvial Flood Risk

The OPW PFRA map for the Sligo area (Appendix B) shows that the site lies out with the regions at risk of fluvial flood events.

Available historical flood data indicates that no fluvial flooding has occurred in this area. The previous flooding was associated with extreme spring tides coupled with high onshore winds, as well as the blockage of Copper River culvert beneath the proposed development.

Additionally, the Sligo Flood Risk Review Report produced as part of the Western CFRAM Study confirms that there is limited evidence of frequent fluvial flooding in the Sligo area.

The only location where there is any potential fluvial risk to the development is at the Copper River culvert. The proposed finished road level at this location is 4.35mOD which is over 1m higher than the average ground level on the landward side of the road.

However, the water level upstream of the Copper River Culvert is controlled by the tidal boundary. Fluvial flows in the Copper River would not affect this level. With limited historical evidence of flooding in the area it is unlikely that there would be potential flood depths of over 1m.

Therefore, the risk of fluvial flooding to the proposed development is considered to be very low

This has been confirmed with regard to the draft CFRAM flood extent maps, where the fluvial flood risk upstream of the culvert is shown to be confined to the river channel.

4.4 Estuarine Flood Risk

Estuarine flooding occurs due to a combination of tidal and fluvial flows, rivers and the sea. A combination of a high flow and a high tide will force water back upstream, increasing water levels and leading to a river bursting its banks.

The existing road and proposed development forms a barrier preventing tidal flow propagating upstream via overland flow paths. Although tidal flow propagating upstream is confined to the twin arched Copper River culvert, fluvial flow may be constrained in a fluvial event.

The only location where there is any potential estuarine risk to the development is at the Copper River culvert. The proposed finished road level at this location is 4.35mOD which is over a 1m higher than the average ground level on the landward side of the road. With limited historical evidence of flooding in the area it is unlikely that there would be potential flood depths of over 1m.

Therefore, the risk of estuarine flooding to the proposed development is considered to be very low

This has been confirmed with regard to the draft CFRAM flood extent maps, which would have considered tidal locking of fluvial flows, where the fluvial flood risk upstream of the culvert is shown to be confined to the river channel.

4.5 Pluvial Flood Risk

Pluvial flooding occurs during periods of heavy rainfall, when the rainfall rate is greater than the infiltration capacity. It is usually associated with high intensity rainfall events (typically > 30mm/h) resulting in overland flow and ponding in depressions in the topography. In urban situations underground sewerage/drainage systems and surface watercourses may be completely overwhelmed.

It is evident from Figure 7 below that the topography of the land on which the road is situated is reasonably level. Therefore, the potential for overland flow from surrounding land onto the proposed development is considered low. In addition, the finished road level of the proposed development will be 400mm above the existing ground level and will incorporate drainage systems to intercept overland flow, where required.

Therefore, the risk of pluvial flooding to the development is considered very low.

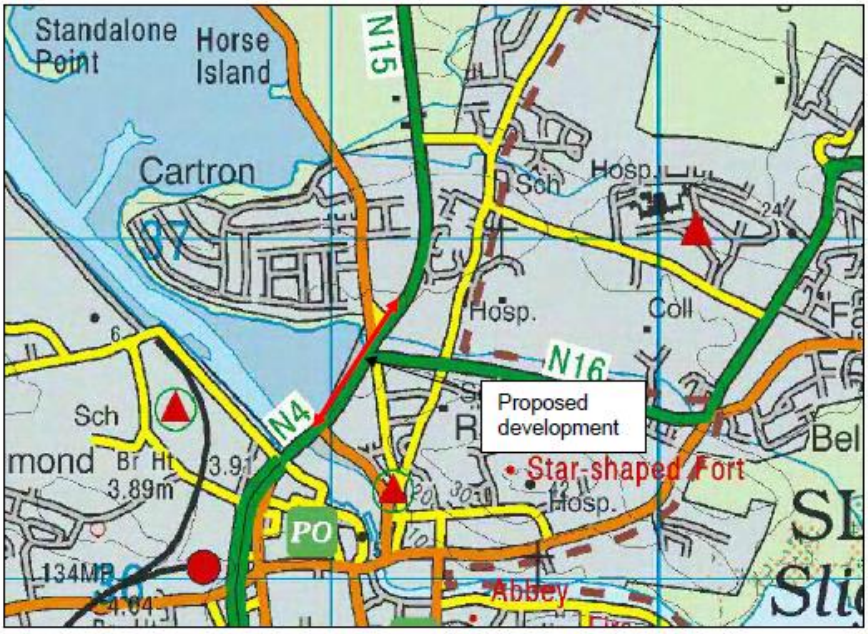


Figure 7: Proposed Development and Topography of Surrounding Land

4.6 Artificial Drainage Systems

Flooding occurs from artificial drainage systems during periods of heavy rainfall, when the local drainage system reaches capacity and surcharges from manholes and/or gullies.

The finished road level of the proposed development will be 400mm above the existing ground level. The proposed raised road surface profile, as shown in Appendix I, ensures that any potential artificial drainage systems flooding issues will not affect the development. Therefore, the risk from artificial drainage systems is considered to be very low.

4.7 Groundwater Flood Risk

With reference to Geological Survey of Ireland (GSI) Groundwater Data maps, the proposed site lies within a Dinantian Upper Impure Limestone region which is classed as a locally important aquifer with bedrock which is moderately productive only in local zones.

Glacial tills dominate the subsoils in the northwest of County Sligo. The high quantity of rainfall in the northwest coupled with the low permeability of the subsoil results in a high water table and a thin unsaturated zone. The water table is often less than 5m below the surface.

Due to the low-lying nature of the proposed development site there is a potential for prolonged rainfall and high tides to further raise the groundwater level within the aquifer and the overlying deposits above ground level, resulting in flooding.

However, the finished road level of the proposed development will be 400mm above the existing ground level. The proposed raised road surface profile ensures that any potential groundwater flooding issues will not significantly affect the development. Therefore, the risk from groundwater flooding is considered to be very low.

4.8 Flood Risk due to Climate Change

In the future, it is predicted that climate change will increase sea levels, storm events magnitude and frequency, and rainfall depths, intensities and patterns. It is therefore necessary to consider the impact this might have on the flood risk to the proposed development.

Climate change will impact on both fluvial and coastal flooding. The finished road level ranges from 4.190mOD to 6.604mOD (Appendix I). This means that the finished road level at every point in the site is at least 1m above the predicted 0.5% AEP predicted water level of 3.12mOD. The standard allowance for climate change for the high end future scenario is 1m, giving a water level of 4.12mOD which is lower than the road surface profile. Therefore, the risk of climate change on coastal flooding to the proposed development is considered to be low.

For fluvial flow the standard allowance for climate change on the 1% AEP event is a 20% increase in flow. This increase in flow is likely to increase the risk of estuarial and fluvial flooding. However as previously stated the channel upstream of the bridge is determined to be adequate to maintain flows in the channel and the proposed finished level of road downstream of the culvert is 1m above the ground level on the landward side. Therefore, the impact of climate change on fluvial and estuarine flooding to the proposed development is considered to be very low.

While climate change is likely to increase the risk of flooding from pluvial, artificial drainage systems and groundwater sources, this study has indicated that these risks are already very low and it is considered that climate change will not significantly increase these flood risks.

4.9 Summary of Flood Risk

Table 2 below provides a summary of the potential impact from each of the sources of flooding considered for the proposed development.

Flood Risk	Summary of Impact	Notes
Coastal	Low	Site location is unlikely to be influenced by coastal flooding as the finished road level is higher than the predicted 0.5% AEP level.
Fluvial	Very Low	Site is unlikely to be impacted by river flooding – limited evidence of frequent fluvial flooding and the finished road level is over 1m higher than the surrounding topography at the Copper River culvert area where fluvial flood risk is present.
Estuarine	Very Low	Site is unlikely to be influenced by estuarine flooding as the finished road level is higher than the predicted maximum tide levels and the surrounding ground levels.
Pluvial	Very Low	The topography of the site is reasonably level and appropriate drainage design systems shall be accommodated in the development to reduce impact of pluvial flooding.
Artificial Drainage Systems	Very Low	Site location is unlikely to be impacted by flooding from Artificial Drainage Systems as the finished road level is 0.4m higher than the surrounding topography on average.
Groundwater	Very Low	Groundwater flooding is not considered to affect the site as the finished road levels are to be raised an average of 0.4m above existing ground level.
Climate Change	Low	The flood risk due to climate change is considered low for the proposed development.

Table 2: Summary of Flood Risk to Proposed Development

5. Potential Flood Risk Impacts from Development on the Proposed Site

Whilst the development site and the proposed development can be at risk from flooding, it is also possible for the development to cause changes to flooding patterns and mechanisms resulting in increases in flooding in other areas. This section examines these impacts in more detail.

5.1 Impacts on Coastal Flooding

The proposed development consists of online widening and upgrade works of the N4-N15 mainline, i.e. it does not significantly alter the line of the existing road. The existing road provides a barrier preventing overland flow paths propagating from the sea to the landward side of the road. The increase in the finished surface levels of the road will increase the standard of protection provided to the land adjacent to the road.

There is no change proposed to the downstream opening of the existing Copper River culvert therefore the proposed development will have no change to the risk of coastal flooding via the culvert at this location.

5.2 Impacts on Fluvial Flooding

The proposed development could result in an increase in flood risk if it:

- Reduces the conveyance of the existing watercourse and floodplain network;
- Reduces the volume of flood storage available on the watercourse floodplains; or
- Increases site runoff rates and volume.

Although the width of the road will increase, it will not impinge on any fluvial floodplains and therefore will not affect the volume of floodplain storage available.

The widening of the road will result in increased surface runoff rates and volumes; however this will be accounted for in the design of the drainage system for the scheme.

The proposed drainage system consists of three outfalls with the run-off discharging into the Garavogue River immediately upstream of the development and outfalls both upstream and downstream of the Copper River development.

The outfall at the Copper River downstream of the development will have no impact on fluvial flooding as this area is tidally controlled. Although the outfall at the Garavogue River upstream of the development will increase runoff to the Garavogue River, the maximum designed flow rates are negligible in comparison to the flow in the Garavogue River. The maximum design outfall is 0.057cumecs compared to a 1%AEP flow in the Garavogue River of the order of 90 cumecs. Therefore, this additional runoff will have a negligible impact on the fluvial risk. Furthermore as the Garavogue is tidally dominated at this point, additional runoff would not impact water levels.

The outfall upstream of the development which enters the Copper River first passes through an attenuation pond which limits flow to Greenfield runoff rates up to the 0.033% (1 in 30 year) rainfall AEP event. Therefore the outfall will have no impact on the existing flood risk to the area. Furthermore as the Copper River remains tidally dominated at this point, additional runoff would not impact water levels.

Therefore given that the proposed development does not meet any of the above criteria; the risk of increasing flooding in the sites surrounding areas is negligible.

5.3 Impacts on Estuarial Flooding

As stated in Section 4.4, the risk of potential estuarine flooding to the proposed development is considered to be very low. Although the width of the road will increase, it will not impinge on any fluvial floodplains and therefore will not affect the volume of floodplain storage available.

Therefore there will be a negligible impact from the proposed development on the estuarine flood risk in surrounding areas.

5.4 Impacts on Pluvial Flooding

In order to assess the increase in pluvial flood risk the following points need to be considered:

- Will the proposed development increase the rainfall runoff rate;
- Will the proposed development alter existing flow paths;
- Will the proposed development alter existing drainage routes.

Although the proposed development will increase the hardstanding area, appropriate surface water drainage systems will be constructed and designed to the necessary standards in order to intercept any surface runoff from the site. The drainage design is included in Appendix H.

As part of the drainage system there are three outfalls with the run-off discharging into the Garavogue River upstream of the development and the Copper River immediately downstream of the development. Water levels in both these area are controlled by the tidal levels. The water levels in these areas are controlled by the tidal levels. The outfalls from the drainage system are designed to ensure their inverts are at an elevation above the 20% AEP tide level of 2.64mOD as required in section 6.2 of the DMRB Volume 4 Section 2 Part 3 (HD 33/15).

Therefore it is considered that the proposed development will not have any impact on the risk of pluvial flooding by overland flow to surrounding areas.

5.5 Impacts on Flooding from Artificial Drainage Systems

A drainage design is being implemented as part of the development, which is included in Appendix H. The proposed drainage system consists of three outfalls with the run-off discharging into the Garavogue River downstream of the development and Copper River immediately downstream of the development. Therefore the drainage system will be completely independent of the local drainage system and will not impact on the capacity of the current system.

The drainage system will be designed to mitigate extreme storm events, reducing the potential risk of flooding as a result of failure/under capacity of the system during an intense rainfall event.

Overall, it is considered that the development will have no impact on the risk of flooding from artificial drainage systems.

5.6 Impacts on Groundwater Flooding

Minor excavations do not significantly impact on the groundwater aquifers/tables and the proposed development does not require significant excavations or large areas where below-ground works are proposed. It is considered that the potential for the development to increase the risk of groundwater flooding is low.

5.7 Summary of Potential Flood Risk Impacts from Development

Table 3 below provides a summary of the potential flood risk impacts on surrounding areas as a result of the proposed development.

Flood Risk	Summary of Impact	Notes
Coastal	No Impact	Proposed site development will not impact existing coastal flooding risk.
Fluvial	Negligible Impact	Proposed site development will have an negligible impact to existing river flooding risk.
Estuarial	Negligible Impact	Proposed site development will have an negligible impact to existing estuarial flooding risk.
Pluvial	No Impact	Appropriate drainage design systems shall be accommodated in the new road development to remove any impact on pluvial flooding.
Artificial Drainage Systems	No Impact	Proposed site development will not impact existing Artificial Drainage Systems flooding risk.
Groundwater	Negligible Impact	Proposed site development will have a negligible impact to existing river flooding risk. Proposed site development is unlikely to significantly impact on existing groundwater aquifers/tables.
Climate Change	N/A	The impact from the proposed development on Climate Change is considered non-applicable.

Table 3: Summary of the potential flood risk impacts on surrounding areas as a result of the development

6. Flood Risk Management and Evaluation

6.1 The Sequential Approach to Development Planning

The FRM Guidelines recommend that a sequential approach is taken for flood risk management for new developments. This mechanism is summarised in Figure 8 below.

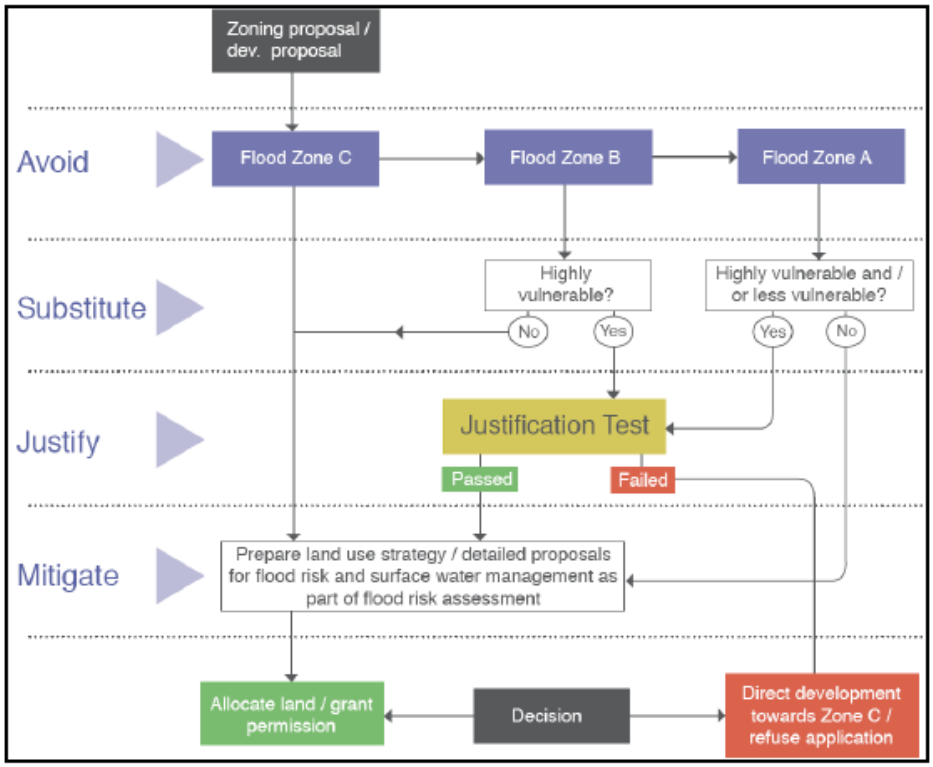


Figure 8: Sequential approach mechanism in the planning process (The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009))

Flood Zone	Notes
Zone A	Where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding)
Zone B	Where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5 % or 1 in 200 for coastal flooding)
Zone C	Where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood zone C covers all areas of the plan which are not in zones A or B.

Table 4: Description of Flood Zones (The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009))

As identified in Section 4.2, the proposed development is situated within an area at risk of flooding from a 0.5% AEP coastal event, therefore in accordance with Table 4 the site can be classified as a 'Flood Zone B' area.

With reference to Table 3.1 of The Planning System and Flood Risk Management Guidelines for Planning Authorities published by the OPW, the proposed scheme falls under the following land use and type of development description:

"Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding."

Therefore in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, the proposed scheme is classed as a 'Highly Vulnerable Development'.

Table 5, extracted from The Planning System and Flood Risk Management Guidelines for Planning Authorities, illustrates the types of development that are considered appropriate to each flood zone and those that are required to meet the Justification Test.

	Flood Zone A (High Probability of Flooding)	Flood Zone B (Moderate Probability of Flooding)	Flood Zone C (Low Probability of Flooding)
Highly Vulnerable Development	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-Compatible Development	Appropriate	Appropriate	Appropriate

Table 5: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

With reference to Table 5, the proposed development will need to meet the criteria of the Justification Test, as it is within a Flood Zone B area and it is considered a Highly Vulnerable Development.

6.2 Justification Test

In accordance with The Planning System and Flood Risk Management Guidelines the definition of the Justification Test is:

"Where there are insufficient sites available to locate development outside flood risk areas, it may be necessary, to meet the objectives of proper planning and sustainable development, for development to be sited within flood risk areas. The Justification Test is an examination of such proposals against proper planning and sustainable development criteria and, if these are satisfied, against flood risk criteria to ensure that risks are reduced to an acceptable level and that flood risk is not increased elsewhere."

As stated in Section 1, the proposed development has been identified as a national strategic road investment under national policy and is covered under the following development plans within County Sligo:

Sligo County Development Plan, 2011-2017

This Plan sets out the following policy objective:

- Objective O-NR-1: "Facilitate programmed improvements to the National Road network, including the programme of realignments and upgrades, as set out in Table 8.B, subject to compliance with the requirements of the Habitats Directive."

It is noted that Table 8.B of the Plan specifically refers to the N4/N15 Sligo Urban Improvement Scheme.

- Objective O-NNR-5: "Carry out improvement works on regional and local roads, and in particular to the regional road network as set out in Table 8.C, subject to compliance with the requirements of the Habitats Directive."

It is noted that Table 8.B of the Plan specifically refers to the R291/N15 junction.

Sligo and Environs Development Plan, 2010-2016

This Plan sets out the following policy objective:

- Objective T1.1: "Reserve strategic road corridors for the development of the following roads: Upgrade and realignment of the N4/N15, from Hughes Bridge to Sligo/Leitrim County boundary, including the upgrading of the N16 from the N4/N15 junction to Duck Street roundabout on the N16."

In accordance with The Planning System and Flood Risk Management Guidelines Section 5.15, Box 5.1 "Justification test for development management", it is necessary to demonstrate that:

"The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines."

The applicable Development Plans demonstrate that the lands necessary to construct the proposed development have been designated/zoned accordingly.

Further to demonstrating that the development is for strategic reasons, it is then necessary as part of The Planning System and Flood Risk Management Guidelines Section 5.15, Box 5.1 "Justification test for development management" that an appropriate flood risks assessment addresses the following criteria:

Criteria to be satisfied	Justification
The development proposed **will not increase flood risk elsewhere**, and, if practicable, will reduce overall flood risk.	It has been shown in section 5 of this report that the development will not increase flood risk from pluvial, artificial drainage systems or coastal sources and that the risk of coastal flooding to areas on the landward side of the road will be reduced by the development. The development may have negligible impacts to the fluvial, estuarine and ground water.
The development proposal **includes measures to minimise flood risk** to people, property, the economy and the environment **as far as reasonably practicable.**	The development will reduce the risk of coastal flooding to the lands on the landward side of the proposed road. There is no flood risk to residential and non-residential properties and the proposed development will not cause any flood risk to residential or non-residential properties.

The development proposed includes measures to ensure that **residual risks to the area and/or development can be managed** to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.	As stated in section 5 of the report the development may have negligible impacts to the fluvial, estuarine and ground water. This impacts will be limited to areas on the left and right bank of the Copper River which have been zoned as open space. The negligible impacts to the fluvial, estuarine risk will be limited/mitigated by the design of the extension to the River Copper culvert. The culvert will be designed to limit headloss across the structure in accordance with the requirements of Section 50 of the Arterial Drainage Act 1945. The negligible impacts to the groundwater flood risk will be limited/mitigated in the design of the required earthworks.
The development proposed addresses the above in a manner that is also compatible with the **achievement of wider planning objectives** in relation to development of good urban design and vibrant and active streetscapes.	The proposed development meets objectives set out in the Sligo County Development Plan 2011 – 2017 and the Sligo and Environs Development Plan 2010 – 2016.

6.3 Mitigation Measures

The finished surface levels has been designed to ensure that they are above the 0.5% AEP flood event level plus 1m allowance for climate change for the high end future scenario. The finished road surface profile ranges from 4.190mOD to 6.604mOD ensuring that the predicted extreme water level of 4.12mOD, taking account of climate change, will not impact on the proposed scheme at present or in the future.

This development will raise the existing road levels reducing the risk of coastal, fluvial, estuarial, artificial drainage systems and pluvial flooding to the development.

Drainage systems have been designed to manage the risk of pluvial sources to and from the development. The outfalls are designed to ensure that the rate of discharge does not exceed that of the existing 'greenfield' catchment area, minimising the risk of overloading the receiving watercourses. The outfalls from the drainage system are designed to ensure their inverts are at an elevation above the 20% AEP tide level of 2.64mOD as required in section 6.2 of the DMRB Volume 4 Section 2 Part 3 (HD 33/15).

The development may have negligible impacts to the fluvial, estuarine and ground water. These impacts will be limited to areas on the left and right bank of the Copper River which have been zoned as open space.

The negligible impacts to the fluvial and estuarine risk will be limited/mitigated by the design of the reconstructed Copper River culvert. The culvert will be designed to limit headloss across the structure in accordance with the requirements of Section 50 of the Arterial Drainage Act 1945.

The negligible impacts to the groundwater flood risk will be limited/mitigated in the design of the required earthworks.

7. Conclusions and Recommendations

7.1 Conclusions

This report provides an assessment of the flood risk issues that could affect the proposed online road upgrade scheme known as the N4-N15 Sligo Urban Improvement Scheme. The assessment has included desktop investigations into the potential flood risks and an assessment of the potential impacts the development could have on flood risk in the surrounding areas. All flood risks and impacts have been assessed as Very Low or Low.

The report also looks to provide an assessment of the flood risk to surrounding areas from the proposed development. It has been concluded that there is no impact to the coastal, pluvial and artificial drainage system flood risk in the surrounding areas. There may be negligible impacts to the fluvial, estuarine and groundwater flood risks. These negligible impacts are limited to lands which have been zoned as open space and will have no impact on residential or non-residential properties. It is proposed that these impacts will be militated against in the design of the Copper River culvert and the design of the required earthworks.

In relation to the Sequential Approach, the route of proposed development includes areas recognised as having moderate probabilities of flooding (i.e. Flood Zone B). In addition, the development is considered a 'Highly Vulnerable Development' under 'The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009). Therefore the scheme must meet the criteria of the Justification Test.

Regarding the Justification Test, it has been demonstrated that the proposed development has been identified as critical infrastructure in terms of regional policy and local development plans. In addition the flood risk assessment has addressed a series of criteria which has been satisfied by the proposed development.

7.2 Recommendations

It has been concluded that both flood risks and impacts associated with the proposed development are low and negligible, and the Justification Test has been satisfied.

It is recommended that any negligible impacts to the ground water be mitigated against in the design of the required earthworks.

Therefore, as the negligible impacts of flooding can be mitigated, it is recommended that further detailed modelling, i.e. Stage 3 Detailed Risk Assessment is not required.

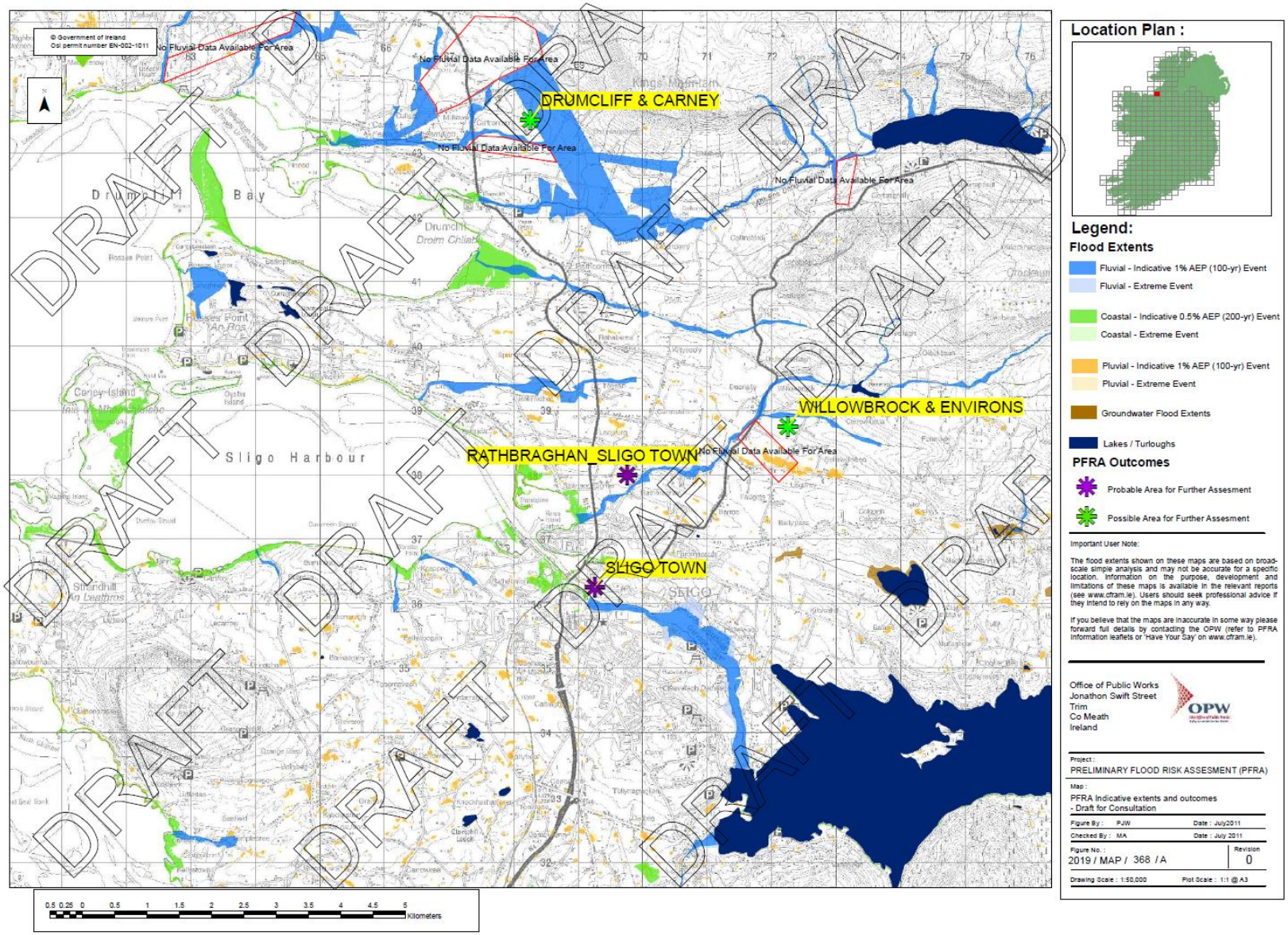
Appendix A. Information Sources Checklist

No.	Information Source	Status	Reference/Comments
1	OPW Preliminary Flood Risk Assessment indicative fluvial flood maps	√	Western CFRAMS Preliminary Flood Risk Assessment Maps – Appendix B
2	National Coastal Protection Strategy Study flood and coastal erosion risk maps.	√	Irish Coastal Protection Strategy Study (ICPSS): Phase 5 – North West Coast Flood Extent and Flood Depth Maps – Appendix C, Appendix D
3	Predictive and historic flood maps, and Benefiting Lands Map	√	
4	Predictive flood maps produced under the CFRAM studies	√	
5	River Basin Management Plans and reports	X	
6	Indicative assessment of existing flood risk under Preliminary Flood Risk Assessment	X	Western CFRAMS Flood Risk Review for Sligo Town – Appendix G
7	Previous Strategic Flood Risk Assessments.	N/A	
8	Expert advice from OPW who may be able to provide reports containing the results of detailed modelling and flood-mapping studies including critical damage areas, and information on historic flood events and local studies etc.	N/A	
9	Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques.	√	

No.	Information Source	Status	Reference/Comments
10	Information on flood defence condition and performance	√	
11	Alluvial deposit maps	N/A	
12	'Liable to Flood' markings on the old 6" Inch Map	√	Historic OSI 6" Map - Appendix E
13	Local Libraries and newspaper reports	√	Adequate information on Flooding History was provided by OPW floodmaps.ie.
14	Interviews with local people, local history/ natural history societies etc;	X	
15	Walkover survey to asses potential sources of flooding, likely routes for flood water and the site's key features, including flood defences, and their condition	X	
16	National , regional and local spatial plans, such as the National Spatial Strategy, regional planning guidelines, development plans and local area plans provide key information on existing and potential future receptors	√	The following Plans were referred to: 1) Sligo County Development Plan 2011 – 2017 2) Sligo and Environs Development Plan 2010 – 2016 Relevant Local Area Plans

Table 6: Information Checklist Table

Appendix B. OPW Preliminary Flood Risk Assessment indicative fluvial & coastal flood maps



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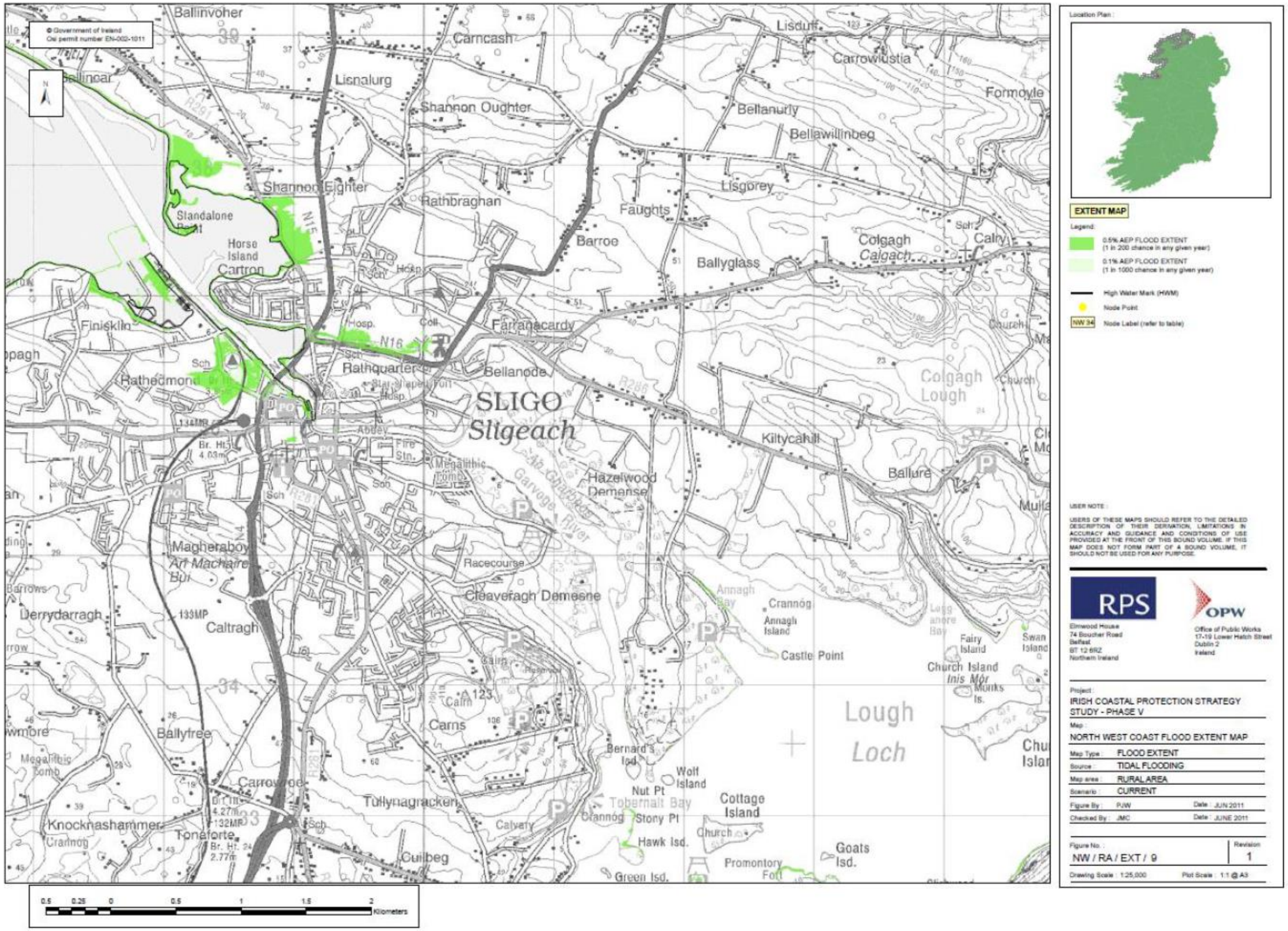
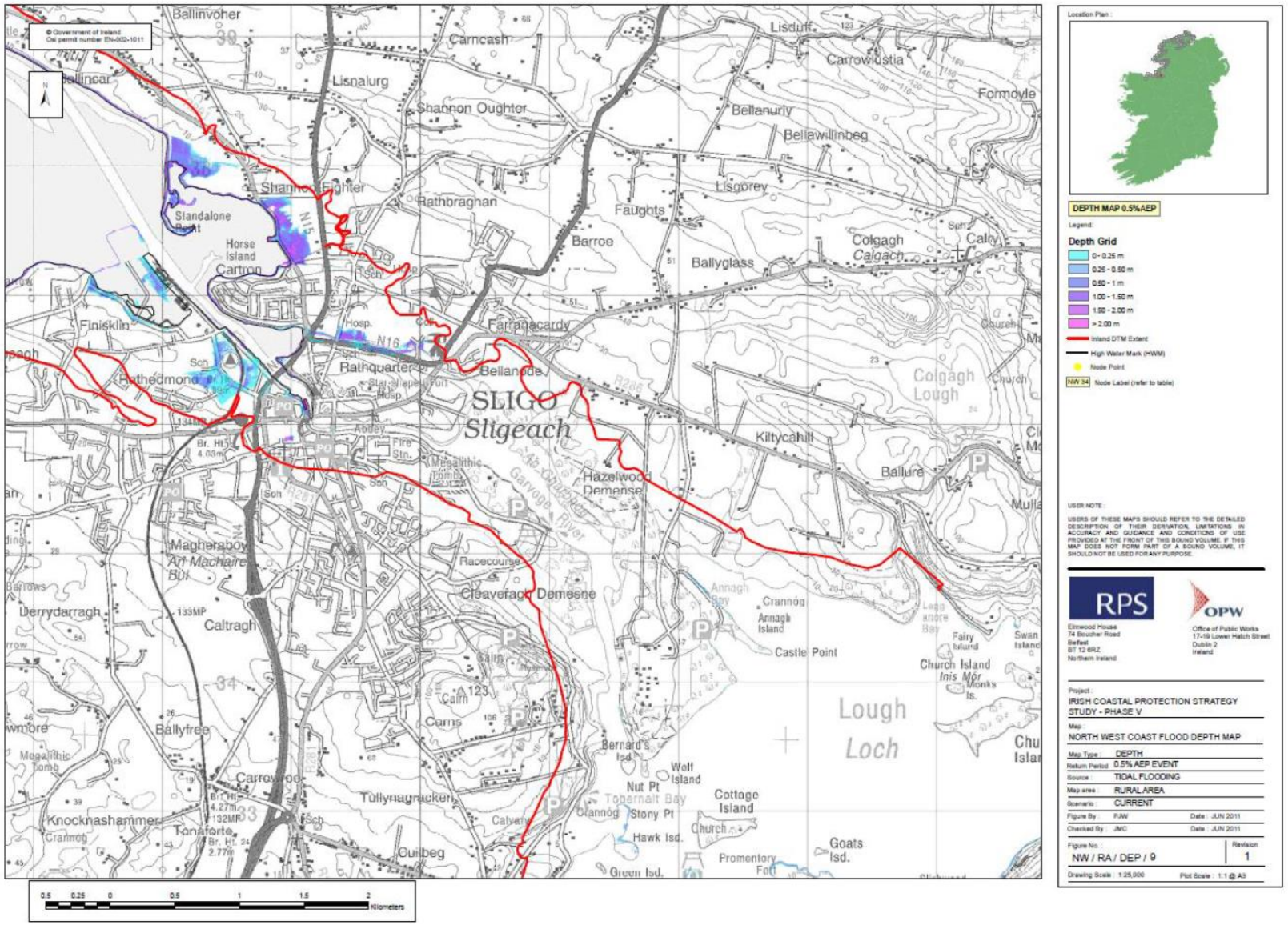
JACOBS

Appendix C. Irish Coastal Protection Strategy Study: Phase 5 – North East Coast Flood Extent Map



Location Plan :
EXTENT MAP
Legend:
0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
High Water Mark (HWM)
Node Point
NW 34
Node Label (refer to table)
USER NOTE :
USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.
Elmwood House
74 Boucher Road
Belfast
BT 12 6RZ
Northern Ireland
Office of Public Works
17-19 Lower Hatch Street
Dublin 2
Ireland
Project : IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE V
Map : NORTH WEST COAST FLOOD EXTENT MAP
Map Type : FLOOD EXTENT
Source : TIDAL FLOODING
Map area : RURAL AREA
Scenario : CURRENT
Figure By : PJW
Date : JUN 2011
Checked By : JMC
Date : JUNE 2011
Figure No. : NW / RA / EXT / 9
Revision 1
Drawing Scale : 1:25,000
Plot Scale : 1:1 @ A3
SLIGO
Sligeach
Lough Loch
Kilometers

Appendix D. Irish Coastal Protection Strategy Study: Phase 5 – North West Coast Flood Depth Map


© Government of Ireland
Ordnance Survey permit number EN-002-1011
Ballinvoher
Carncash
Lisduff
Carrowlustia
Formoyle
Lisnalurg
Shannon Oughter
Bellanurly
Bellawillinbeg
Shannon Fighter
Rathbraghan
Faughts
Lisgorey
Standalone Boat
Horse Island
Carron
Barroe
Ballyglass
Colgagh
Calgagh
Caley
Finisklin
Farranacardy
Rathquarter
Bellanode
Rathedmond
SLIGO
Sligeach
Colgagh Lough
Kiltycahill
Ballure
Hazelwood Demesne
Magheraboy
An Machaire Buí
Racecourse
Cleaveragh Demesne
Derrydarragh
Caltragh
Crannóg
Annagh Island
Castle Point
Church Island
Inis Mór
Monks Is.
Lough
Loch
Ballyfree
Carrowroe
Tullynagracken
Knocknashammer
Cranmore
Tonaforte
Culbeg
Bernard's Isd.
Wolf Island
Nut Pt
Topernait Bay
Stony Pt
Cottage Island
Hawk Isd.
Goats Isd.
Promontory Fort
Green Isd.
Kilometers
Location Plan :
DEPTH MAP 0.5%AEP
Legend:
Depth Grid
0 - 0.25 m
0.25 - 0.50 m
0.50 - 1 m
1.00 - 1.50 m
1.50 - 2.00 m
> 2.00 m
Inland DTM Extent
High Water Mark (HWM)
Node Point
NW 34 Node Label (refer to table)
USER NOTE :
USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.
RPS
Elmwood House
74 Boucher Road
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17-19 Lower Hatch Street
Dublin 2
Ireland
Project :
IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE V
Map :
NORTH WEST COAST FLOOD DEPTH MAP
Map Type : DEPTH
Return Period : 0.5% AEP EVENT
Source : TIDAL FLOODING
Map area : RURAL AREA
Scenario : CURRENT
Figure By : PJW Date : JUN 2011
Checked By : JMC Date : JUN 2011
Figure No. : NW / RA / DEP / 9
Revision : 1
Drawing Scale : 1:25,000
Plot Scale : 1:1 @ A3

Appendix E. Historic Flood Maps: OSI Historic 6" Map


Rathcormack
Drum
1096
1524
Rosses Point
Doonweelin L.
60
192
143
290
Sch.
Doonally Ho.
Oyster Isd.
110
Willsborough
713
Keelogyboy
1430
1367
1316
Standalone Pt.
Cummeen Strand
Pier
35
316
Colgagh
R.C.C.
SLIGO
Ballyglass Ho.
213
Cummeen
Farmhill
Five Mile Bourn
Ch.
Doon L.
692
Woodville Ho.
Rathcarrick Ho.
Magheraboy
119
347
327
Castles
182
Cleaveragh
Hazelwood Ho.
Holywell
20W
183
Belvoir
392
Rathanna Ho.
LOUGH GILL
Church Isd.
468
Carrigeen
Carrowmore
Grange Ho.
174
Knocknahur
Cloverhill Ho.
165
Cottage Isd.
162
68
115
232
Brecoge
Eagle Lo.
967
Slish Wood
761
17
84
Abbey
DRUMAHAIRE
Spring Villa

Appendix F. Western CFRAM Study - Flood Risk Review for Sligo Town: Site Assessment Report

SITE ASSESSMENT

Job Title:	**Western CFRAM**	JBA Job number:	2011s5232
		Sheet number:	1 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

Name: Sligo	**County:** Sligo	**HA:** 35	**Unique ID:** 350561
Source of Flooding (Fluvial /Tidal): Fluvial/Tidal		**Type:** AFA	
Visit By: Sam Willis		**Date of Visit: 26/09/2011**	

PFRA Data / Comments:
Predictive assessment indicates potentially significant flood risk exists (FRI Total > 250). No strong evidence against inclusion as an APSR

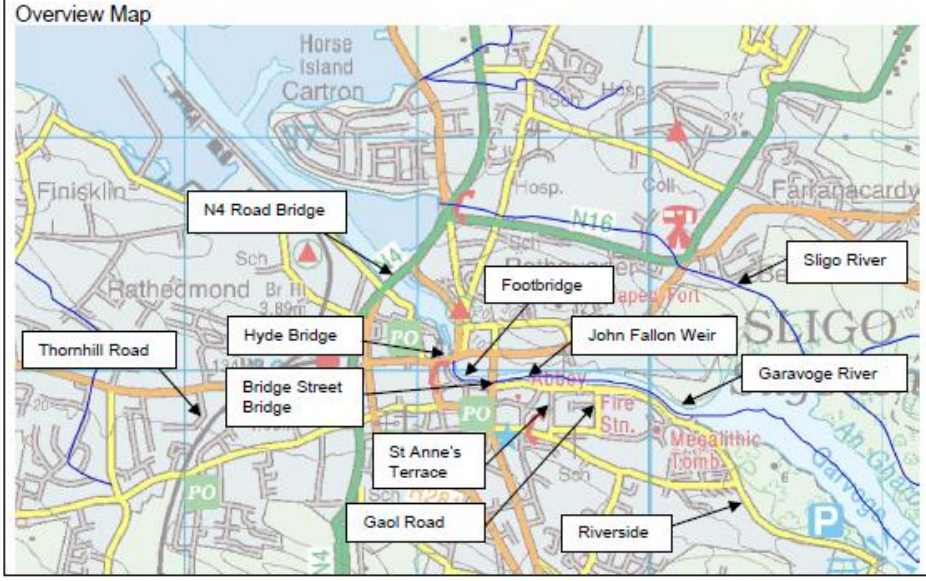
PFRA Database Comments:
OPW comments
No comment in database.

LA comments
Large population in these areas likely to be at risk. IT College Boundary at Risk from high tide & N16 area not included on OPW Map of APSR area at risk of flooding. (Copper River / Old Canal). Docklands area large part reclaimed from sea, site of large wastewater treatment plant.

Watercourses / Flood Sources:
The bulk of the risk is along the banks of the Garavoge with some additional risk along the Sligo River. The downstream reaches of both these watercourses and along the coastline are at risk from tidal flooding.

Maps:
See Flood Risk Review Map below.

Overview Map



SITE ASSESSMENT

Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	2 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

Flood Outlines and Receptors:

FRI Receptors	FRI Score
Total Fluvial	2828.1
Total Tidal	3108.75
Residential Fluvial	1832.1
Commercial Fluvial	834.4
Archaeological Regional Fluvial	104.1
Archaeological National Fluvial	2.5
Museum Medium Vulnerability Fluvial	25
Monument Low Vulnerability Fluvial	30
Residential Tidal	1240.13
Commercial Tidal	1274.93
Post Primary Education Tidal	34.25
Government Low Vulnerability Tidal	27.4
Non-core Exchange Tidal	1.37
Ports Tidal	342.5
Archaeological Regional Tidal	85.22
Archaeological National Tidal	68.5
Museum Medium Vulnerability Tidal	34.25
Monument Low Vulnerability Tidal	0.2
Total FRI Score	5936.85

Comment on Flood Outlines:

The bulk of the flood risk in the flood extents is within Sligo centre. The extents show a clear delineation between fluvial flood risk upstream of Hyde Bridge and tidal flood risk downstream.

There is no fluvial flood risk shown in the extents from the Sligo River.

There is limited variation between the 10% AEP and 1% AEP fluvial flood extents in the areas of interest.

Defence Assets and Structures:

The following significant defence assets and structures were identified at the site that could potentially impact on flood risk:

Raised wall on downstream face of N4

Raised wall of right bank of Garavoge River downstream of Hyde Bridge

SITE ASSESSMENT

Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	3 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

Hyde Bridge on Garavoge River

Weir and fish pass upstream of Hyde Bridge on Garavoge River

Vertical retaining walls on both banks of the Garavoge River through Sligo Town

Bridge Street Bridge on Garavoge River

John Fallon Weir and control structures on Garavoge River

Sligo River culvert beneath N4 has historically blocked and caused flooding

SITE ASSESSMENT

Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	4 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

Raised wall left bank of Sligo River upstream of N4

Culvert beneath entrance to IT park on Sligo River

Environmental Impacts & Opportunities:

The Garavoge River, part of the Lough Gill SAC and pNHA flows through the Sligo site. Lough Gill SAC is designated for its natural eutrophic lakes, sessile oak woodlands and alluvial forests, along with a range of riverine species (e.g. lampreys, Salmon, Otter and White-clawed Crayfish).

Generally the habitats for which the Lough Gill SAC is designated are of low vulnerability to flooding, being waterlogged habitats tolerant of periodic inundation, with the exception of sessile oak woodlands.

The species for which the Lough Gill SAC is designated may be adversely affected by flooding, particularly during their breeding seasons through disturbance to spawning gravels or flooding of holts. The site is also susceptible to water quality issues, particularly associated with agricultural activities, and in-channel flood risk management works could potentially have a significant impact.

This river discharges into Sligo Bay which is designated as part of the Cummeen Strand/Drumcliff Bay SAC and pNHA/Cummeen Strand SPA. The SAC is designated for a range of coastal habitats, petrifying springs and Juniper formations.

These habitats are generally subject to tidal influence and natural flooding and therefore of low vulnerability. The exceptions to this are the stable sand dune habitats where coastal flooding could cause a change in habitat structure and Juniper formations which are intolerant of flooding.

The SAC is also designated for Common Seal, which are of low vulnerability to flooding as it is likely that they will be able to readily adapt, and Narrow-mouthed Whorl Snail which are very sensitive to hydrological changes.

The Cummeen Strand SPA is designated for several species of seabird and wader. The impact of flooding on these SPA species is generally low, although some wading species could be adversely impacted upon by inundation of intertidal feeding and roosting areas which require populations to move elsewhere.

The site contains numerous sites of heritage interest, including 66 monuments and 349 buildings listed on the NIAH, predominantly in Sligo town centre.

Floodmaps.ie Data:

Sligo Borough Area Engineer Meeting Minutes – 15/12/2005

- *Road flooding during periods of heavy rain due to low point in the road combined with lack of capacity in surface water network. – Recurring. Flood ID 4979*
- *Land flooding during high tides combined with debris build backing up occurs and causes land to flood. – Recurring. Flood ID 4980*
- *Historical flooding of college due to blockage in discharge to the sea. Flood ID 4981*

All the above relate to the Sligo watercourse to the north of the site. The records highlight the importance of tidal influences and debris build up at this site.

Sligo County Council Office Meeting Minutes – 10/11/2005

SITE ASSESSMENT

Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	5 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

- *Road flooding at Finisklin road during extreme high tides and heavy rain. Rare event. – recurring Flood ID 4949*
- *Car park flooding in vicinity of Lower Quay Street, Sligo City during periods of extreme spring tides combined with high winds. It is a rare event. Flood ID 4950*
- *Road flooding at Fish Street, Sligo City, during extreme spring tides and high onshore winds. Rare event Flood ID 4951*

The above incidents are all to the south of the Garavoge watercourse to the south of the site. Again the events highlight the importance of the tidal influence in the area. Two of the three above incidents do not fall within the flood risk outlines.

Sligo County Council Office Meeting Minutes – 10/11/2005

- *Road flooding on coastal road L75011 in vicinity of Gibraltar point due to overtopping by heavy seas. – recurring Flood ID 4954*

The above shows overtopping along the coast.

North Sligo Area Engineer Meeting Minutes – 10/11/2005

- *Land flooding adjacent to R284, suspected mini turlough only appears during heavy rainfall. – Recurring Flood ID 4998*
- *Land flooding adjacent to R284, at rear of garage. Suspected turlough. Works have been carried to alleviate problem and it appears to be fixed. Flood ID 4999*

The above are related to flood risk to the R284 and do not appear to be related to a specific watercourse.

Flooding in Sligo Strandhill area, Nov 2009 – this file reflects flooding along the coastline and to the south of the site on the R281 but was corrupted and could not be retrieved from the website.

Other Relevant Information (e.g. web search, SFRA, other OPW studies and supplied data):

June 11 2007

Roads and footpaths were quickly swamped and commercial outlets in Adelaide Street were flooded as three units of the Sligo Fire Service spent almost three hours battling the rising waters.

The fire service responded to calls at Adelaide Street, the Market Yard, Knappagh Road, Cranmore Place, Larkhill Road and Cleveragh Road.

And, further flooding was reported at St. Joseph's Terrace, the Pilkington Terrace junction with Pearse Road and along Riverside, at the junction with Jail Road.

Paul Ryan of the Sligo Fire Service told The Sligo Champion that problems developed when the sudden amount of water, combined with a full tide, lifted manholes and brought debris into drains.

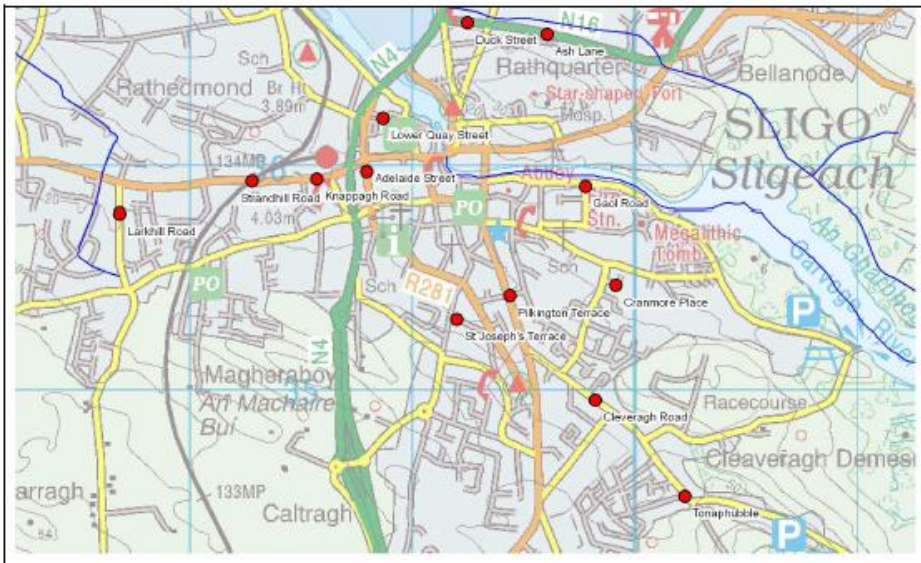
Unknown Date

Strandhill Road blocked at the railway. Flooding also reported at Duck Street, the Cartron/ Rosses Point Road, Ash Lane, Tonaphubble and Lower Quay Street.

A summary of the locations highlighted in the web search are detailed below.

SITE ASSESSMENT

Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	6 of 8
Site Name:	Sligo	UM Approval:	Sam Willis



Discussions with Key Stakeholders:

Telephone conversation with, OPW, on 19th September 2011.

- *There will be tidal flood risk along the quays.*
- *Historically there has been flooding on the left bank between the Bridge Street Bridge and the footbridge. Work was undertaken to raise the levels of the road on the left bank and this has stopped flooding.*

Meeting with Sligo County Council on 30th September 2011

- *Flooding has occurred on left bank of Sligo River immediately upstream of the N4 as a result of a blockage in the N4 culvert.*
- *Quay Street car park has historically flooded*
- *Fish Street floods and there is a car park with a basement in this location which also floods*
- *As flows on the Garavoge River increase the Bridge Street Bridge becomes the key hydraulic control*
- *There is a surface water flooding problem at the junction of St Anne's Terrace and Riverside*
- *An extreme flood event (1% AEP) could potentially reach the Riverside Road level upstream of Gaol Road but is unlikely to exceed it*
- *The marsh land in the upstream reaches of Sligo River is expected to flood*
- *There are surface water flooding problems on the estate between Cranmore Drive and McNeill Drive*
- *Surface water runs along the railway line and has flooded a property on Thornhill Road*

Conversation with employee in Fiddlers Creek Bar upstream on left bank upstream of Stephens Street Bridge

- *No known flooding.*

Conversation with employee in Pepper Alley Sandwich Bar upstream on left bank upstream of Stephens Street Bridge

- *No known flooding.*

SITE ASSESSMENT

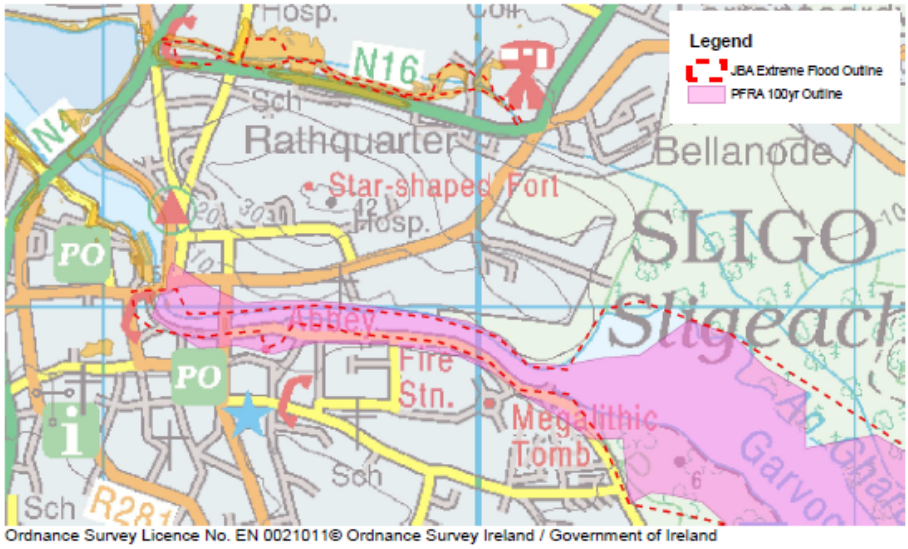
Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	7 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

Site Visit Findings:

The Garavoge River is a significant watercourse but its potential to increase in water level and affect properties is expected to be largely moderated Lough Loch located immediately upstream. This assertion is supported by the lack of any historical fluvial flooding identified affecting properties within Sligo town. Similarly Sligo County Council has indicated that water levels are expected to remain at or below the level of Riverside Road during the 1% AEP event.

The Sligo River is considered to be more prone to flooding although again historical flooding on this watercourse is limited to a blockage incident on the N4 culvert at its downstream limit which affected properties in this location.

In both cases given the limited evidence of properties flooding at the site it is considered the 10% AEP outline in this area should include properties at the downstream of the Sligo River only. Amendments to the extreme outline to reflect the findings for Sligo River and feedback from the council on the Garavoge are shown below.



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There is however documented tidal flood risk to the downstream limits of the Garavoge and Sligo Rivers and along the coastline. The latest tidal flood maps completed as part of the PFRA are considered realistic and therefore the flood risk areas shown in these has been left unchanged. These show 22 residential and 9 commercial properties in the 10% AEP outline.

It has also been highlighted through discussions with the local council that surface water flooding is an ongoing problem within Sligo. The site however did not score in excess of 150 in the pluvial flood risk assessment completed as part of the PFRA.

Summary:

The review of the historical data and discussions with local authorities and residents indicate there is limited evidence of frequent fluvial flooding at the site. There is however evidence of tidal flood risk at the site and the review of the tidal outlines suggest these are reasonable.

It is noted that the PFRA outlines treat fluvial and tidal flood risk as independent; in the case of Sligo the combined probability reach of interest is expected to fall in the centre of Sligo a short

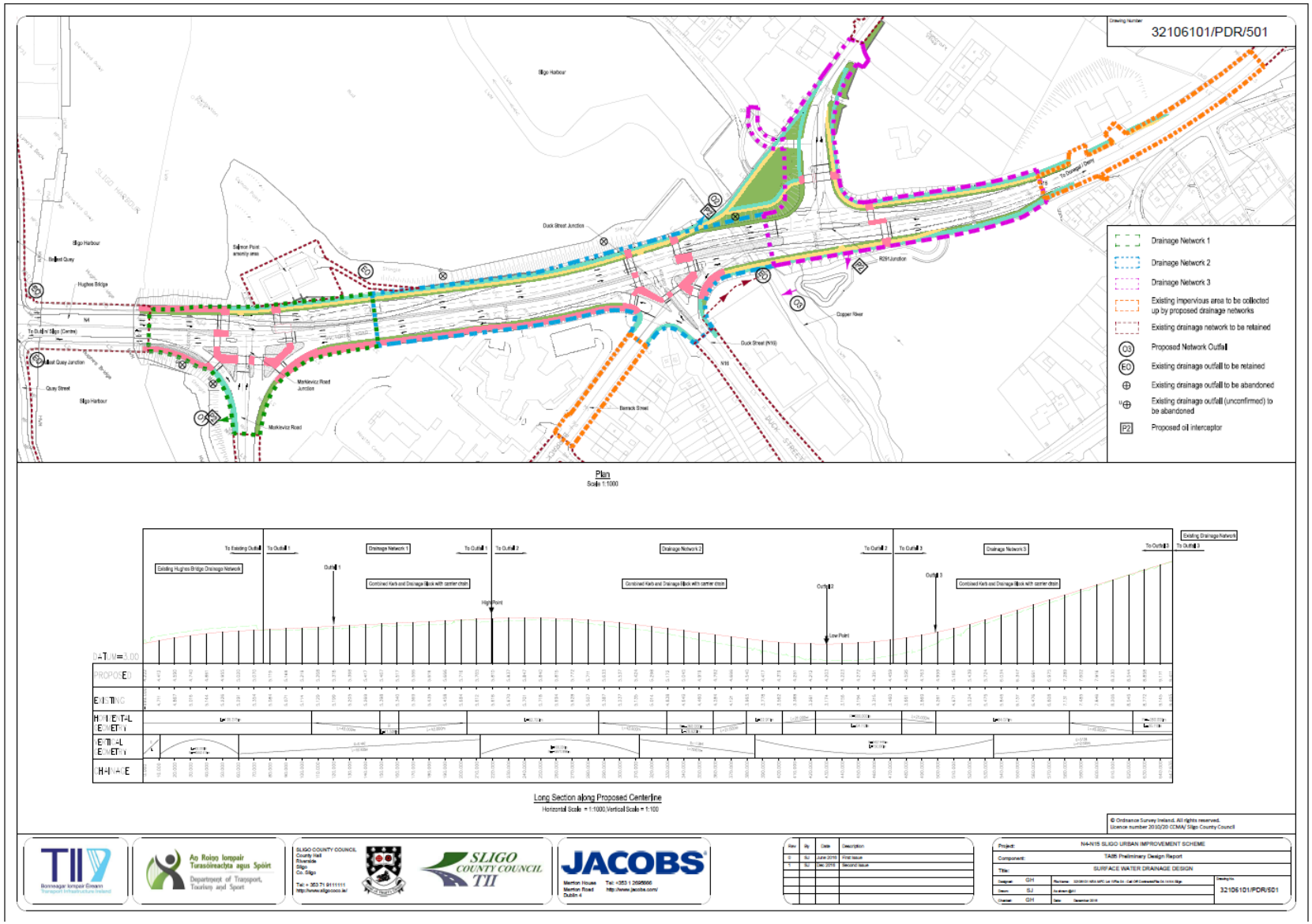
SITE ASSESSMENT

Job Title:	Western CFRAM	JBA Job number:	2011s5232
		Sheet number:	8 of 8
Site Name:	Sligo	UM Approval:	Sam Willis

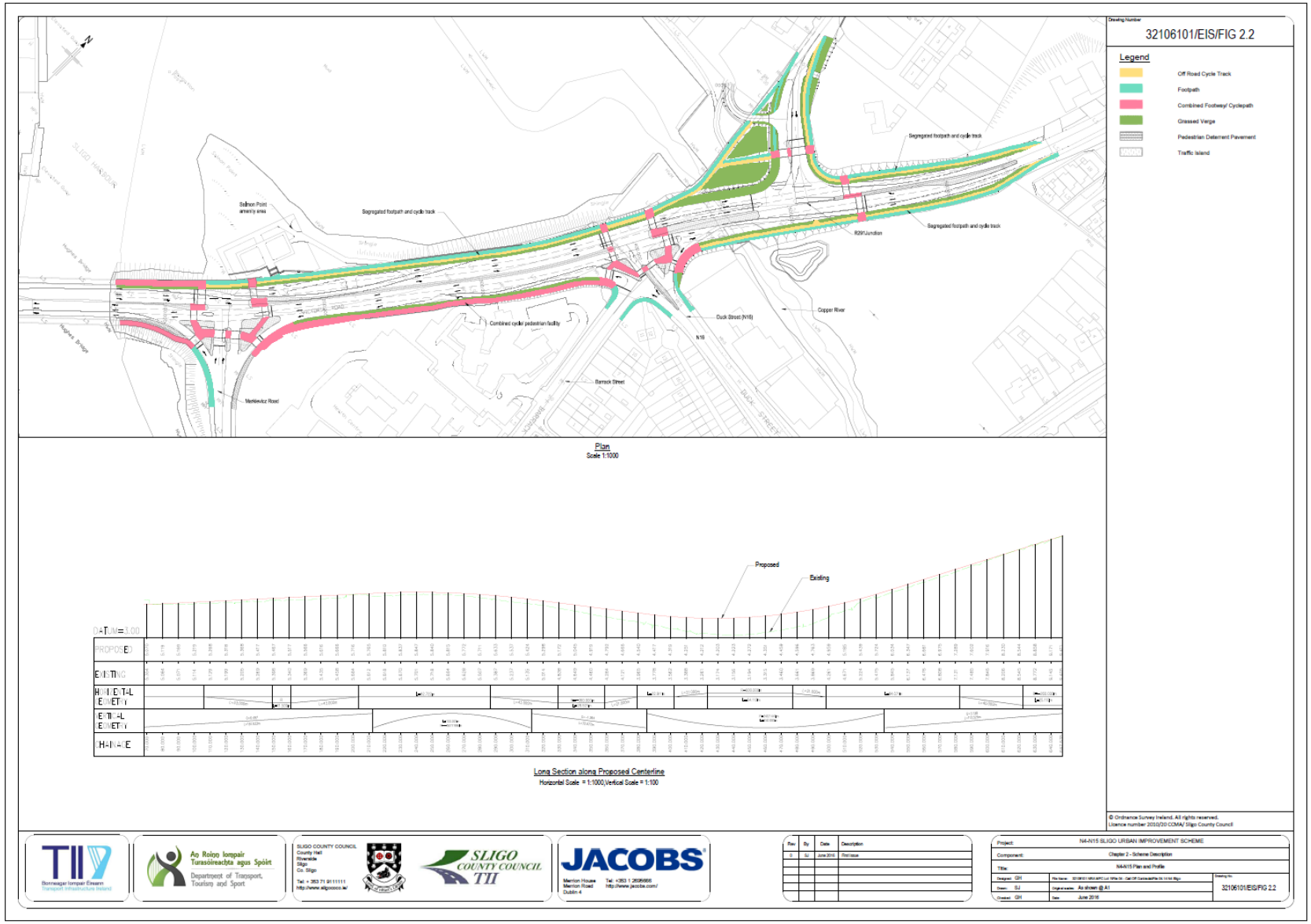
distance upstream of Hyde Bridge. The density of properties and people in this area suggest it will be critical to get a full understanding of risk in this area. The number of properties affected by tidal flooding and the risk associated with a joint probability event indicate a score in excess of 250 for this site is appropriate and the site should remain an AFA.	
Recommended FRR Status	**AFA**

Appendix G. Proposed Development Drainage Layout

Document No.


32106101/PDR/501
Drainage Network 1
Drainage Network 2
Drainage Network 3
Existing impervious area to be collected up by proposed drainage networks
Existing drainage network to be retained
Proposed Network Outfall
Existing drainage outfall to be retained
Existing drainage outfall to be abandoned
Existing drainage outfall (unconfirmed) to be abandoned
Proposed oil interceptor
Plan
Scale 1:1000
Long Section along Proposed Centerline
Horizontal Scale = 1:1000,Vertical Scale = 1:100
SLIGO COUNTY COUNCIL
JACOBS
N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
TABS Preliminary Design Report
SURFACE WATER DRAINAGE DESIGN
32106101/PDR/501

Appendix H. Long Section of Finished Road Levels


32106101/EIS/FIG 2.2
Legend
Off Road Cycle Track
Footpath
Combined Footway/ Cyclepath
Grassed Verge
Pedestrian Deterrent Pavement
Traffic Island
Segregated footpath and cycle track
Combined cyclist pedestrian facility
Duck Street (N16)
Barrack Street
Merlin Woods Road
R291 Junction
Copper River
Plan
Scale 1:1000
Proposed
Existing
DATUM=3.00
PROPOSED
EXISTING
HORIZONTAL GEOMETRY
VERTICAL GEOMETRY
CHAINAGE
Long Section along Proposed Centerline
Horizontal Scale = 1:1000,Vertical Scale = 1:100
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TII
Department of Transport, Tourism and Sport
SLIGO COUNTY COUNCIL
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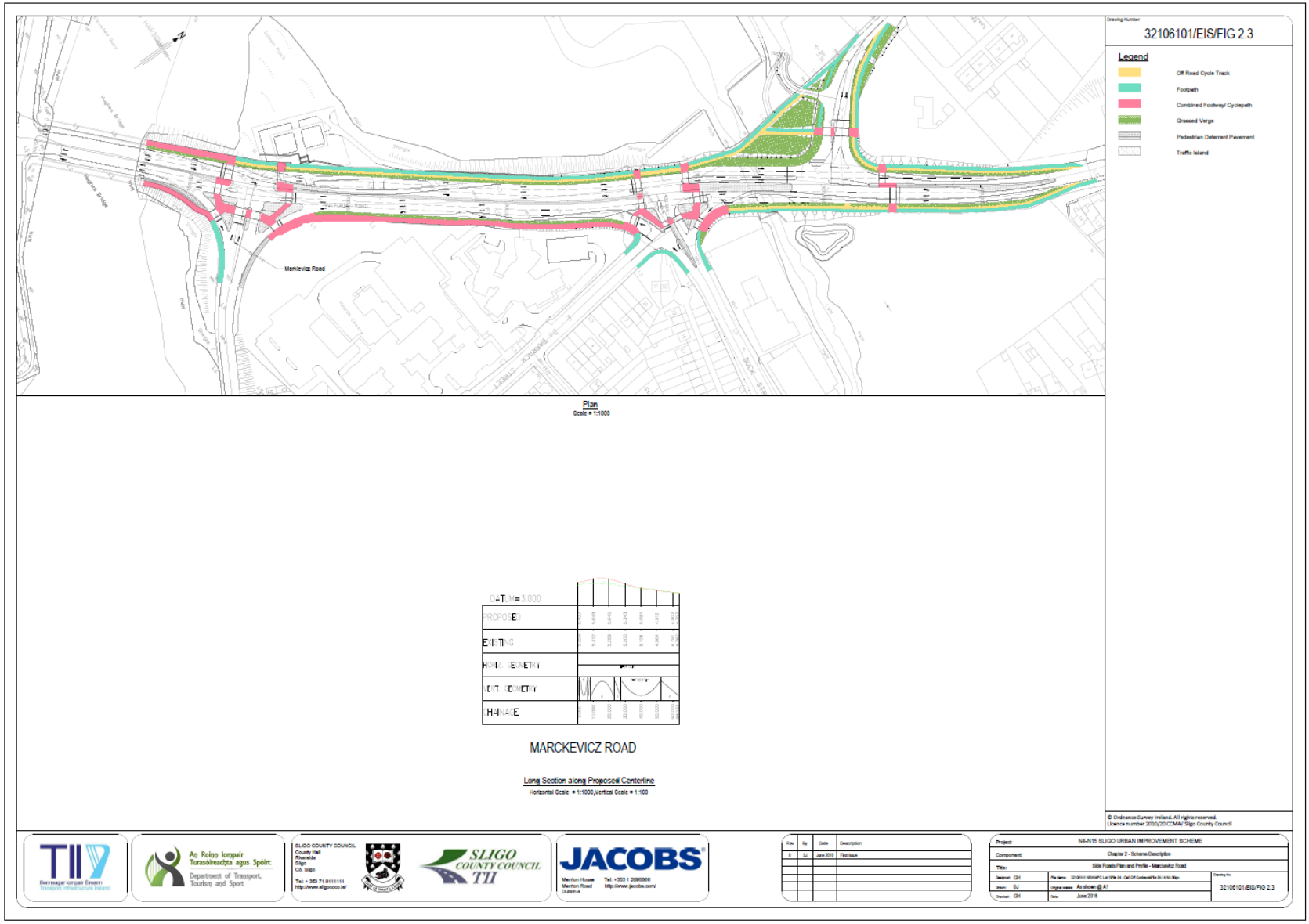
JACOBS
Project: N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
Component: Chapter 2 - Scheme Description
Title: N4-N15 Plan and Profile
Original scale: As shown @ A1
Date: June 2016
32106101/EIS/FIG 2.2

JACOBS


32106101/EIS/FIG 2.3
Legend
Off Road Cycle Track
Footpath
Combined Footway/ Cyclepath
Grassed Verge
Pedestrian Deterrent Pavement
Traffic Island
Markievicz Road
Plan
Scale = 1:1000
DATUM= 3.000
PROPOSED
EXISTING
HORIZ. GEOMETRY
VERT. GEOMETRY
CHAINAGE
MARCKEVICZ ROAD
Long Section along Proposed Centerline
Horizontal Scale = 1:1000,Vertical Scale = 1:100
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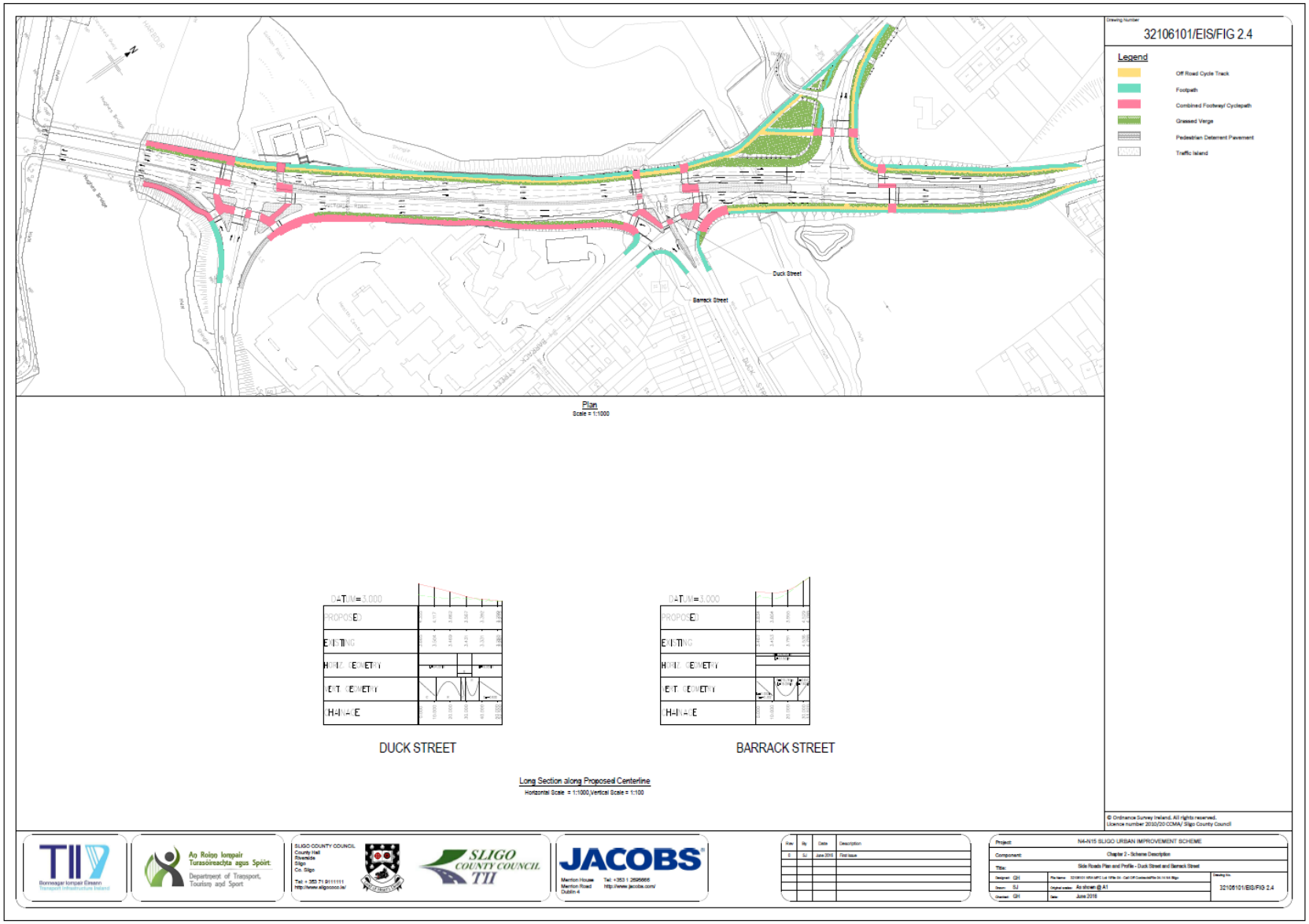
JACOBS
Project: N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
Component: Chapter 2 - Scheme Description
Title: Side Roads Plan and Profile - Marckievicz Road
Original scale: As shown @ A1
Date: June 2018
32106101/EIS/FIG 2.3


32106101/EIS/FIG 2.4
Legend
Off Road Cycle Track
Footpath
Combined Footway/ Cyclepath
Grassed Verge
Pedestrian Deterrent Pavement
Traffic Island
Duck Street
Barrack Street
Plan
Scale = 1:1000
DATUM = 0.000
PROPOSED
EXISTING
HORIZ. GEOMETRY
VERT. GEOMETRY
CHAINAGE
DUCK STREET
DATUM = 0.000
PROPOSED
EXISTING
HORIZ. GEOMETRY
VERT. GEOMETRY
CHAINAGE
BARRACK STREET
Long Section along Proposed Centerline
Horizontal Scale = 1:1000,Vertical Scale = 1:100
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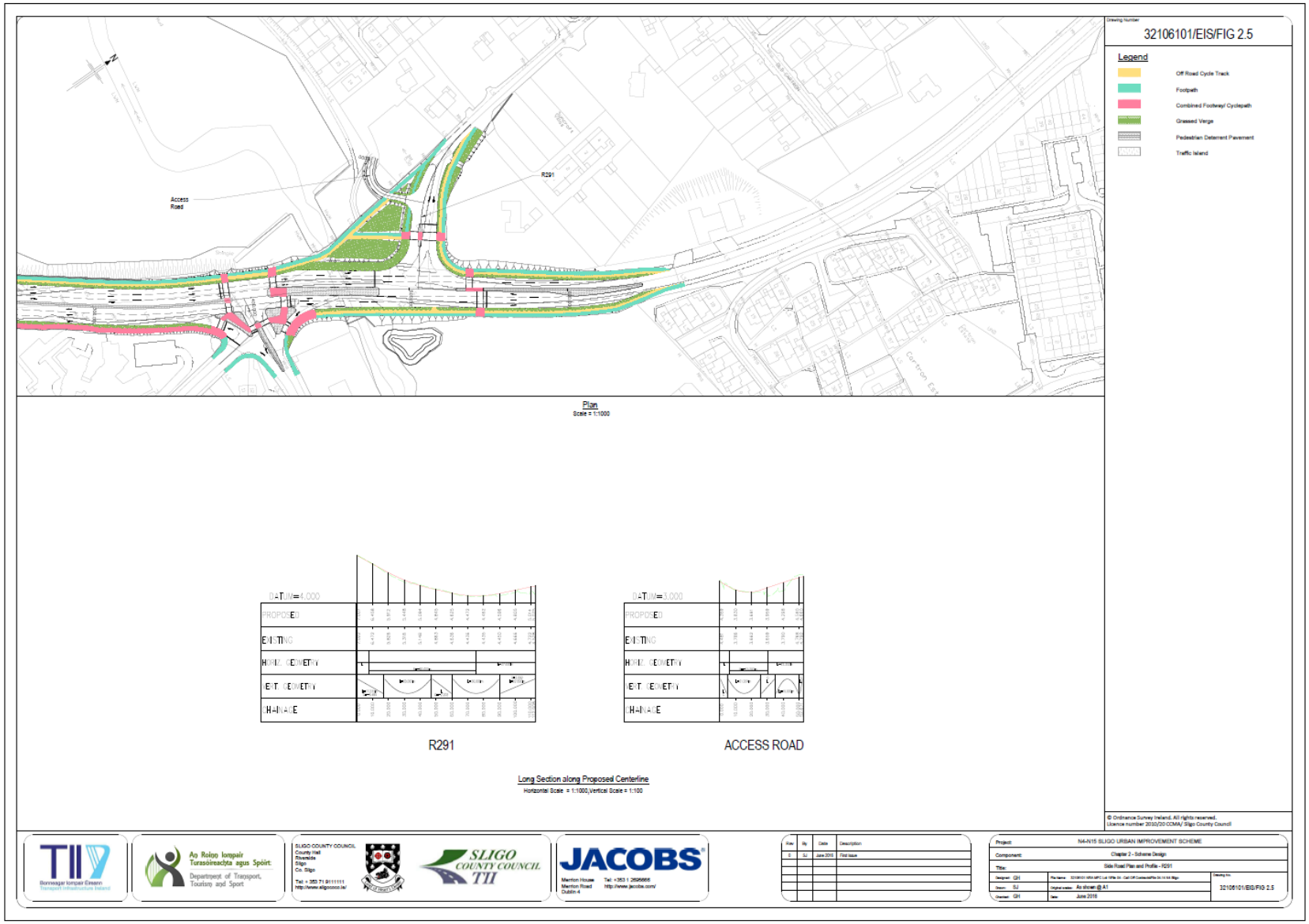
JACOBS
Merrion House
Merrion Road
Dublin 4
Tel: +353 1 2696666
http://www.jacobs.com/
Project: N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
Component: Chapter 2 - Scheme Description
Title: Side Roads Plan and Profile - Duck Street and Barrack Street
Designed: GH
Drawn: SJ
Checked: GH
Original scale: As shown @ A1
Date: June 2018
32106101/EIS/FIG 2.4


32106101/EIS/FIG 2.5
Legend
Off Road Cycle Track
Footpath
Combined Footway/ Cyclepath
Grassed Verge
Pedestrian Deterrent Pavement
Traffic Island
Access Road
R291
Plan
Scale = 1:1000
DATUM=4.000
PROPOSED
EXISTING
HORIZ. GEOMETRY
VERT. GEOMETRY
CHAINAGE
R291
DATUM=3.000
PROPOSED
EXISTING
HORIZ. GEOMETRY
VERT. GEOMETRY
CHAINAGE
ACCESS ROAD
Long Section along Proposed Centerline
Horizontal Scale = 1:1000,Vertical Scale = 1:100
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JACOBS
Project: N4-N15 SLIGO URBAN IMPROVEMENT SCHEME
Component: Chapter 2 - Scheme Design
Title: Side Road Plan and Profile - R291
Drawing No: 32106101/EIS/FIG 2.5

Appendix 6.2 IFI Consultation Response

Iascach Intíre Éireann
Inland Fisheries Ireland

21 Dec 2015

Jacobs Engineering Ireland Limited
ACTION
RECEIVED
7 DEC 2015
ACTION COMPLETE | DATE | INITIAL
PM APROVAL TO FILE
FILE NO.

Ms Sarah Kiernan
Jacobs Engineering Ireland Ltd.
Merrion House
Merrion Road
Dublin 4

RE: **N4-N15 Sligo Urban Improvement Scheme – Environmental Impact Assessment Consultation**

Dear Ms Kiernan,

I refer to the design stage of the N4-N15 Sligo Urban Improvement Scheme in Sligo city. IFI welcomes this opportunity for consultation and would like to make the following comments:

This project has the potential to impact on two water bodies; Sligo Harbour/Garvogue Estuary and the Copper River. Sligo Harbour/Garvogue Estuary is an important migratory route for a number of fish species. The adjoining Lough Gill SAC is of considerable importance for the presence of four Red Data Book fish species that are listed on Annex II of the E.U. Habitats Directive - Brook Lamprey, River Lamprey, Sea Lamprey and Atlantic salmon. The three migratory species of the above – salmon, river and sea lamprey use Sligo Harbour during migrations to and from Lough Gill SAC. Lough Gill holds stocks of both salmon and trout and is popular for angling. Salmon stocks have improved in the last number of years in Lough Gill. Restrictions have been lifted on anglers and IFI aim to maintain this improvement in salmon stocks into the future. The Copper River provides habitat for salmonids but the fish stock status of the river is uncertain. IFI proposes that a comprehensive survey of this river be carried out prior to commencement of works. Both of these systems drain into the Cummeen Strand/Drumcliffe Bay SAC.

The impact of road improvement works on natural watercourses can be minimised by applying sound design principles and following good work practices. The most common and potentially serious impacts are as follows:

Discharge of polluting materials during construction and operational phase:

There are several types of water pollution that can occur during road improvement works. Sedimentation can cause mortalities in fish of all ages, reducing abundance of food and impeding movement of fish. Certain types of construction materials (e.g. cement, concrete and grout) are toxic to fish. There is also the potential for the release of oils and fuels, which can have a direct impact on fish, fish food and fish habitat.

- Prior to any earth works commencing, surface site drainage and silt control measures should be established. No run-off from machine servicing or concrete mixing areas should enter watercourses. Suitably designed and sited settlement ponds and filter channels may be required. All run-off from the working site or any areas of exposed soil should be channelled and intercepted at regular intervals for discharge to silt-traps or lagoons, with overflows directly to land rather than to a watercourse.

- Any construction work that involves the pouring of concrete should only be carried out in dry weather conditions. Pumped concrete should be monitored carefully to ensure no accidental discharge to watercourses. Mixer washings or excess concrete should not be discharged to surface waters.

Ceantar Abhantraí an Iarthair - Béal an Átha, Teach Árd na Rí, Sráid na Mainistreach, Béal an Átha, Co. Mhaigh Eo.
- Western River Basin District - Ballina, Ardnaree House, Abbey Street, Ballina, Co Mayo.
+ 353 (0)96 22788 - ballina@fisheriesireland.ie - www.fisheriesireland.ie

- Watercourse banks should be left intact if possible. If they have to be disturbed, all practicable measures should be taken to prevent soils from entering the watercourse. All in-stream earthworks should be executed so as to minimise the suspension of solids.

- Any stockpile areas for sands or gravels should be kept to a minimum size and well away from any watercourses. Fuels, oils, greases and hydraulic fluids must be stored in bunded compounds well away from any watercourses. Refuelling of machinery should be carried out off site. No oil containment unit should be located within 10m of any watercourse, the Copper River or Sligo Harbour.

- A Construction and Environmental Management Plan should be established by the contractor which should include silt control and pollution control measures during the construction period. An Emergency Response Plan should also be produced, in the event of a major spill or other significant discharge of polluting matter to surface waters.

In-stream works:

If in-stream works are required, these must not be carried out between 1 October and 1 May. Care should be taken to prevent disturbance or removal of bed material as this can cause loss of instream vegetation and food and may destroy spawning and nursery habitats. Disturbance of riparian vegetation should also be kept to a minimum in order to maintain shelter and a source of food for the fish population.

Barriers to migratory fish movement:

Poorly designed bridges or culverts can be a physical or hydraulic barrier to fish movement, and are likely to obstruct or delay upstream fish passage unless the depths and velocities in them are within the capabilities of the species to be catered for. Entry and exit conditions are also critical for ease of fish passage. Where clear span bridges are not suitable / practical IFI requests that bottomless culverts be the primary culvert of choice on stream/river crossings, as they allow for the natural streambed to be maintained.

Other matters for consideration:

The IFI guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development work" should be followed and is available at: http://www.fisheriesireland.ie/fisheries-management-1/90-requirements-for-the-protection-of-fisheries-habitat-during-construction-and-development-works-at-ri-1

Measures should be put in place to prevent the spread of invasive species as a result of these works being carried out. IFI provide a number of guidance documents on invasive species including a Bio-security Protocol which are available at: http://www.fisheriesireland.ie/Research/invasive-species.html

IFI look forward to reviewing the EIS in due course.

Yours sincerely

pp. Barry Kelly

John Conneely
Director

Road-N4N15-1215

Note : See updated to above consultation response in Chapter 5 Flora and Fauna.

Appendix 6.3 Water Quality Monitoring Results

			Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Analyte	Units	EC Env Objective (Surface Water Regs 2009)	SW01		SW02		SW03		SW04		SW05		SW06	
pH		Soft Water 4.5< pH < 9.0 pH Hard Water 6.0< pH < 9.0	8.1	8	8.3	8.2	7.7	8.3	8.2	8.1	8.3	8.1	8.2	*
DO	mg/l	95%ile >80% saturation lower saturation saturation Limit 95%ile <120% saturation upper klimit	9.1	10	9	10.8	9.3	10.4	9.2	10.2	9.3	10.2	9.2	*
Conductivity	us/cm	N/A	479	11400	315	2960	1230	3470	610	9550	1730	17900	1790	
Temperature		Not greater than a 1.5□C rise in ambient temperature outside the mixing zone	*	*	*	*	*	*	*	*	*	*	*	*
Copper, Filtered as Cu	ug/l	5 (water hardness ≤ 100) or 30 (water hardness < 100)	<9.00	<9.00	<9.00	<9.00	<9.00	<9.00	<9.00	<9.00	<9.00	<9.00	<9.00	*
Zinc , Total as Zn	ug/l	8 (water hardness ≤ 10 mg/l) or 50 (water hardness > 10 mg/l ≤ 100 mg/l)100µg/l elsewhere	21	38.3	42.2	40.3	<18.0	<18.0	<18.0	<18.0	<18.0	<18.00	<18.0	*
Total Hardness as CaCO3	mg/l	No Standard	151	1480	134	527	185	405	113	1140	238	2100	241	*
Ammoniacal Nitrogen as N	mg/l	< 0.065	<0.27	<0.41	<0.27	<0.41	<0.42	<0.41	<0.27	<0.41	<0.27	<0.41	<0.27	*
Nitrate as N	mg/l	No Standard	<0.42	<0.7	<0.42	<0.7	<0.42	<0.7	<0.42	<0.7	<0.42	<0.7	<0.42	*
Phosphate, Ortho as P	mg/l	< 0.035	<1.2	0.9	<1.2	<0.6	<1.2	<0.6	<1.2	<0.6	<1.2	<0.6	<1.2	*
Total Suspended Solids	mg/l	No Standard	4	N/A	2	4	5	7	8	8	6	13	8	*
EH >C6 - C40	ug/l	No Standard	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*
EH >C6 - C8	ug/l	No Standard	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*
EH >C8 - C10	ug/l	No Standard	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*
EH >C16 - C24	ug/l	No Standard	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*
EH >C24 - C40	ug/l	No Standard	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*
EH >C10 - C16	ug/l	No Standard	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*
BODS + ATU	mg/l	≤ 1.5 mg/l or ≤ 2.6 (95%ile) mg/l	<1	1	<1	2	<1	<1	<1	<1	<1	<1	<1	*

Appendix 6.4 HAWRAT Outputs

Outfall 1

Summary of predictions		Soluble - Acute Impact		Sediment - Chronic Impact							
		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Prediction of impact	Step1										
	Step2										
	Step3										

DETAILED RESULTS

In Runoff

Step 1

		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		RST24					Toxicity Threshold				
Allowable Exceedances/year		1	1	1	1	1	1	1	1	1	1
No. of exceedances/year		**69.50**	**57.20**	**88.20**	**116.00**	**2.20**	**49.20**	**113.20**	**49.20**	**23.40**	**92.80**
No. of exceedances/worst year		78	67	101	138	4	64	127	64	36	106
		RST6									
Allowable Exceedances/year		1	1								
No. of exceedances/year		**19.30**	**22.50**								
No. of exceedances/worst year		32	31								
		(ug/l)	*(ug/l)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(ug/kg)*	*(ug/kg)*	*(ug/kg)*	*(ug/kg)*	*(ug/kg)*
Thresholds	***RST24***	21	92	***Toxicity Threshold*** 197	315	3.5	16770	875	2355	245	515
Thresholds	***RST6***	42	184								
Event Statistics Mean		24.00	67.53	345	1189	1	16007	2769	2657	170	749
90%ile		45.95	144.85	760	2738	2	35481	6138	5890	376	1661
95%ile		57.54	191.09	999	3684	2	70795	12247	11752	750	3313
99%ile		90.93	346.16	1442	6003	4	89125	15419	14795	945	4171

In River (no mitigation)

Step 2

		Copper	Zinc
		RST24	
Allowable Exceedances/year		1	1
No. of exceedances/year		**0**	**0**
No. of exceedances/worst year		0	0
No. of exceedances/summer		0	0
No. of exceedances/worst summer		0	0
		RST6	
Allowable Exceedances/year		0.5	0.5
No. of exceedances/year		**0**	**0**
No. of exceedances/worst year		0	0
No. of exceedances/summer		0	0
No. of exceedances/worst summer		0	0
Annual average concentration (ug/l)		0.00	0.00
		(ug/l)	*(ug/l)*
Thresholds	***RST24***	21	92
Thresholds	***RST6***	42	184
Event Statistics Mean		0.00	0.00
90%ile		0.00	0.01
95%ile		0.00	0.01
99%ile		0.02	0.05

Velocity 0.02 m/s — Tier 1 is used for the calculation

DI 1.87

% settlement needed 0 %

In River (with mitigation)

Step 3

		Copper	Zinc
		RST24	
Allowable Exceedances/year		1	1
No. of exceedances/year		**-**	**-**
No. of exceedances/worst year		-	-
No. of exceedances/summer		-	-
No. of exceedances/worst summer		-	-
		RST6	
Allowable Exceedances/year		0.5	0.5
No. of exceedances/year		**-**	**-**
No. of exceedances/worst year		-	-
No. of exceedances/summer		-	-
No. of exceedances/worst summer		-	-
Annual average concentration (ug/l)		-	-
		(ug/l)	*(ug/l)*
Thresholds hresholds	***RST24***	21	92
Thresholds	***RST6***	42	184
Event Statistics Mean		-	-
90%ile		-	-
95%ile		-	-
99%ile		-	-

DI -

Details of the chosen rainfall site	
SAAR (mm)	**1205.3**
Altitude (m)	**32**
Easting	**2478**
Northing	**6642**
Coastal distance (km)	**28.25**

Outfall 2

Summary of predictions		Soluble - Acute Impact		Sediment - Chronic Impact							
		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Prediction of impact	Step1										
	Step2										
	Step3										

DETAILED RESULTS

In Runoff

Step 1

		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		RST24		Toxicity Threshold							
Allowable Exceedances/year		1	1	1	1	1	1	1	1	1	1
No. of exceedances/year		69.50	57.20	88.20	116.00	2.20	49.20	113.20	49.20	23.40	92.80
No. of exceedances/worst year		78	67	101	138	4	64	127	64	36	106
		RST6									
Allowable Exceedances/year		1	1								
No. of exceedances/year		19.30	22.50								
No. of exceedances/worst year		32	31								
		(ug/l)	(ug/l)	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24	21	92	Toxicity Threshold 197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	42	184								
Event Statistics Mean		24.00	67.53	345	1189	1	16007	2769	2657	170	749
90%ile		45.95	144.85	760	2738	2	35481	6138	5890	376	1661
95%ile		57.54	191.09	999	3684	2	70795	12247	11752	750	3313
99%ile		90.93	346.16	1442	6003	4	89125	15419	14795	945	4171

In River (no mitigation)

Step 2

		Copper	Zinc				
		RST24					
Allowable Exceedances/year		1	1				
No. of exceedances/year		0.3	0.3	Velocity	0.00	m/s	Tier 1 is used for the calculation
No. of exceedances/worst year		1	1				
No. of exceedances/summer		0.1	0.2	DI	63.38		
No. of exceedances/worst summer		1	1				
				% settlement needed	0	%	
		RST6					
Allowable Exceedances/year		0.5	0.5				
No. of exceedances/year		0	0				
No. of exceedances/worst year		0	0				
No. of exceedances/summer		0	0				
No. of exceedances/worst summer		0	0				
Annual average concentration (ug/l)		0.37	1.15				
		(ug/l)	(ug/l)				
Thresholds	RST24	21	92				
Thresholds	RST6	42	184				
Event Statistics Mean		0.99	2.93				
90%ile		2.43	6.76				
95%ile		4.74	13.28				
99%ile		12.90	37.48				

In River (with mitigation)

Step 3

		Copper	Zinc			
		RST24				
Allowable Exceedances/year		1	1			
No. of exceedances/year		-	-			
No. of exceedances/worst year		-	-			
No. of exceedances/summer		-	-	DI	-	
No. of exceedances/worst summer		-	-			
		RST6				
Allowable Exceedances/year		0.5	0.5			
No. of exceedances/year		-	-			
No. of exceedances/worst year		-	-			
No. of exceedances/summer		-	-			
No. of exceedances/worst summer		-	-			
Annual average concentration (ug/l)		-	-			
		(ug/l)	(ug/l)			
Thresholds hresholds	RST24	21	92			
Thresholds	RST6	42	184			
Event Statistics Mean		-	-			
90%ile		-	-			
95%ile		-	-			
99%ile		-	-			

Details of the chosen rainfall site	
SAAR (mm)	1205.3
Altitude (m)	32
Easting	2478
Northing	6642
Coastal distance (km)	28.25

Outfall 3

Summary of predictions		Soluble - Acute Impact		Sediment - Chronic Impact							
		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Prediction of impact	Step1										
	Step2										
	Step3										

DETAILED RESULTS

In Runoff — Step 1

		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		RST24		Toxicity Threshold							
Allowable Exceedances/year		1	1	1	1	1	1	1	1	1	1
No. of exceedances/year		69.50	57.20	88.20	116.00	2.20	49.20	113.20	49.20	23.40	92.80
No. of exceedances/worst year		78	67	101	138	4	64	127	64	36	106
		RST6									
Allowable Exceedances/year		1	1								
No. of exceedances/year		19.30	22.50								
No. of exceedances/worst year		32	31								
		(ug/l)	(ug/l)	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24	21	92	Toxicity Threshold 197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	42	184								
Event Statistics Mean		24.00	67.53	345	1189	1	16007	2769	2657	170	749
90%ile		45.95	144.85	760	2738	2	35481	6138	5890	376	1661
95%ile		57.54	191.09	999	3684	2	70795	12247	11752	750	3313
99%ile		90.93	346.16	1442	6003	4	89125	15419	14795	945	4171

In River (no mitigation) — Step 2

		Copper	Zinc				
		RST24					
Allowable Exceedances/year		1	1				
No. of exceedances/year		0.3	0.3	Velocity	0.00	m/s	Tier 1 is used for the calculation
No. of exceedances/worst year		1	1				
No. of exceedances/summer		0.1	0.2	DI	61.80		
No. of exceedances/worst summer		1	1				
				% settlement needed	0	%	
		RST6					
Allowable Exceedances/year		0.5	0.5				
No. of exceedances/year		0	0				
No. of exceedances/worst year		0	0				
No. of exceedances/summer		0	0				
No. of exceedances/worst summer		0	0				
Annual average concentration (ug/l)		0.36	1.12				
		(ug/l)	(ug/l)				
Thresholds	RST24	21	92				
Thresholds	RST6	42	184				
Event Statistics Mean		0.97	2.87				
90%ile		2.37	6.61				
95%ile		4.63	13.00				
99%ile		12.65	36.74				

In River (with mitigation) — Step 3

		Copper	Zinc		
		RST24			
Allowable Exceedances/year		1	1		
No. of exceedances/year		-	-		
No. of exceedances/worst year		-	-		
No. of exceedances/summer		-	-	DI	-
No. of exceedances/worst summer		-	-		
		RST6			
Allowable Exceedances/year		0.5	0.5		
No. of exceedances/year		-	-		
No. of exceedances/worst year		-	-		
No. of exceedances/summer		-	-		
No. of exceedances/worst summer		-	-		
Annual average concentration (ug/l)		-	-		
		(ug/l)	(ug/l)		
Thresholds hresholds	RST24	21	92		
Thresholds	RST6	42	184		
Event Statistics Mean		-	-		
90%ile		-	-		
95%ile		-	-		
99%ile		-	-		

Details of the chosen rainfall site	
SAAR (mm)	1205.3
Altitude (m)	32
Easting	2478
Northing	6642
Coastal distance (km)	28.25

Outfall 1-3

Summary of predictions		Soluble - Acute Impact		Sediment - Chronic Impact							
		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Prediction of impact	Step1										
	Step2										
	Step3										

DETAILED RESULTS

In Runoff

		Step 1		Step 1							
		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		RST24					Toxicity Threshold				
Allowable Exceedances/year		1	1	1	1	1	1	1	1	1	1
No. of exceedances/year		69.50	57.20								
No. of exceedances/worst year		78	67								
		RST6									
Allowable Exceedances/year		1	1								
No. of exceedances/year		19.30	22.50								
No. of exceedances/worst year		32	31								
		(ug/l)	(ug/l)	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24	21	92	Toxicity Threshold 197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	42	184								
Event Statistics Mean		24.00	67.53								
90%ile		45.95	144.85								
95%ile		57.54	191.09								
99%ile		90.93	346.16								

In River (no mitigation)

		Step 2		Step 2							
		Copper	Zinc								
		RST24									
Allowable Exceedances/year		1	1								
No. of exceedances/year		0	0	Velocity		m/s	Tier 1 is used for the calculation				
No. of exceedances/worst year		0	0								
No. of exceedances/summer		0	0	DI							
No. of exceedances/worst summer		0	0								
				% settlement needed		%					
		RST6									
Allowable Exceedances/year		0.5	0.5								
No. of exceedances/year		0	0								
No. of exceedances/worst year		0	0								
No. of exceedances/summer		0	0								
No. of exceedances/worst summer		0	0								
Annual average concentration (ug/l)		0.00	0.00								
		(ug/l)	(ug/l)								
Thresholds	RST24	21	92								
Thresholds	RST6	42	184								
Event Statistics Mean		0.00	0.01								
90%ile		0.01	0.03								
95%ile		0.02	0.06								
99%ile		0.07	0.21								

In River (with mitigation)

		Step 3									
		Copper	Zinc								
		RST24									
Allowable Exceedances/year		1	1								
No. of exceedances/year		-	-								
No. of exceedances/worst year		-	-								
No. of exceedances/summer		-	-	DI							
No. of exceedances/worst summer		-	-								
		RST6									
Allowable Exceedances/year		0.5	0.5								
No. of exceedances/year		-	-								
No. of exceedances/worst year		-	-								
No. of exceedances/summer		-	-								
No. of exceedances/worst summer		-	-								
Annual average concentration (ug/l)		-	-								
		(ug/l)	(ug/l)								
Thresholds	RST24	21	92								
Thresholds	RST6	42	184								
Event Statistics Mean		-	-								
90%ile		-	-								
95%ile		-	-								
99%ile		-	-								

Details of the chosen rainfall site	
SAAR (mm)	1205.3
Altitude (m)	32
Easting	2478
Northing	6642
Coastal distance (km)	28.25

Outfall 2 & 3

Summary of predictions		Soluble - Acute Impact		Sediment - Chronic Impact							
		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Prediction of impact	Step1										
	Step2										
	Step3										

DETAILED RESULTS

In Runoff — Step 1

		Copper	Zinc	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		RST24						Toxicity Threshold			
Allowable Exceedances/year		1	1	1	1	1	1	1	1	1	1
No. of exceedances/year		69.50	57.20	88.20	116.00	2.20	49.20	113.20	49.20	23.40	92.80
No. of exceedances/worst year		78	67	101	138	4	64	127	64	36	106
		RST6									
Allowable Exceedances/year		1	1								
No. of exceedances/year		19.30	22.50								
No. of exceedances/worst year		32	31								
		(ug/l)	(ug/l)	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24	21	92	Toxicity Threshold 197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	42	184								
Event Statistics Mean		24.00	67.53	345	1189	1	16007	2769	2657	170	749
90%ile		45.95	144.85	760	2738	2	35481	6138	5890	376	1661
95%ile		57.54	191.09	999	3684	2	70795	12247	11752	750	3313
99%ile		90.93	346.16	1442	6003	4	89125	15419	14795	945	4171

In River (no mitigation) — Step 2

		Copper	Zinc
		RST24	
Allowable Exceedances/year		1	1
No. of exceedances/year		1.5	0.4
No. of exceedances/worst year		5	1
No. of exceedances/summer		0.4	0.2
No. of exceedances/worst summer		1	1
		RST6	
Allowable Exceedances/year		0.5	0.5
No. of exceedances/year		0	0.2
No. of exceedances/worst year		0	1
No. of exceedances/summer		0	0.1
No. of exceedances/worst summer		0	1
Annual average concentration (ug/l)		0.65	2.02
		(ug/l)	(ug/l)
Thresholds	RST24	21	92
Thresholds	RST6	42	184
Event Statistics Mean		1.65	4.92
90%ile		4.27	12.09
95%ile		7.78	22.81
99%ile		19.26	58.58

Velocity 0.08 m/s — Tier 2 is used for the calculation

DI 71.00

% settlement needed 0 %

In River (with mitigation) — Step 3

		Copper	Zinc
		RST24	
Allowable Exceedances/year		1	1
No. of exceedances/year		-	-
No. of exceedances/worst year		-	-
No. of exceedances/summer		-	-
No. of exceedances/worst summer		-	-
		RST6	
Allowable Exceedances/year		0.5	0.5
No. of exceedances/year		-	-
No. of exceedances/worst year		-	-
No. of exceedances/summer		-	-
No. of exceedances/worst summer		-	-
Annual average concentration (ug/l)		-	-
		(ug/l)	(ug/l)
Thresholds	RST24	21	92
Thresholds	RST6	42	184
Event Statistics Mean		-	-
90%ile		-	-
95%ile		-	-
99%ile		-	-

DI -

Details of the chosen rainfall site	
SAAR (mm)	1205.3
Altitude (m)	32
Easting	2478
Northing	6642
Coastal distance (km)	28.25

Appendix 6.5 Accidental Spillage Risk Assessment

N69 Listowel Bypass												
							Design Year 2032					
Network	Outfall	Receiving Watercourse	Road Type	RL length (km)	SS	Response time Urban < 20 mins	AADT	% HGVs	Probability of accident (Pspl) - Note 1	Probability / year (PInc/year) Note 2	1 in years	Probability of accident %
1- GREEN	A1	WF1	Urban trunk road - no junction	0.22	0.31	0.45	25768	5	0.00003	0.00001	68063	0.001%
			Side road	0.07	1.81	0.45	6675	2	0.00001	0.00000	324275	0.000%
												0.002%
2 - BLUE	A2	WF3	Urban trunk road - no junction	0.22	0.31	0.45	28278	5	0.00003	0.00002	65906	0.002%
			Side road	0.05	1.81	0.45	12146	4	0.00001	0.00001	154714	0.001%
												0.002%
3 - PINK	A3	WF3	Urban trunk road - no junction	0.18	0.31	0.45	20551	5	0.00002	0.00001	99237	0.001%
			Side road	0.10	1.81	0.45	6333	5	0.00002	0.00001	111583	0.001%
												0.002%

Spillage Rate (SS)

Ppol

Note 1

$$P_{SPL} = RL \times SS \times (AADT \times 365 \times 10^{-9}) \times (\%HGV/100)$$

Note 2

$$P_{INC} = P_{SPL} \times P_{POL}$$

Appendix 6.6 Preliminary Erosion and Sediment Control Plan

JACOBS

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N4-N15 Sligo Urban Improvement Scheme

Sligo County Council

Preliminary Erosion and Sediment Control Plan

32106101_NIS_pESCP | Final

April 2017

Preliminary Erosion and Sediment Control Plan

N4-N15 Sligo Urban Improvement Scheme

Project No:	32106101
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Final	December 2016		RD	OD	PC
Final	April 2017		RD	OD	PC

Preliminary Erosion and Sediment Control Plan

Contents

Preliminary Erosion and Sediment Control Plan

JACOBS

1. Introduction & Need for the Proposed Road Development

1.1 Overview

Sligo County Council (SCC) has developed proposals for the improvement of a section of the N4 and N15 national road corridor on the north-western extents of Sligo City; see full details in Chapter 1 of Volume 2 of the N4-N15 Sligo Urban Improvement Scheme (UIS) Environmental Assessment Report (EAR).

During construction of the proposed development there is the potential for sediment loading and associated anthropogenic polluting substances entering the watercourses in the study area including the Garavogue River/Estuary and the Copper River. The purpose of this preliminary Erosion and Sediment Control Plan (pESCP) is to describe the mitigation, control, monitoring and emergency measures that will be implemented during the construction of the proposed development in relation to erosion and sediment control.

This pESCP is intended to be a working document and will be updated by the contractor to form the detailed Erosion and Sediment Control Plan (dESCP) which will form part of the contractors Environmental Operating Plan (EOP) for the construction of the proposed development.

1.2 Principal Objectives of Erosion and Sediment Control

The principal objectives of erosion and sediment control as outlined in the Construction Industry Research and Information Association (CIRIA) C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane *et al.* 2006) are:

- *Minimise erosion and potential for soiled water to be generated by minimising runoff;*
- *Install drainage and runoff controls before starting site clearance and earthworks;*
- *Minimise the area of exposed ground;*
- *Prevent natural clean runoff entering the works area / site;*
- *Provide appropriate control and containment measures on site;*
- *Monitor and maintain erosion and sediment controls throughout the project; and*
- *Establish vegetation as soon as practicable on all areas that have been exposed.*

1.3 Contract Procurement

The contract procurement for the construction of the proposed development is expected to be a traditional Employer-designed contract with permanent on-site Employer supervision throughout to monitor compliance with the NIS, EAR, EOP, dESCP and any other planning or environmental mitigation commitments given during the statutory planning process. Although this plan is preliminary it should be considered a demonstration of the level of control which is required.

The dESCP will be more detailed and may incorporate alternative details provided it can be demonstrated that it provides the same performance criteria (or higher) than those outlined in this preliminary plan.

1.4 Content of the Plan

This pESCP contains the following information:

- *Details of the characteristic of the site;*
- *Details of the Source - Pathway - Receptor relationship;*
- *Erosion and sediment control measures;*
- *Details of monitoring and auditing requirements; and*

- *Details on emergency procedures.*

1.5 Consultation

In October 2015, a number of interested parties including National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI) were contacted for any additional information that they would be able to provide relevant to the proposed development, including any environmental issues or other factors that they felt should be considered as the environmental assessment was developed.

Consultation feedback was received from IFI and NPWS as outlined in Section 5.2.2.2 in Volume 2 of the EAR. Any recommendations from this consultation that related to the construction phase of the proposed development have been incorporated into this pESCP.

The NPWS and IFI will be informed when works are about to commence on site, prior to works taking place in the Copper River and in the vicinity of the Garavogue River / Estuary and / or as outlined within this pESCP. Such advance notice will be issued as soon as practicable to ensure that these organisations are provided with sufficient time to allow inspection of the proposed control measures that are to be put in place.

2. Site Characteristics

2.1 Surface Water Features

The proposed development lies within the Western River Basin District (WRBD), Hydrometric Area (HA) 35 within the Garavogue and the Transitional and Coastal Water Management Units. The catchment of this HA is drained by the Garavogue River with all associated watercourses entering the Garavogue Estuary to the west.

The Garavogue River and Estuary is the main surface water feature that could be impacted by the proposed development as shown in Figure 6.1 of Volume 3 of the EAR. The Garavogue River and Estuary form part of the Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC / pNHA and Cummeen Strand SPA. The Cummeen Strand SPA and Cummeen Strand / Drumcliff Bay SAC are located immediately adjacent to the proposed development and part of the SPA / SAC is located within the footprint of the proposed development. However, this footprint also includes existing hardstanding of the N4 national road and rock armour. The Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC which includes the Garavogue River and Estuary is designated for River and Sea Lamprey. Any impact associated with increased sediment and silt release during construction could potentially impact the designated features of this watercourse.

In addition, the Copper River is a minor watercourse that could be impacted by the proposed development. This watercourse lies to the north of the Garavogue River. It discharges to the Garavogue Estuary and is connected to the Garavogue River some 3 km upstream in the townland of Hazelwood Demesne.

Drinking water is not abstracted from within the study area. Further detailed descriptions of the watercourses are provided in Chapter 6; Surface Water in Volume 2 of the EAR.

The watercourses in the study area are detailed in Table 2.1 below and shown in Figure 6.1 of Volume 3 of the EAR.

Table 2.1 Summary of Water Features in the Study Area

No.	Water Feature Name	Location of Water Features
WF1	Garavogue River	Located south of the proposed development. The Garavogue River discharges the waters of Lough Gill to the Garavogue Estuary.
WF2	Garavogue Estuary	Located west of the proposed development.
WF3	Copper River	Located north of the Garavogue River and flows to join the Garavogue Estuary.

2.2 Water Quality

The current Water Framework Directive (WFD) status of the Garavogue River and its estuary is "good" and neither water body is classed as a heavily modified. The Environmental Protection Agency (EPA) also assesses the water quality of rivers and streams across Ireland using a biological assessment method. The EPA assigns biological river quality (biotic index) ratings from Q5 – Q1 to watercourse sections. Q5 denotes a watercourse with good water quality and high community diversity, whereas Q1 denotes very low community diversity and a bad water quality. The nearest monitoring station to the study area is some 600 m upstream on the Garavogue River and the status is Good (Q4).

In addition to regular monitoring carried out by the EPA, baseline water quality monitoring was undertaken for the proposed development in May and November 2015 at various locations along the Copper River and the Garavogue Estuary as shown in Figure 6.1 of Volume 3 of the EAR. Where available, these results are compared to the standards in the European Communities Environmental Objective (Surface Water) Regulations, S.I. 272 of 2009. Physico-chemical analysis results for the water samples show few exceedances of the guideline limits and there is no indication of pollution within the watercourses. Suspended solids results are all under the 25 mg/l annual average for salmonid waters S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations, 1988.

Further detail on surface water quality is provided in Chapter 6: Surface Water in Volume 2 of the EAR.

2.3 Flooding

Sligo City is one of the areas under assessment in the Western RBD Catchment Flood Risk Assessment and Management Study (CFRAMS) and is therefore considered to be potentially at risk from flooding.

The Western River Basin District Flood Risk review undertaken as part of the CFRAM study indicated that there is limited evidence of frequent fluvial flooding in the Sligo area but there is evidence of tidal flood risk. The report references that the Sligo River (Copper River) is more prone to flooding than the Garavogue River. A Flood Risk Assessment (FRA), in line with the Guidelines for Planning Authorities (GPA) 20: The Planning System and Flood Risk Management (OPW, 2009), has been conducted for the proposed development. Further detail on flooding is provided in Chapter 6; Surface Water in Volume 2 and Appendix 6.1; Detailed Flood Risk Assessment in Volume 4 of the EAR.

2.4 Existing Surface Topography and Existing/Potential Drainage ways

Overland or sheet flow is water flowing over the ground that has yet to enter a drainage channel or similar. It usually occurs as a result of an intense period of rainfall, which exceeds the infiltration capacity of the ground. Typically, sheet flow occurs on sloping land where the ground surface is relatively impermeable as a result of either natural conditions such as soil type or geology, or as a result of development which places a large area of impervious material over the ground surface (i.e. paving or roads).

The topography of the study area is relatively flat given that most of the study area of the proposed development is on existing hard standing which would be of low permeability. There is a slight section of elevated ground in the vicinity of Salmon Point and the road then gently slopes downwards as it moves north. Currently, runoff from the N4-N15 carriageway is discharged through a kerb and gully system to a number of outfalls (providing no treatment or attenuation) directly to the Copper River and the Garavogue Estuary.

There will be a limited increase in impermeable area due to the proposed development. The proposed drainage network will be split into three separate catchments and will outfall at three locations. Two outfalls will discharge to the Copper River and eventually into the Garavogue Estuary and the third will discharge directly to the Garavogue Estuary. Petrol interceptors will be provided at the outfalls between the carriageway drainage outfall and watercourse within each drainage network.

During the proposed construction works the following potential drainage ways have been identified:

- *Any runoff/spills associated with the construction work within the footprint of the proposed development would potentially make its way to the Garavogue River and Estuary or Copper River through sheet flow or through the existing road drainage or drainage measures proposed as part of the construction works;*
- *Any runoff/spills associated with the works within estuary for the installation for the sheet piling/retaining wall would make its way to the Garavogue Estuary through sheet flow; and*
- *Any runoff/spill associated with the works within the Copper River for the bridge works would make its way to the Copper River and Garavogue Estuary through sheet flow.*

2.5 Soils

The following information is taken from Chapter 7: Geology, Soils and Hydrogeology of Volume 2 of the EAR and further information on soils and geology are contained within that chapter.

Table 2.2 shows the runoff potential for the different soil classes as indicated in CIRIA C648.

Table 2.2 Soil Classes and Runoff Potential (source: CIRIA C648)

No.	General Description	Runoff Potential
1	Well-drained, sandy, loamy or earthy peat soils	Very low

No.	General Description	Runoff Potential
2	Very permeable soils (e.g. gravel, sand with shallow groundwater or rock)	Low
3	Very fine sands, silts and clays. Permeable soils with shallow groundwater in low-lying areas	Moderate
4	Clayey or loamy soils	High
5	Wet uplands, shallow, rocky soils on steep slopes, peats with impermeable layers at shallow depth	Very High

The ground investigation encountered **limestone, made ground and glacial till** at the site.

Glencar Limestone bedrock found in the study area (which comprised of a dark fine limestone interbedded with calcareous shales) was encountered at 5.4mbgl. A Dartry Limestone formation (dark fine-grained Cherty Limestone) was encountered south of the study area, approximately 200 m to the south of the southern extent of the road alterations.

The EPA Map Viewer indicates that the entire study area is underlain by **made ground.** Made ground (comprised of sandy gravelly clay, with rubble or cobbles) was encountered ranging in depth from 1.6 mbgl to 2.3 mbgl. Asphalt and concrete was also encountered in one trial pit.

The majority of the study area is underlain by urban deposits, with a small area of till mapped to the northern part of the route between Ash Lane and the N15 Duck Street. Superficial geology is shown to be absent in a small area north-west of St. John's Hospital adjacent to Ballytivnan Road. **Glacial till** (comprised of sandy gravelly clays, locally with silt or cobbles) was encountered across the study area beneath the made ground ranging in thickness from 1 m to 3.6 m.

The runoff potential is likely to range from moderate to high within the study area due to the existing nature.

3. Source- Pathway – Receptors

3.1.1 Construction Area Units

The proposed development extends over a distance of approximately 670 m. Given the relatively short length of the proposed development it is anticipated that the construction works will be delivered in one working zone but this will be determined by the contractor during Phase 5 of the NRA Project Management Guidelines (PMG) and detailed in their dESCP.

3.1.2 Potential Sources of Pollution (including sediment and silt)

The potential pollution sources are outlined below.

Earthworks - The most significant area of concern regarding erosion and sediment control on any road construction project is soil and subsoil which are exposed during earthworks operations. These surfaces could be exposed during:

- *The initial site clearance works;*
- *Demolition works of the existing road or structures, including structural material and surrounding backfill;*
- *Works on the bridge structure over the Copper River;*
- *Construction works include retaining walls within and adjacent to watercourses including the Garavogue Estuary;*
- *Excavations including those associated with the provision of drainage works;*
- *Reconstructive and resurfacing works; and*
- *Stockpiling of acceptable, unacceptable and import earthworks material for use, reuse or removal offsite.*

The material to be excavated during the earthworks will include topsoil, made ground and glacial till. Approximately 8,000 m^3 of material will be excavated as part of the site clearance works. It is anticipated that none of the excavated material will be acceptable for reuse. During construction any excavated materials will be segregated where possible and stored in designated storage area(s) outside of any exclusion zones around water courses.

Transportation - There will be a requirement for transportation of plant, personnel and material during the proposed development. This can result in material build-up on the public road system and subsequent sediment laden runoff from the road.

The contractor will be permitted to haul on the National and Regional Road Network on specified routes on the national and regional road network, subject to agreement with Sligo County Council.

Without the prior agreement of the Local Authority the contractor will not be permitted to haul along other local roads in the vicinity of Sligo town. Haulage along other local roads as necessary between the location of the source of the material and the permitted routes will be subject to prior agreement with the relevant Local Authority. If the contractor proposes to use the local road network he/she should be required to assess the environmental impact of same in advance of any agreement.

Watercourse Crossings – There is one watercourse crossings of the Copper River at ch. 450-460 associated with this proposed development. The Copper River ultimately discharges to the Garavogue Estuary.

Structures & Concrete – There are a number of new structures required for the proposed development as detailed below in Table 3.1, full details of which are provided in Chapter 2 of the EAR. Concrete, grout and other cement-based products which would typically be used in the construction of structures are highly alkaline and corrosive and can have detrimental effect upon water quality if released so these require consideration.

Table 3.1 Proposed Structures within Study Area

Watercourse	Structure Type	Description
Ch. 70-170 (northbound) Salmon Point	Retaining Wall	New retaining wall to retain widened road carriageway and minimise impact on adjacent designated area.
Ch. 250-330 (northbound) Salmon Point	Retaining Wall	New retaining wall to retain widened road carriageway and minimise impact on adjacent designated area.
Ch. 460	Bridge	Existing twin culverts spanning Copper River to be replaced by concrete box structure. Masonry arch section to be retained.
Ch. 295-225 (southbound)	Retaining Wall	Existing retaining wall reconstructed at back of widened verge to minimise impact on HSE facility.
R291 (mainline ch. 550-565)	Retaining Wall	Existing retaining wall reconstructed at back of verge to provide adequate sightlines on approach to junction.

Construction Compounds including machinery re-fuelling/lubrication, Laydown and Material Storage – Construction compounds are a potential source of pollution due to storage of fuels and stockpiles and other material storage and potential vandalism. The construction compound will potentially be located within an area of existing hardstanding (the Valet Depot) on Ballast Quay approx. c.300 m to the south-west of the proposed development. This is located approx. c.50 m from the Garavogue Estuary (at its closest point). The exact location and construction arrangements will be determined by the contractor in advance of the construction phase, with the agreement of the Local Authority.

3.1.3 Potential Pathways of Pollution

The potential pathway link is the flow path from an area of exposed ground or the works area to adjacent watercourses. This might include for example runoff from the works area which subsequently has a route via the ground topography or an existing drainage system to enter into adjacent watercourses. Additionally, there is the potential for pathways to be exacerbated with the removal of the cut-off wall or cofferdam from the Copper River after the construction of the replacement Copper River Bridge.

3.1.4 Potential Receptors of Pollution

The key receptor in terms of pollution, erosion and sediment control are:

- *The Garavogue River and Estuary which form part of Cummeen Strand SPA, the Cummeen Strand / Drumcliff Bay cSAC and pNHA - it is noted that part of the SAC and the pNHA fall within the existing road boundary, see Figure 5.1-6.1 of Volume 3 of the EAR;*
- *The Copper River which lies to the north of the Garavogue River and discharges to the Garavogue Estuary, see Figure 6.1 of Volume 3 of the EAR; and*
- *Aquatic ecology and fisheries particularly associated with the Garavogue River and Estuary and Copper River, see Chapter 5 of Volume 2 of the EAR.*

4. Erosion and Sediment Control Measures

4.1 Principal Avoidance Measures

The protection of watercourses from pollution by construction works is achieved by avoidance in the first instance. In this regard, the following avoidance measures will be implemented during the construction phase:

- *Site clearance works of excavated material will not be carried out over large areas in advance resulting in these areas being exposed for long periods of time.*
- *The earthworks construction period will be as short as possible to minimise the length of time that open ground is exposed.*
- *Transportation and journey lengths will be minimised to reduce the opportunity for material to be spilled on the road that could enter the water system via road runoff.*
- *Having an efficient earthworks operation that allows material to be removed and replaced will fill in the minimum amount of time thus reducing the ingress of water into the construction works and reducing the amount of dewatering required.*

4.2 Principal Control Measures

All construction works will be completed in line with the recommendations of the following guidelines:

- *'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes' (NRA, 2005);*
- *CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane et al., 2006);*
- *CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane et al., 2006);*
- *'Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA, 2001);*
- *IFI Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters" (IFI, 2016); and*
- *UK Environment Agency:*
    - *PPG5 Pollution Prevention Guidelines Works and Maintenance in / or near Water;*
    - *PPG21 Incident Response Planning;*
    - *PPG22 Dealing with Spills; and*
    - *PPG26 Drums and Intermediate Bulk Containers.*

This section outlines the principal control measures that will be provided for the proposed development. The control measures for specific construction tasks and in relation to particular features such watercourse crossings are outlined in Section 4.3 to 4.9.

The Local Authority shall employ an Environmental Assurance Officer (EAO) during of the construction works and will form part of the Employer's Site Representative Team. The EAO shall have suitable environmental qualifications and report directly to the Local Authority. The Local Authority will ensure that the EAO is delegated sufficient powers under the construction contract so that he/she will be able to instruct the contractor to stop works and to direct the carrying out of emergency mitigation/clean-up operations. The EAO will also be responsible for consultation with environmental bodies including the NPWS and IFI. The EAO shall be responsible for carrying out regular Audits of the Contractor's EOP on behalf of the Local Authority.

Before works commence on site the Contractor will need to prepare an EOP in accordance with the Guidelines for the Creation and Maintenance of an EOP (National Roads Authority, 2007). Responsible personnel and communication lines should be established and documented in the EOP prior to the commencement of on-site works. The EOP will be implemented and maintained by the Contractor as a system of documenting compliance with environmental commitments and requirements during the construction of the proposed development.

The Contractor will be required to prepare the dESCP for the proposed works. The Plan will be based on and build upon the measures to prevent or reduce the amount of sediment and silt released into watercourses outlined in this pESCP.

The Contractor shall consult with the NPWS and IFI in relation to the control measures in the dESCP.

The Contractor's detailed method statements shall account for the requirements of the dESCP.

The Contractor should ensure that all sub-contractors and site supervisors are aware of the environmental commitments made in relation to the proposed development.

The proposed development has the potential to impact Garavogue Estuary which forms part of the Cummeen Strand/Drumcliff Bay SAC/pNHA and SPA so the timing of these works will be discussed with the IFI and the NPWS, in advance of the works.

The Copper River has habitat for salmonids but the fish stock status of the river is uncertain. The river is also tidal at this point. As a result there is no seasonal restriction on instream works in the Copper River.

4.3 Measures for the Construction Compound(s)

The construction compounds are expected to be sited within an area of existing hardstanding (the Valet Depot) on Ballast Quay. This will minimise damage to areas outside the boundary of the proposed development during construction. The following text describes the control measures that will be put in place for this or any other construction compound(s):

- *The construction compounds will be located c.50 m from the Garavogue River / Estuary and the Copper River.*
- *The main construction compounds will be located on dry land and set back from waterbodies, and outside of any ecologically sensitive areas.*
- *The impermeable area within compounds will be minimised to limit surface runoff.*
- *Any watercourses that occur in areas of land that will be used for storage facilities will be fenced off at a minimum distance of 5 m. In addition, measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse.*
- *Storage of fuels, other hydrocarbons and other chemicals within the construction compounds will not be permitted within 50 m of a waterbody.*
- *All surface water runoff will be intercepted and directed to treatment systems for the removal of pollutants prior to discharge.*
- *All compounds will have security to deter vandalism, theft and unauthorised access.*

4.4 Measures for Transportation

The following principal controls will be put in place by the contractor with regard to transportation:

- *Construction will be managed by the contractor so as to minimise journey lengths.*
- *Where any excavated material is "wet" and presents a risk of splashing over the top of the trucks, the capacity of the trucks will be limited to 75% of the height of the lowest side of the truck.*
- *HGVs shall be covered, treated or secured to prevent the escape of materials.*

- *HGVs leaving and entering the site will do so via a stabilised construction entrances.*
- *Wheel washing systems will be installed at the exit of the construction compound(s) and all trucks leaving the compound will be required to pass through this facility.*
- *Road cleaning will be carried out at least daily to ensure that there is no build-up of sediment on public roads.*

4.5 Measures for Stockpiling

The following measures will be put in place by the contractor with regard to stockpiling of material:

- *Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within c.50 m of sensitive watercourse (i.e. the Garavogue River/ Estuary and Copper River).*
- *Management of stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be required with the final measures to be determined by the contractor, these may include the following:*
    - *Providing silt fences or straw barriers at the toe of the stockpile to mitigate runoff during rain events.*
    - *Surrounding stockpiles with cut-off ditches to contain runoff.*
    - *Directing any runoff to the site drainage system and to the settlement pond (or other) treatment systems.*
    - *Providing earth bunds or another form of diversion to keep runoff from entering the stockpile area.*

4.6 Measures for the Vegetation/Topsoil Strip

Topsoil stripping will be minimal during construction of the proposed devolvement; however the following measures will be put in place by the contractor where vegetation/topsoil stripping occurs:

- *Topsoil stripping in proximity to the Garavogue Estuary / River and Copper River will be undertaken as far as practicable in dry weather conditions.*
- *Measures such as silt fence shall be used to prevent siltation of watercourse systems through runoff during rainstorms.*

4.7 Measures for Earthworks

The following measures will be put in place by the contractor during the earthworks:

- *Before earthworks commence the temporary site drainage, erosion control and sediment control measures must be in place and functioning.*
- *As far as is practicable, where treatment measures (e.g. settlement ponds) are being provided they shall be located at the locations identified for the operational stage attenuation/treatment systems at each of the proposed road drainage outfalls.*
- *Runoff from the earthworks will be directed to the temporary site drainage system and to the settlement pond (or other) treatment system.*
- *Provision of exclusion zones and barriers (sediment fences, interceptor drains) between earthworks and watercourses to prevent sediment washing into the watercourses, the contractor will be required to confirm these locations in the dESCP.*
- *Where dewatering is necessary water will be directed to the temporary site drainage system and to the settlement pond (or other) treatment system.*
- *In the unlikely event of intercepting contaminated groundwater, the contaminated groundwater will removed off site to a suitably licenced facility.*

4.8 Measures for Working in or Near Watercourses

The proposed development will require the installation of a replacement road bridge structure over the Copper River. Three drainage outfalls will be required, two within the Copper River and another which will discharge to the Garavogue Estuary. In addition, an attenuation / treatment pond will be constructed adjacent the Copper River, the provision of which is based on the findings of the cumulative assessment undertaken under the HAWRAT assessment, see Section 6.6 and 6.7 of Volume 2 of the EAR.

The following sections outline the control measures that will be put in place to protect these waterbodies and any designated / protected features from pollution events or sediment and silt during construction.

4.8.1 Copper River – Construction of the Replacement Bridge & Provision of Ponds/Outfalls

The Copper River is a minor surface water feature within the study area which lies to the north of the Garavogue River. The proposed development will require the installation of a replacement bridge structure over the Copper River. In addition, there is a requirement to provide an attenuation / treatment pond and associated direct outfalls A2 and A3 to the Copper River, see Figure 2.9 of Volume 3 of the EAR. The following control measures will be implemented during the construction of the proposed development:

- *Works within and adjacent to watercourses will only be conducted during forecast low flow periods or when the tide is out.*
- *Operation of machinery in-stream should be kept to an absolute minimum. All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should be cleaned and checked prior to commencement of in-stream works.*
- *The design of the culverts, outfalls and ponds and the construction method statements for their installation shall be agreed with IFI prior to construction.*
- *The area of disturbance of the watercourse bed and bank will be the absolute minimum required for the installation of the culvert/outfall.*
- *Any dewatering flows directed to the construction drainage system and to the settlement pond (or other) treatment system.*

In addition, the following text describes measures that are specific to the Copper River.

Before works commence on site drainage, the detailed erosion control and sediment control measures must be in place and functioning.

The construction of the bridge and outfalls, A2 and A3, in the Copper River will be undertaken in the dry to avoid sediment entering the river. To facilitate the construction of the bridge a temporary dam will be installed to at the connection to the Garavogue Estuary and upstream of the Copper River works to ensure that there is no hydraulic activity between the temporary works area and the watercourse (the Copper River and Garavogue Estuary) during construction. An impermeable material will be used and the water from the Cooper River will be overpumped to the Garavogue Estuary. The barrier should be sufficient to deal with high tide and the 1 in 200 year coastal / 1 in 100 year fluvial flood event the pump and associated equipment should be sized to deal with high flow in the Cooper River.

There is likely to be some level of water ingress therefore water entering the works areas. This water will be removed using a second water pump and directed to the temporary site drainage system and to the settlement pond (or other) treatment system prior to discharge.

The dam will be removed carefully (at low tide) and prior to removal a silt curtain / fence will be installed around the perimeter of the dam to prevent any disturbed material from entering the Copper River and Garavogue Estuary. This will remain in place post removal until the area has been stabilised.

The river banks, above and below the crossing, should not be disturbed unless directly associated with the bridge/road structure. The extent of bank-side interference and vegetation removal should be agreed, identified, documented and demarcated with appropriate fencing in advance of undertaking any construction works.

4.8.2 Garavogue River & Estuary – Retaining Walls & Provision of an Outfall

The Garavogue River / Estuary is a main surface water feature situated adjacent to the study area. Works will include the construction of a retaining wall on existing rock armour along the existing Garavogue Estuary shoreline to retain the widened road carriageway and prevent encroachment onto the designated shoreline.

The principal control measures described in the above section will be applicable to construction works adjacent to the Garavogue Estuary.

Before works commence on site drainage, a detailed erosion control and sediment control measures must be in place and functioning.

To facilitate the construction of the retaining wall adjacent to the Garavogue Estuary, works will be undertaken in the dry and during low tide where possible. Timber bog mats will be deployed in intertidal habitats to enable construction machinery to safely move across the cSAC / SPA while limiting impacts on these intertidal habitats. Buffer areas with silt curtains will be used to prevent direct runoff from the works area to the adjacent watercourse.

During the construction of outfall A1 in the Garavogue River, works will be undertaken in the dry to avoid sediment entering the river. To facilitate this construction a small cofferdam will be constructed using an impermeable material. There is still likely to be some level of water ingress therefore water entering the cofferdam. This water will be removed using a water pump and directed to the temporary site drainage system and to the settlement pond (or other) treatment system prior to discharge. The cofferdam will be removed carefully at low tide and prior to removal a silt curtain will be installed around the perimeter of the cofferdam to prevent any disturbed material from entering the Garavogue River.

4.9 Measures for Concrete Works

The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage. The following control measures will be employed to reduce the risks associated with concreting works near or within watercourses:

- *Only precast concrete pipes / units will be used in the installation of the culverts.*
- *Pouring of concrete should be carried out in the dry and allowed to cure for 48 hours before re-flooding.*
- *Pumped concrete will be monitored to ensure no accidental discharge into the watercourse.*
- *Mixer washings and excess concrete will not be discharged to surface water.*
- *Cement will be stored temporarily on site within the contractors' compounds.*
- *Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used to promote the early set of concrete surfaces exposed to water.*
- *Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters.*
- *Placing of concrete in or near watercourses will be carried out only under the supervision of the EAO.*
- *Any concrete spills will be contained immediately.*
- *Concrete waste and wash-down water will be contained and managed on site to prevent pollution of surface watercourses.*
- *On-site concrete batching and mixing activities will not be allowed within 50 m of the Garavogue River and Estuary and Copper River.*
- *Washout from lorries, with the exception of the chute, will not be permitted on site.*
- *Chute washout will be carried out at designated locations only. These washout locations will be signposted. The concrete plant and all delivery drivers will be informed of their location both within the order information and upon arrival on site.*

- *The designated chute washout locations will be on an impermeable surface and treatment facilities will be provided, including adequately sized settlement tanks.*
- *The water from the settlement tanks shall be pH corrected prior to discharge or alternatively disposed of as waste in accordance with the contractor's Waste Management Plan (WMP) included in the EOP.*

5. Monitoring and Audit

5.1 Introduction

A monitoring programme will be required at the pre-construction and construction stage.

This pESCP will be developed by the Contractor into the dESCP and will form part of the EOP. The dESCP will be sent to the IFI for approval. In addition, consultation on the dESCP will be carried out with the NPWS. The minimum requirements shall include all of the controls, measures, mitigation and monitoring described in this document. The monitoring of all aspects of the EOP, including the dESCP, will be carried out by the Contractor as the responsible party. The responsibilities of the Employer will be discharged by the Employer's Site Representative Team and in particular the EAO.

5.2 Monitoring and Audit

5.2.1 General

Pre-construction Monitoring

Pre-construction water quality monitoring will be undertaken by the contractor once every two weeks for a four month period, prior to the commencement of the construction works. Samples will be taken for total suspended solids (TSS), turbidity, pH, temperature, dissolved oxygen (DO) and hydrocarbons up and downstream of the Copper River Bridge to build upon the baseline monitoring carried out at the EAR stage and in order to further establish the baseline water quality conditions prior to the construction phase. Samples for turbidity, pH, DO and temperature will be taken in situ; samples for TSS and hydrocarbons will be sent to an accredited laboratory for analysis.

Construction Monitoring

Weekly during construction the contractor will monitor the levels of TSS, turbidity, pH, temperature, DO and hydrocarbons at the same locations up and down stream once a week for the duration of the following works:

- *Site clearance works, earthworks movements and stockpiling;*
- *Excavations including those associated with the provision of drainage works;*
- *Construction of the Copper River Bridge; and*
- *Construction works within and adjacent to watercourse.*

The construction monitoring results will be compared with those results established in pre-construction monitoring. In the event of an elevation above pre-construction levels an investigation will be undertaken by the contractor and remediation measure will be put in place in agreement with SCC.

In addition, daily visual inspections of the surface drainage and sediment control measures and the watercourses will be undertaken by the contractor. Indicators that water pollution may have occurred include the following:

- *Change in water colour;*
- *Change in water transparency;*
- *Increases in the level of silt in the water;*
- *Oily sheen to water surface;*
- *Floating detritus; or*
- *Scums and foams.*

These inspections shall be recorded. In the event that such indicators are observed, works will cease, sampling will be immediately undertaken as described for the weekly monitoring and an investigation of the potential cause will be undertaken by the contractor in consultation with SCC.

Where the works are identified as the source causing the exceedance the following will apply:

- *Contact will be made with SCC or their site representative;*
- *SCC will liaise with the NPWS and IFI on the issue;*
- *Works capable of generating sediment and all discharges shall be stopped immediately; and*
- *The contractor will be required to take immediate action to implement measures to ensure that such discharges do not re-occur.*

The above monitoring will alert the contractor to any detrimental effects that particular construction activities may be having on water quality in order that appropriate remedial action can be taken as quickly as possible; and allow the Contractor to demonstrate the success of the mitigation measures employed in maintaining any sediment release within the trigger value established.

5.2.2 Contractor

The procedures, monitoring and audit regime outlined in this section shall be used by the contractor to ensure and demonstrate the effective operation of the avoidance, control and mitigation measures for sediment and silt control. It will help the contractor to target any issues that may arise.

The following are the main procedures that will be followed:

- *The contractor will undertake a full day training course for key site staff (at a minimum the site foreman, project manager and site agent) immediately before works commence on site on the EOP, and in particular the dESCP.*
- *Environmental Checklists shall be prepared for each operation. Responsibility or completion of these checklists will be assigned to individual members of the contractor's staff. The following operations will also require an Approval-to-Work before operations can commence. These must be counter signed by the EAO:*
    - *Any in-stream works;*
    - *Placing of concrete in or within 50 m of watercourse;*
    - *Completion of sediment removal facilities prior to initial discharge to watercourse; and*
    - *Restart of works following any pollution incident.*
- *All environmental monitoring and checklists shall be recorded and added to the EOP on a daily basis.*
- *The EOP shall assign particular responsibility and monitoring duties to particular named staff and the Site Agent/Manager shall ensure that this is implemented in full. Training for each member of staff on their specific area of responsibility shall be carried out before the commencement of that operation. A record of all training carried out shall be maintained in the EOP and a further copy issued to the EAO.*
- *Monitoring shall be undertaken as described in Section 5.2.1.*
- *All mitigation/control measures shall be inspected daily by designated contractor staff and maintenance and repairs carried out immediately.*

5.2.3 Environmental Assurance Officer (EAO)

Separate from the on-going and detailed monitoring carried out by the contractor as part of the EOP; the EAO shall carry out the inspection / monitoring regime described below on behalf of the employer. The results will be stored in the EAO's monitoring file and will be available for inspection/audit by the client, NPWS or IFI staff. All inspections / monitoring / results will be recorded on standard forms.

- *Inspect the Principal Control Measures on a weekly basis. Report findings to the Contractor.*
- *Inspect surface water treatment measures (ponds, silt fences, sandbags etc.) on a weekly basis and obtain turbidity readings.*
- *Inspect all outfalls to watercourses on a weekly basis and obtain turbidity readings. Where excavation, pumping out or concreting works are on-going in the vicinity obtain turbidity readings three times per day.*
- *Weekly visual inspection of watercourses to which there is a discharge from the works and those where there is construction works in the vicinity.*
- *Wheel wash facilities shall be inspected on a weekly basis.*
- *Stockpiles shall be monitored on a daily basis while being filled or emptied, and otherwise on a weekly basis.*
- *Control measures for works at or near water bodies shall be inspected on a weekly basis.*
- *Concrete operations at or near watercourses shall be supervised and designated chute washing point facilities shall be inspected on a weekly basis.*
- *All site compounds shall be inspected on a weekly basis.*
- *The contractor's EOP monitoring results shall be audited on a bi-weekly.*
- *Any and all exceedance of the investigatory level for turbidity shall be reported to the NPWS and IFI and shall be investigated thoroughly by the EAO and the contractor.*
- *Where the EAO considers that the risk of a sediment release is high, he/she shall inform the contractor and request protective action to be taken. Where the contractor does not take immediate action the EAO shall instruct the contractor to take action and this shall be reported to the Contract Manager and the Client.*
- *The EAO will be delegated powers under the contract sufficient for these instructions to be issued and for an instruction to stop works or carry out emergency works.*

6. Emergency Procedures

6.1 Introduction

Prior to commencing the works, the Contractor shall prepare an Emergency Response Plan (ERP) based on a thorough risk assessment. The ERP shall detail the procedures to be undertaken in the event of the release of any sediment into a watercourse, serious spillage of chemical, fuel or other hazardous wastes (e.g. concrete), non-compliance incident with any permit or licence, or other such risks that could lead to a pollution incident, including flood risks.

6.2 Resources and Training

Relevant staff shall be trained in the implementation of the ERP and the use of any spill kit / control equipment, as necessary. The contractor shall provide a list of all such staff to the Employer's Site Representative detailing the name, contact number and training received, and the date of the training.

The Contractor shall provide a full list, including the exact locations, of all pollution control plant and equipment to the Employer's Site Representative. All such plant and equipment shall be maintained in place and in working order for the duration of the works.

The following training measures will be carried out to prepare site personnel for pollution / impact control:

- *Training to raise environmental awareness and pollution control awareness during inductions and toolbox talks.*
- *Comprehensive training in emergency response and spill management for key personnel.*
- *Training of an emergency response team to carryout both reactive and proactive mitigation on pollution control. This team will carry out other duties but their primary role will be environmental response.*
- *Environmental Emergency Response Drills will be carried out at a minimum of every six months.*

6.3 Spill Response

The ERP shall include a simplified Spill Response Procedure with the following as a minimum:

- *Instruction to stop work;*
- *Instruction to contain the spill;*
- *Details of spill clean-up material location;*
- *Name and contact details of all responsible staff;*
- *Measures particular to the location and the activity; and*
- *Instruction to contact the EAO (including Name and Contact Details).*

This Spill Response Procedure shall be displayed throughout the site and at all sensitive locations.

Emergency equipment / spill kits to facilitate the implementation of the ERP will be made available in secured locations within the area.

The EAO shall decide on whether or not the NPWS / IFI should be notified and shall also determine if and when works may proceed once corrective actions have been completed.

The main objectives of the ERP are as follows:

- *Identify the personnel required to take control of an environmental incident.*

- *Maintain a state of preparedness to prevent or reduce negative impacts on the environment as a result of an environmental incident on the site.*
- *Provide factual and timely communications to employees, regulatory authorities/prescribed bodies and the public (if required) during an incident.*

References

- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes' (NRA, 2005).
- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane *et al*., 2006).
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane *et al*., 2006).
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan: National Roads Authority (NRA, 2007).
- Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters (IFI, 2016).
- N4-N15 Sligo Urban Improvement Scheme Environmental Impact Statement.
- Other EIS's for similar projects.

Appendix 7.1 GSI Consultation Response

Roinn Cumarsáide,
Fuinnimh & Acmhainní Nádúrtha
Department of Communications,
Energy & Natural Resources

GSI
Suirbhéireacht Gheolaíochta Éireann
Geological Survey of Ireland

Sarah Kiernan
Jacobs Engineering Ireland Ltd.
Merrion House
Merrion Road
Dublin 4

11 November 2015

RE: N4 – N15 Sligo Urban Improvement Scheme – Environmental Impact Assessment

GSI Ref: 15/216

Dear Ms Kieran

With reference to Emer Concannon's letter of Sligo County Council National Road Design Office from the 16th October 2015, I would like to make the following comments on behalf of the Geological Survey of Ireland in relation to the N4-N15 Sligo Urban Improvement Scheme.

Guidelines

The following guidelines may be of assistance:

- National Road Authority, 2008. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes
- Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements.

Datasets and viewers

To assist you with the preparation of the Environmental Impact Assessment (EIA), and especially the "Soils & Geology", "Surface Water & Groundwater" and "Material Assets" parts, maps and datasets are currently available for viewing and/or download on GSI website under "Online Mapping"- direct link: www.gsi.ie/mapping.htm for the following:

- Bedrock
- Geological Heritage
- Groundwater
- Karst features
- Geotechnical and Bedrock boreholes
- Mineral locations and quarry directory
- Quaternary Geology
- Landslide records.

More recent viewers accessible from the same link include:

- the Groundwater Viewer (April 2014)
- the National Landslide Viewer,
- the Aggregate Potential Mapping Viewer
- and the Geotechnical Viewer.

Suirbhéireacht Gheolaíochta Éireann
Tor an Bhacaigh / Bóthar Haddington
Baile Átha Cliath D04 K7X4
Fón +353 1 678 2000 / Facs +353 1 668 1782
www.gsi.ie

Geological Survey of Ireland
Beggars Bush / Haddington Road
Dublin D04 K7X4
Tel +353 1 678 2000 / Fax +353 1 668 1782
www.gsi.ie

Geochemistry and Geophysics data for Sligo are also available at:

- to view: http://spatial.dcenr.gov.ie/GeologicalSurvey/TellusBorder/index.html
- to download: http://www.tellusborder.eu/Data+Downloads/

Comments

Geological Heritage

The audit of geological heritage sites for Co. Sligo was completed 2004. From the audit, a few sites have been identified within a 10 km radius of the proposed scheme with the closest one at about 5 km to the south west. However due to the nature of these sites, they are unlikely to be affected by the proposed road development. Therefore no impact is anticipated on geological heritage.

SAC/SPA

Due to the close proximity of the identified Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC and Cummeen Strand SPA, an appropriate assessment is likely to be required along with a Natura Impact Statement. Consultation with the National Parks and Wildlife Service will inform on the requirement.

Landscaping

Should any significant bedrock cuttings be created, we would ask that they will be designed to remain visible as rock exposure rather than covered with soil and vegetated, in accordance with safety guidelines and engineering constraints. In areas where natural exposures are few, or deeply weathered, this measure would permit on-going improvement of geological knowledge of the subsurface and could be included as additional sites of the geological heritage dataset, if appropriate.

Data request

As GSI's karst dataset is far from comprehensive due to important data gaps, GSI would welcome complementary data collected during the EIA; data which would be added to the national database. If you wish to contribute data, please contact Caoimhe Hickey, Groundwater Programme, at caoimhe.hickey@gsi.ie, 01-678 2811.

At a later stage, GSI would much appreciate a copy of reports detailing any site investigations carried out. The data would be added to GSI's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to Beatriz Mozo, Land Mapping Unit, at beatriz.mozo@gsi.ie, 01-678 2795.

I hope that these comments are of assistance, and if the GSI can be of any further help, please contact me.

Yours sincerely,

Sophie Préteseille, Geologist
E. sophie.preteseille@gsi.ie
T. 01-678 2897

Appendix 8.1 Ambient Air Quality Standards

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time. In response to the problem of acid rain, sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, was passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and does so every 12 months by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, details limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. This has also been passed into Irish Law under the Air Quality Standards Regulations 2011 (S.I. 180 of 2011). Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ is to establish a target value of 25 µg/m^3, as an annual average (to be attained everywhere by 2010) and a limit value of 25 µg/m^3, as an annual average (to be attained everywhere by 2018), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 µg/m^3 to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 µg/m^3. Where the AEI is currently greater than 22 µg/m^3 all appropriate measures should be employed to reduce this level to 18 µg/m^3 by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008-2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 µg/m^3 has been set to be complied with by 2018, again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 2008/50/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 2008/50/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 2008/50/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 2008/50/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_x (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_x such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex III of EU Directive 2008/50/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

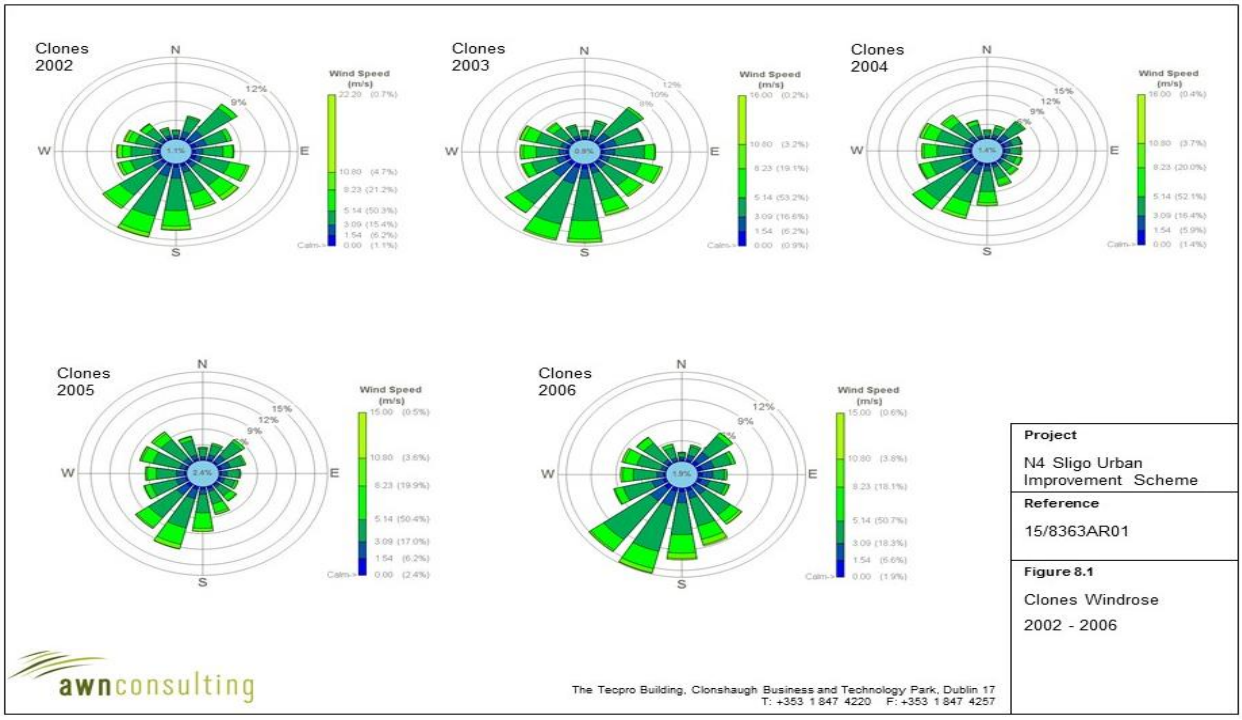
- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 21 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

Appendix 8.2 Clones Meteorological Station (2002 – 2006)


Clones
2002
Clones
2003
Clones
2004
Clones
2005
Clones
2006
N
S
E
W
Wind Speed
(m/s)
Calm
awnconsulting
The Tecpro Building, Clonshaugh Business and Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257
Project
N4 Sligo Urban Improvement Scheme
Reference
15/8363AR01
Figure 8.1
Clones Windrose
2002 - 2006

Appendix 8.3 Air Dispersion Modelling

The inputs to the DMRB model consist of information on road layouts, receptor locations, annual average daily traffic movements, annual average traffic speeds and background concentrations (UK DEFRA, 2007). Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data.

The DMRB underwent an extensive validation exercise as part of the UK's Review and Assessment Process to designate areas as Air Quality Management Areas (AQMAs). The validation exercise was carried out at 12 monitoring sites within the UK DEFRAs national air quality monitoring network. The validation exercise was carried out for NO_x, NO_2 and PM_{10}, and included urban background and kerbside/roadside locations, "open" and "confined" settings and a variety of geographical locations (UK Highways Agency, 2009).

In relation to NO_2, the model generally over-predicts concentrations, with a greater degree of over-prediction at "open" site locations. The performance of the model with respect to NO_2 mirrors that of NO_x showing that the over-prediction is due to NO_x calculations rather than the NO_x:NO_2 conversion. Within most urban situations, the model overestimates annual mean NO_2 concentrations by between 0 to 40% at confined locations and by 20 to 60% at open locations. The performance is considered comparable with that of sophisticated dispersion models when applied to situations where specific local validation corrections have not been carried out.

The model also tends to over-predict $PM_{10.}$ Within most urban situations, the model will over-estimate annual mean PM_{10} concentrations by between 20 to 40%. The performance is comparable to more sophisticated models, which, if not validated locally, can be expected to predict concentrations within the range of $\pm$50%.

Thus, the validation exercise has confirmed that the model is a useful screening tool for the Second Stage Review and Assessment, for which a conservative approach is applicable.

Appendix 8.4 Dust Minimisation Plan

Dust Minimisation Plan

Introduction

This dust minimisation plan has been formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within two hundred metres of the construction area.

Dust Minimisation Measures

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented. Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

Vehicles using site roads shall have their speeds restricted where there is a potential for dust generation. Vehicles delivering material with dust potential to an off-site location shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

Vehicles exiting the site shall make use of a wheel wash facility where appropriate, prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

At all times, the procedures put in place will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem.

Implementation during Construction

This dust minimisation plan shall be reviewed and updated at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

Appendix 9.1 Predicted Noise Levels (Pre Mitigation)

Receiver Location Reference	Opening Year 2017 Predicted Noise Level		TII/NRA Condition for Noise Mitigation Satisfied?			Mitigation Required?	Design Year 2032 Predicted Noise Level		TII/NRA Condition for Noise Mitigation Satisfied?			Mitigation Required?	Comments
	Do Minimum	Do Something					Do Minimum	Do Something					
	L_{den} (dB)	L_{den} (dB)	(a)	(b)	(c)		L_{den} (dB)	L_{den} (dB)	(a)	(b)	(c)		
R01_A	59	59	No	No	Yes	No	59	59	No	No	Yes	No	
R01_B	59	60	No	No	Yes	No	60	60	No	No	Yes	No	
R02_A	59	59	No	No	Yes	No	60	60	No	No	Yes	No	
R02_B	61	61	Yes	No	Yes	No	61	61	Yes	No	Yes	No	
R03_A	54	54	No	No	Yes	No	54	54	No	No	Yes	No	
R03_B	56	56	No	No	Yes	No	56	57	No	No	Yes	No	
R04_A	54	56	No	Yes	Yes	No	55	56	No	Yes	Yes	No	
R04_B	56	58	No	Yes	Yes	No	56	58	No	Yes	Yes	No	
R05_A	64	66	Yes	Yes	Yes	No	65	66	Yes	Yes	Yes	No	
R05_B	66	69	Yes	Yes	Yes	**Yes**	67	69	Yes	Yes	Yes	**Yes**	Mitigation requirement confirmed
R06_A	66	67	Yes	No	Yes	No	67	67	Yes	No	Yes	No	
R06_B	68	70	Yes	Yes	Yes	**Yes**	69	71	Yes	Yes	Yes	**Yes**	Mitigation requirement confirmed
R07_A	63	63	Yes	No	Yes	No	64	64	Yes	No	Yes	No	
R07_B	64	65	Yes	No	Yes	No	65	66	Yes	No	Yes	No	
R08_A	65	65	Yes	No	Yes	No	65	66	Yes	No	Yes	No	
R08_B	66	67	Yes	No	Yes	No	66	67	Yes	No	Yes	No	
R09_A	63	64	Yes	No	Yes	No	64	65	Yes	No	Yes	No	
R09_B	64	65	Yes	No	Yes	No	65	66	Yes	No	Yes	No	
R10_A	63	61	Yes	No	Yes	No	63	62	Yes	No	Yes	No	
R10_B	64	62	Yes	No	Yes	No	64	63	Yes	No	Yes	No	
R11_A	55	56	No	No	Yes	No	55	56	No	No	Yes	No	

Receiver Location Reference	Opening Year 2017 Predicted Noise Level		TII/NRA Condition for Noise Mitigation Satisfied?			Mitigation Required?	Design Year 2032 Predicted Noise Level		TII/NRA Condition for Noise Mitigation Satisfied?			Mitigation Required?	Comments
	Do Minimum	Do Something					Do Minimum	Do Something					
	L_{den} (dB)	L_{den} (dB)	(a)	(b)	(c)		L_{den} (dB)	L_{den} (dB)	(a)	(b)	(c)		
R11_B	55	56	No	No	Yes	No	56	57	No	No	Yes	No	

Appendix 9.2 Predicted Noise Levels (Post Mitigation)

Receiver Location Reference	Opening Year 2017 Predicted Noise Level		TII/NRA Condition for Noise Mitigation Satisfied?			Mitigation Required?	Design Year 2032 Predicted Noise Level		TII/NRA Condition for Noise Mitigation Satisfied?			Mitigation Required?	Comments
	Do Minimum	Do Something					Do Minimum	Do Something					
	L_{den} (dB)	L_{den} (dB)	(a)	(b)	(c)		L_{den} (dB)	L_{den} (dB)	(a)	(b)	(c)		
R01_A	59	59	No	No	Yes	No	59	59	No	No	Yes	No	
R01_B	59	60	No	No	Yes	No	60	60	No	No	Yes	No	
R02_A	59	59	No	No	Yes	No	60	60	No	No	Yes	No	
R02_B	61	61	No	No	Yes	No	61	61	Yes	No	Yes	No	
R03_A	54	54	No	No	Yes	No	54	54	No	No	Yes	No	
R03_B	56	56	No	No	Yes	No	56	57	No	No	Yes	No	
R04_A	54	55	No	No	Yes	No	55	56	No	Yes	Yes	No	
R04_B	56	57	No	No	Yes	No	56	58	No	Yes	Yes	No	
R05_A	64	62	No	No	Yes	No	65	63	Yes	No	Yes	No	
R05_B	66	67	No	No	Yes	No	67	68	Yes	No	Yes	No	
R06_A	66	61	No	No	Yes	No	67	61	Yes	No	Yes	No	
R06_B	68	68	No	No	Yes	No	69	68	Yes	No	Yes	No	
R07_A	63	62	No	No	Yes	No	64	63	Yes	No	Yes	No	
R07_B	64	64	No	No	Yes	No	65	65	Yes	No	Yes	No	
R08_A	65	65	No	No	Yes	No	65	66	Yes	No	Yes	No	
R08_B	66	66	No	No	Yes	No	66	67	Yes	No	Yes	No	
R09_A	63	64	No	No	Yes	No	64	65	Yes	No	Yes	No	
R09_B	64	65	No	No	Yes	No	65	66	Yes	No	Yes	No	
R10_A	63	62	No	No	Yes	No	63	62	Yes	No	Yes	No	
R10_B	64	63	No	No	Yes	No	64	63	Yes	No	Yes	No	
R11_A	55	56	No	No	Yes	No	55	56	No	No	Yes	No	
R11_B	55	56	No	No	Yes	No	56	57	No	No	Yes	No	

Appendix 10.1 Photographs

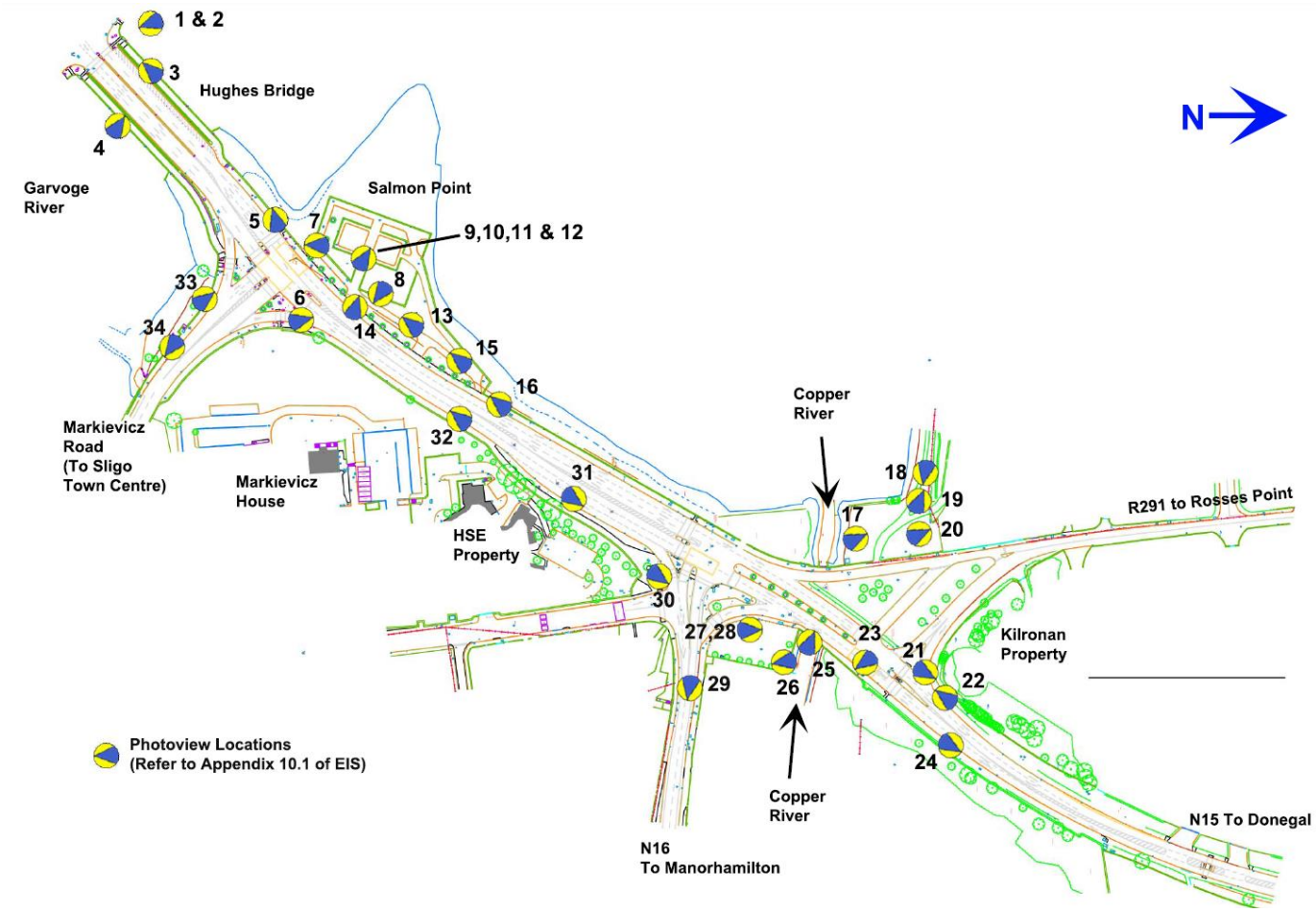

1 & 2
3
Hughes Bridge
4
Garvoge River
Salmon Point
5
7
9,10,11 & 12
8
33
6
13
34
14
15
16
Markievicz Road (To Sligo Town Centre)
Markievicz House
32
31
HSE Property
Copper River
18
19
17
20
R291 to Rosses Point
30
27,28
23
21
Kilronan Property
29
26
25
22
24
Copper River
N15 To Donegal
N16 To Manorhamilton
N
Photoview Locations (Refer to Appendix 10.1 of EIS)

Plate 1: Custom House Quay east towards Sligo Harbour/Port with Sligo Bay beyond

Plate 2: View northwest/north over Cartron to Benbulbin / Dartry Mountains

Plate 3: Recently completed upgrading / widening of Hughes Bridge

Plate 4: View east over mouth of Garvoge River to Sligo City

Plate 5: View north from Hughes Bridge to Constance Markievicz House

Plate 6: Feature section of wall at Constance Markievicz House with 'The Pursuit of Diarmuid and Grainne' artwork

Plate 7: Salmon Point Amenity Area with artwork

Plate 8: Salmon Point Artwork Plaque

Plate 9: Sligo Harbour Commissioners 1869

Plate 10: Corporation of Sligo 1612 JR Sligo Borough Improvement Act

Plate 11: Corporation of Sligo 1612 JR

Plate 12: Corporation for Improving the Town & Harbour of Sligo

	
Plate 13: View north along footpath west of N4 Road	**Plate 14**: View east across N4 to Constance Markievicz House with high limestone wall around property
	
Plate 15: Coastal edge to west of N4	**Plate 16**: View north over N4/N15/N16 Road junction to background mountains
	
Plate 17: West (coast) face of Copper River Culvert	**Plate 18**: View west of footpath / cycleway along north side of Sligo Bay at Cartron

	
Plate 19: Coastal edge grassland at Cartron	**Plate 20**: View east over Grassland areas at N4/N15/R291 Road junction
	
Plate 21: View south over N4/N15/N16/R291 Road Junction	**Plate 22**: View north along N15
	
Plate 23: View west over R291 junction to properties at Cartron Hill	**Plate 24**: View south over low lying lands along east side of N15

Plate 25: View east along Copper River

Plate 26: East face of Copper River Culvert

Plate 27: View south over small open space northeast of N4/N16 Duck Street junction with St. John's Terrace beyond

Plate 28: View south over N16 Duck Street junction with St. John's Terrace and Barrack Street with HSE property to right (west)

Plate 29: View west along N4/N16 Duck Street junction

Plate 30: Low wall and railing boundary to HSE property with Special Olympics plaque

	
Plate 31: View south along low wall and railing boundary to HSE property with mature trees	**Plate 32**: View north along high wall boundary to HSE property with low wall and railing and mature trees beyond

	
Plate 33: View east over small riverside amenity area west of Hughes Bridge	**Plate 34**: Access to Amenity Area

Appendix 11.1 Archaeology and Cultural Heritage Gazetteer

Site No.	AR1
Site Name	Garavogue River Area of Archaeological Potential
Designation	None
Townland	Rathquarter; Redmond
Site Type	River
Grid Reference	568846,836383
Description	This area consists of the River Garavogue, where the proposed development will cross the water way by means of an existing bridge. The river is wide at this point and flows in an east-west direction. [1]
Adjacent Archaeological Sites	None
Sources	[1] [Ryan Hanley WSP 2011, N4/N15 Sligo Urban Road Improvement Environmental Impact Statement Volume 3 – Appendices
Approximate Distance from Proposed development	0m
Type of Impact	Direct impact
Mitigation Measures	Geo-archaeological assessment Watching brief

Site No.	AR2
Site Name	Copper River Area of Archaeological Potential
Designation	None
Townland	Rathquarter
Site Type	River
Grid Reference	569087,836714
Description	This stream is marked on all the OS map editions, including the first edition. However, it is clear that prior to the mid 19th century that the stream was straightened in order to improve drainage in the area. Ultimately the stream is a tributary to the River Garvogue as it drains out in Sligo Bay to the west. Today the stream is crossed by a large modern road bridge. [1]
Adjacent Archaeological Sites	None
Sources	[1] [Ryan Hanley WSP 2011, N4/N15 Sligo Urban Road Improvement Environmental Impact Statement Volume 3 – Appendices
Approximate Distance from Proposed development	0m
Type of Impact	Direct impact
Mitigation Measures	Geo-archaeological assessment Watching brief

Appendix 11.2 Architectural Heritage Gazetteer

Reference Number	Yard behind Custom House
Photo reference number	P1100729, P1100731, P1100732
Address	N/A
Location / Coordinates	568816, 836308
Site type	Wall
Description	The Yard behind Custom House is visible on the 1st edition 6" Ordnance Survey map of 1837 [1] and is identified as part of the Custom House complex. Much of the historic building fabric survives today and comprises a substantial partially-coursed granite boundary wall, with three pairs or square section gateposts [2]
Approximate date	19th century
Sources	[1] First edition 6" Ordnance Survey map, 1837, [2] Jacobs walkover survey 2015
Importance / Legal Status	Local
Distance from proposed development (m)	50m
Type of Impact	No impact
Nature of Impact	No impact
Quality of Impact	No impact
Magnitude of Construction Impact	No impact
Significance of Construction Impact	No impact
Magnitude of Operation Impact	No impact
Significance of Operation Impact	No impact
Mitigation Measures	None proposed
Magnitude of Construction Impact with Mitigation	No impact

Significance of Construction Impact with Mitigation	No impact
Magnitude of Operation Impact with Mitigation	No impact
Significance of Operation Impact with Mitigation	No impact
Extent of Impact	No impact

Plate 1: Yard behind Custom House (Site AH1)

Reference Number	AH2 - Sligo Harbour walls
Photo reference number	P1100738, P1100742, P1100743, P1100745
Address	Custom House Quay, Markievicz Road
Location / Coordinates	568960, 836240
Site type	Quay
Description	Section of Sligo Harbour including retaining walls and quay. Markievicz Road/Lower Knox Street/ Fish Quay and Lower New Street, Rathedmond Td. [1] Harbour wall depicted on the 1st edition Ordnance Survey map of 1837 along the south side of the Garavogue River when it is labelled as the 'New Quay'. with the Custom's House to the south, and a ballast wall to the northwest. By the time of the 25" Ordnance Survey map of 1910, the New Quay had been renamed 'Customhouse Quay' and a further quay had been constructed to the northwest. This area is identified as 'Lynn's Dock' on the mapping and a series of landing stages are also recorded. The quay wall to the north of the river is depicted on this map [3] Much of the historic building fabric associated with sites survives and comprises coursed limestone abutments with coping stones and a series of 'mushroom-shaped' mooring bollards. The historic cobbled road surface is also visible at points along the quayside. The construction of Hughes Bridge (opened in 1988) resulted in the demolition of the Queen's stores and the removal of a section of the western end of Sligo Harbour Wall. The western return is still visible to the west of Hughes Bridge. [3].
Approximate date	19th century
Sources	[1] Recorded Protected Structure [2] First edition 6" Ordnance Survey map, 1837, [3] 1st edition 25" Ordnance Survey map, [4] Jacobs walkover survey 2015
Importance / Legal Status	Regional
Distance from proposed development (m)	1m
Type of Impact	No impact
Nature of Impact	No impact
Quality of Impact	No impact
Magnitude of Construction Impact	No impact
Significance of Construction Impact	No impact

Magnitude of Operation Impact	No impact
Significance of Operation Impact	No impact
Mitigation Measures	None proposed
Magnitude of Construction Impact with Mitigation	No impact
Significance of Construction Impact with Mitigation	No impact
Magnitude of Operation Impact with Mitigation	No impact
Significance of Operation Impact with Mitigation	No impact
Extent of Impact	No impact

Plate 2: Sligo Harbour Walls (Site AH2)

Reference Number	AH3 - Markievicz House
Photo reference number	P1100741, P1100742, P1100768, P1100774, P1100775, P1100854, P1100864
Address	Barrack Street. Rathquarter Td
Location / Coordinates	569026, 836474
Site type	House
Description	Detached three-bay two storey over basement with attic, rendered former school building, built c. 1870. Rectangular plan, flat-roofed square porch projecting from west (front) elevation, three bays deep, six-bay three-storey lower return, c. 1920 to northeast. [1] NIAH Description & Appraisal: Detached three-bay two-storey over basement with attic rendered former school building, built c. 1870, now derelict. Rectangular plan, flat-roofed square porch projecting from west (front) elevation, three bays deep, six-bay three-storey lower return c. 1920 to northeast. Hipped artificial slate roof to main building, pitched slate finishing in hip to west to return building, artificial ridge and hip tiles to main building, clay ridge tiles to return building, gabled dormer to front elevation, wrought-iron finial, moulded cast-iron gutters on painted timber eaves with fascia and soffit carried on modillions with dentils between, profiled extruded aluminium gutters on painted timber fascia to return, cast-iron downpipes, cast-iron sectional water storage tank to east, copper-clad flat-roofed dormers to south and north elevations c. 1950. Painted ruled-and-lined smooth-rendered walling, straight quoins with channel joints, steel fire escape staircase to north elevation of return. Square-headed window openings, painted moulded render architraves, painted stone sills, painted one-over-one timber sash windows to main building, two-over-two to return. Round-headed window opening to dormer over main entrance, painted moulded render archivolt, painted stone sill, painted timber casement window with plain-glazed light over. Square-headed entrance door in projecting porch, stepped jambs, hardwood timber door with twelve panels, hardwood panelled side panels, hardwood panelled over-panels, approached by double perron concrete steps with steel balustrade. Overlooking Garavoge River, new high school building to east, grass lawn to west, car park to north. This once fine building occupies one of the most prominent positions in Sligo. Although greatly neglected, it retains its original massing, an interesting dentiled cornice and moulded surrounds to windows. [2] Markievicz House is prominently sited on a small hill overlooking the Garavogue River. Set within gernerous grounds, all laid down to grass, with modern development to the rear. A tall stone boundary wall defines the property to the south and west. This has previously been subject to realignment and rebuilding for road development. [3]
Approximate date	19th century
Sources	[1] Record of Protected Structures [2] Ryan Hanley WSP, 2011, *N4/N15 Sligo Urban Road Improvement Environmental Impact Statement Volume 3 – Appendices, Part 3 of 3* [3] Jacobs walkover survey 2015
Importance / Legal Status	Regional / Protected Structure
Distance from proposed development (m)	0m
Type of Impact	Direct Indirect

Nature of Impact	Partial removal of boundary wall Impact on setting during construction.
Quality of Impact	Adverse
Magnitude of Construction Impact	Low
Significance of Construction Impact	Slight
Magnitude of Operation Impact	No impact
Significance of Operation Impact	No impact
Mitigation Measures	Rebuilding of boundary wall
Magnitude of Construction Impact with Mitigation	Neutral
Significance of Construction Impact with Mitigation	No change
Magnitude of Operation Impact with Mitigation	No impact
Significance of Operation Impact with Mitigation	No impact
Extent of Impact	c.150m of wall to be demolished and rebuilt.

Plate 3: Markievicz House (Site AH3)

Reference Number	AH4 – Ard-Na-Greine
Photo reference number	P1100830
Address	Cartron Hill, Rosses Point Road
Location / Coordinates	569037, 836876
Site type	House
Description	A substantial house constructed in the 1920s, comprising a two-storey, three bay house, roughcast with a slate roof and modern glazing. Principal elevation looks to the south and is formed by two gables flanking a central recessed bay. [1] Building set within a large garden, and screened by mature vegetation. [2]
Approximate date	19th century
Sources	[1] http://www.ard-na-greine.com/ Consulted 20/04/16 [2] Jacobs walkover survey 2015
Importance / Legal Status	Local
Distance from proposed development (m)	71m
Type of Impact	No impact
Nature of Impact	No impact
Quality of Impact	No impact
Magnitude of Construction Impact	No impact
Significance of Construction Impact	No impact
Magnitude of Operation Impact	No impact
Significance of Operation Impact	No impact
Mitigation Measures	None proposed
Magnitude of Construction Impact with Mitigation	No impact
Significance of Construction Impact with Mitigation	No impact

Magnitude of Operation Impact with Mitigation	No impact
Significance of Operation Impact with Mitigation	No impact
Extent of Impact	No impact

Plate 4: Ard-Na-Greine (Site AH4)

Reference Number	AH5 –River Copper culvert
Photo reference number	P1100834
Address	Carton Hill
Location / Coordinates	569081,836722
Site type	Bridge
Description	River crossing shown in this location on Nimmo's 1821 plan of Sligo Harbour and the 1st edition 6" Ordnance Survey map of 1837. [1; 2] Stone built structure, only the western elevation is now visible above ground level, the eastern elevation having been removed during road widening. The west elevation comprises a mortared stone wall with cow and calf coping, and two angled buttresses. A CCTV survey undertaken for this project has identified a pair of stone-built culverts to survive under the modern road surface. East elevation removed during road widening. [3]
Approximate date	Post medieval
Sources	[1] Nimmo, 1821. The Bay and harbour of Sligo surveyed for the Commissioners of that port by A. Nimmo. Consulted in Horner, A. 2011 *Mapping Sligo in the early 19th century.* [2] First edition 6" Ordnance Survey map, 1837, [2] Jacobs walkover survey 2015
Importance / Legal Status	Local
Distance from proposed development (m)	0m
Type of Impact	Direct
Nature of Impact	Removal of culverts
Quality of Impact	Adverse
Magnitude of Construction Impact	High
Significance of Construction Impact	Moderate
Magnitude of Operation Impact	No impact
Significance of Operation Impact	No impact
Mitigation Measures	Historic Building recording comprising a photographic survey in advance of construction and photographic and during removal of the structure.

Magnitude of Construction Impact with Mitigation	Low
Significance of Construction Impact with Mitigation	Imperceptible
Magnitude of Operation Impact with Mitigation	No impact
Significance of Operation Impact with Mitigation	No impact
Extent of Impact	Removal of culverts. Retention of west elevation.

Plate 5: West elevation of the River Copper culvert (Site AH5)

Reference Number	AH6 – Sea wall
Photo reference number	P1100841
Address	West of the R291
Location / Coordinates	569046,836736
Site type	Sea wall
Description	Sea wall depicted on the 1st edition 6" Ordnance Survey map of 1837. Comprising a verical wall with large rectangular stones to the upper portions, and a batter wall constructed of small blocks below. To the south of the Copper River, thick vegetation prevented inspection of the structure, however it is assumed that the wall survives under the vegetation.
Approximate date	Post medieval
Sources	[1] First edition 6" Ordnance Survey map, 1837, [2] Jacobs walkover survey 2015
Importance / Legal Status	Local
Distance from proposed development (m)	13m
Type of Impact	No impact
Nature of Impact	No impact
Quality of Impact	No impact
Magnitude of Construction Impact	No impact
Significance of Construction Impact	No impact
Magnitude of Operation Impact	No impact
Significance of Operation Impact	No impact
Mitigation Measures	None proposed
Magnitude of Construction Impact with Mitigation	No impact
Significance of Construction Impact with Mitigation	No impact

Magnitude of Operation Impact with Mitigation	No impact
Significance of Operation Impact with Mitigation	No impact
Extent of Impact	No impact

Plate 6: Sea wall (Site AH6)