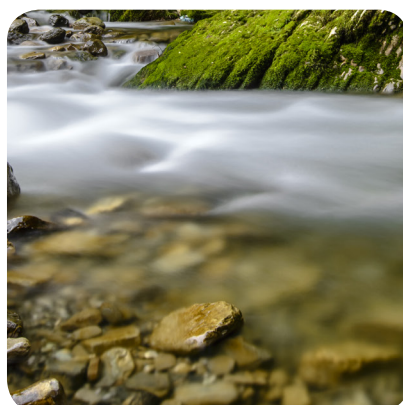
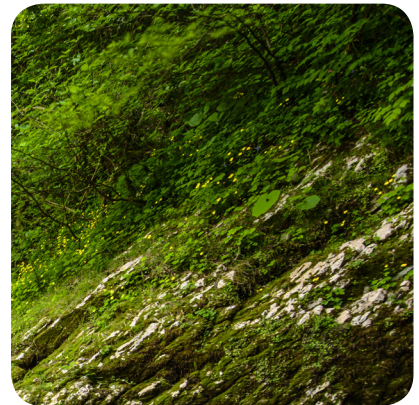
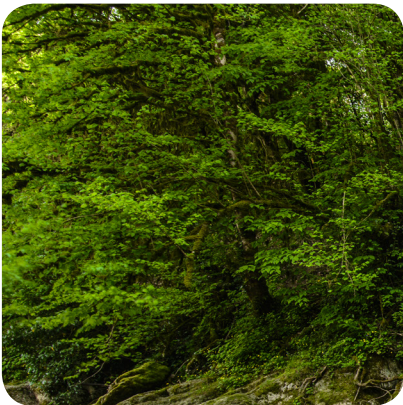




Environmental Impact Assessment Screening Report of Bridge Rehabilitation Works at Ballynamona Upper Bridge, Co. Kerry

November 2016














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1 INTRODUCTION

This Environmental Impact Assessment Screening Report will assess the proposed rehabilitation works of the Ballynamona Upper Bridge (KY-N70-007) (here after referred to as the Bridge) in Co. Kerry and examine any likely impacts which have the potential to occur as a result of the works in the surrounding area.

The Bridge carries the N70 (National Secondary Road) over a tributary of the River Maine. This tributary is referred to as the Cloghleagh Stream by the EPA (<http://gis.epa.ie/Envision>). It is a single span structure with a clear span of 3m located on the N70, approximately 3km North of Castlemaine, Co. Kerry.

1.1 BACKGROUND

The Bridge is a single span masonry arch Bridge and can be seen in **Figure 1.1**.

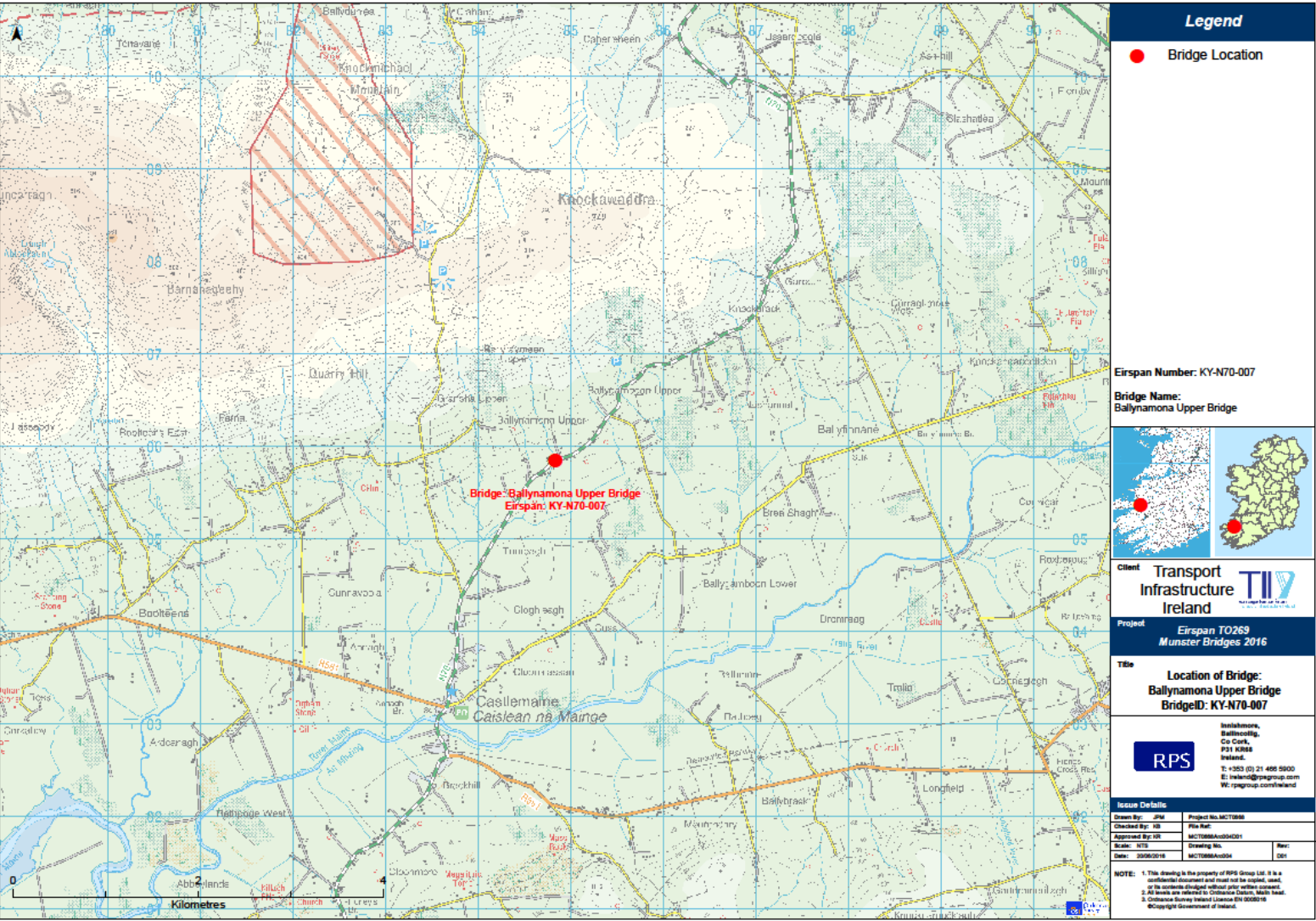
An initial inspection of the Bridge was carried out by an RPS engineer on the 23th May 2016 and the following was noted:-

- The existing structure is generally in good condition and appears to function as a cattle pass in low flow conditions.
- There is scour evident along the abutments, the scour skirt does not appear to have been constructed to an appropriate depth below the riverbed.
- The embankment adjacent to the southwest corner comprises large block stone units.
- Ecology surveys were undertaken by an RPS ecologist on the 22nd and 27th of June 2016 which have informed this assessment.
- Protected Aquatic Species and Habitats Surveys were undertaken by Aquatic Services Unit (ASU) of University College Cork in July 2016.

Figure 1.1: Photograph of Ballynamona Upper Bridge



Figure 1.2: Location of Proposed Works



1.2 DESCRIPTION OF PROPOSED WORKS

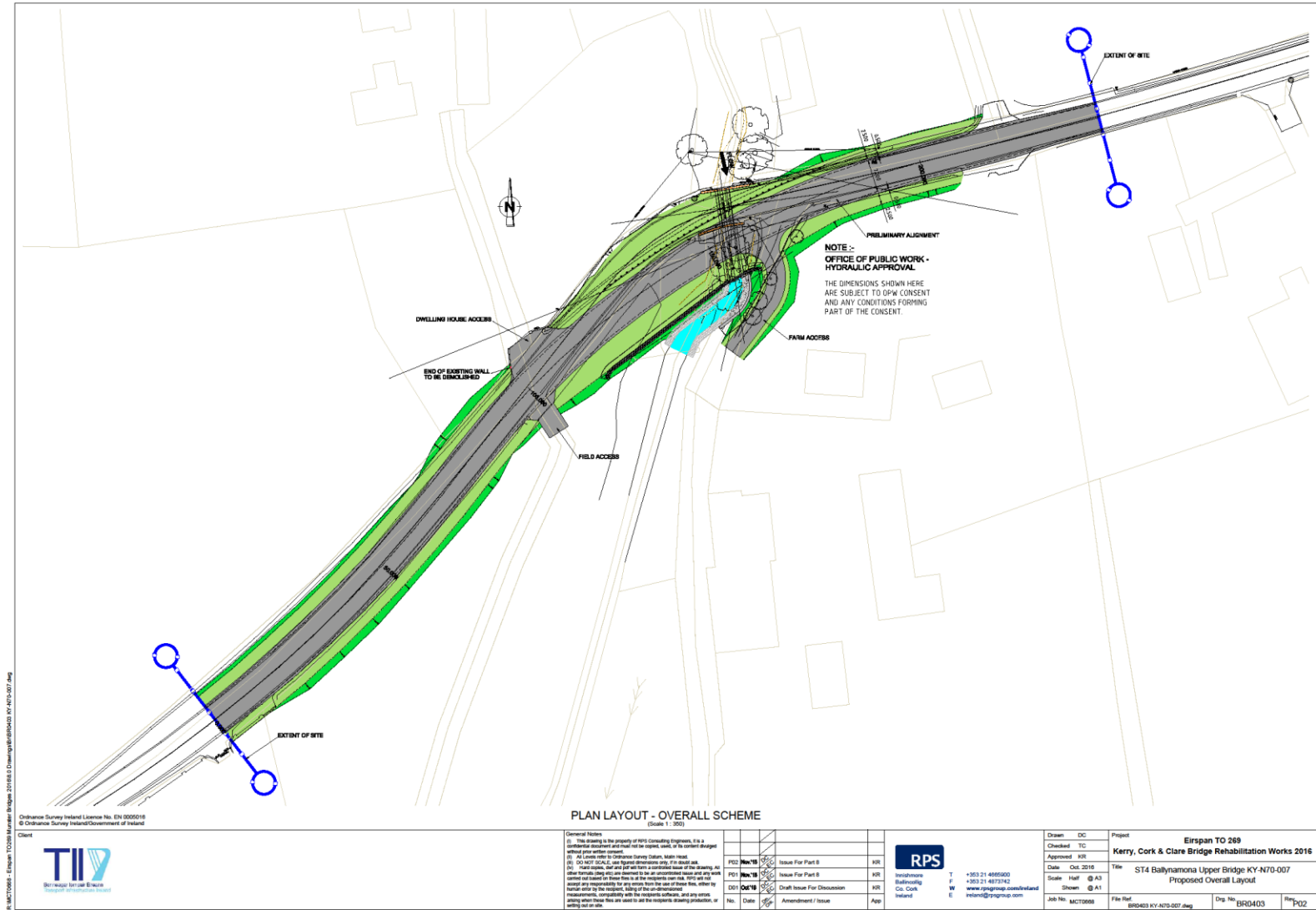
The proposed works include the online realignment of approximately 240m of the existing N70. The works shall also include the construction of an in-situ reinforced concrete bridge and widening the existing bridge, (the widened bridge shall be 20.2m long and 3m wide). The works shall include, inter alia the following activities:

- Provision of traffic management including a bailey bridge, site clearance and erection of contractor's compound;
- Earthworks (import and export of fill materials) for the construction of the widened road base and embankments;
- Provision of water management: the existing river shall be dammed and flumed to allow the foundations for the bridge extension to be constructed;
- Excavation for the new bridge foundations;
- Construction of new in-situ concrete bridge foundations, abutments and bridge deck;
- Application of bridge deck waterproofing and installation of new bridge parapets and safety barrier;
- Masonry cladding to the widened reinforced concrete section;
- Provision of new road surfacing and lines on the widened road;
- Topsoiling and grass seeding of the widening bridge embankments;
- Demobilisation from site and removal of traffic management; and
- Standard Environmental Protection Measures.

Refer to **Appendix A** of the **Appropriate Assessment Screening Report** for proposed works drawings.

The sequence of work activities shall be dependent on the contractor's proposed construction sequence.

Figure 1.3: Layout of Proposed Works at Ballynamona Upper Bridge



1.3 METHOD STATEMENT

The appointed contractor will draw up a Method Statement (MS)/Environmental Operating Plan (EOP) that will include detailed measures as outlined below in relation to the implementation of all measures proposed. This method statement will be strictly adhered to by the contractors involved in the works and will be overseen by the Kerry County Council (the Competent Authority) site representative. Should, for any reason, the contractor not be able to complete the works in accordance with the stipulated protective measures or design proposed then an assessment of any changes he proposes will be conducted. The following documents will form the backbone of the method statement supplemented by specific additional measures proposed below:

- IFI (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, Dublin;
- Irish Water (2016). *Information and Guidance Document on Japanese knotweed Asset Strategy and Sustainability*;
- NRA (2008) *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
- NRA (2010) *Guidelines for the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*. National Roads Authority, Dublin;
- NRA (2008) 'Environmental Impact Assessment of National Road Schemes, A Practical Guide' National Roads Authority, Dublin;
- Murphy, D. (2004) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*. Eastern Regional Fisheries Board, Dublin.
- DOMNR (1998). *Fishery guidelines for Local Authority works*. Department of the Marine and Natural Resources, Dublin;
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors (C532)*. CIRIA;
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects. Technical guidance (C648)*. CIRIA: and
- E. Murnane et al., (2006) *Control of water pollution from linear construction projects. Site guide (C649)*. CIRIA

The method statement will detail how these measures will be monitored for effectiveness by the competent authority. A mechanism for reporting of pollution incidents will be agreed in advance between the contractor(s) and the awarding authority.

1.3.1 General Measures Included in the Method Statement

The following text sets out in summary the general measures that will be incorporated into the Contractor Method Statements and how they will be implemented on site:-

- Except where absolutely necessary, machinery will operate from the bank side and not in-stream;
- Machinery used will not be refuelled near the river and no fuels, oils etc. will be stored on-site;
- No hedgerows or trees will be removed between 1st March and 31st August as per the Wildlife Act;
- Wash-down water from exposed Bridge surfaces must be trapped to allow sediment to settle out and reach neutral pH before clarified water is released to the river or drain system or allowed to percolate into the ground;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Fuels, lubricants and hydraulic fluids for equipment used on the site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids must be collected in leak-proof containers and removed from the site for disposal or re-cycling;
- Mixing of concrete must be carried out away from watercourses;
- Run off from machine service and concrete mixing areas must not enter the watercourse;
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) must be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species such as Japanese knotweed, Rhododendron and Himalayan Balsam; and
- Generation of dust will be controlled during the demolition of the Bridge structure through use of bowsers/wetting down as appropriate.

1.3.1.1 Additional Measures Specifically to Protect Water Quality

The following measures are critical for preserving water quality and aquatic habitats:-

Water Management

- Damming of a watercourse must occur at low flow.
- It is essential that sufficient pump or flume capacity is on hand before operations commence to ensure that: (a) upstream flows can be adequately transferred, and (b) downstream flows are not stopped or significantly interrupted.
- Sandbagging (damming) must be carefully planned and executed as this carries a risk of negative impacts through generation or introduction of silt and sediment to the river system (if bags burst, for example).
- Sand-bags must be clean and of good integrity, preferably fully sealed (i.e., composed of high grade polythene, not webbing or hessian).

- Sand-bags must be filled with very clean, coarse grade sand with no fines at all. They need to be carefully handled and placed so they don't burst and no other additional material (like clay or soil etc.) should be introduced to seal gaps.
- Small (1/4 filled) sandbags must be on hand to seal gaps/leaks in dams as they arise – this will discourage the use of clay or soil to seal gaps.
- With any works involving river damming there is always a need for additional pumping from the works area to retain dry conditions. Complete drying out of instream working areas is a difficult task. Even tiny leaks through dams can lead to pooling of water over time, requiring intermittent or continual pumping out. This water can easily become contaminated with sediment or substances that are harmful to aquatic life (cement, oils etc.).
- At no time should contaminated water from the working area be pumped directly to the river/stream.
- Water contaminated with sediment will be pumped through a series of settlement tanks before it is discharged back to the waterbody.
- Water contaminated with spilled or leaked concrete or even water that leaks and surrounds newly dry concrete can be very alkaline. It must be pumped into barrels and removed off-site to an appropriate disposal facility.

Concrete

Wet concrete and cement/mortar are very alkaline and corrosive and can cause serious pollution to watercourses.

- Disposal of raw or uncured waste concrete must be controlled to ensure that the watercourse will not be impacted.
- Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times must be adhered to.
- Where shuttering is used, measures must be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils.
- Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline. Lorries and mixers and all concrete delivery equipment (wheelbarrows, buckets etc.) must be washed out off site.
- Cement dust must be controlled as it is alkaline and harmful to the surrounding ecology. Activities which result in the creation of cement dust must be controlled by dampening down areas.
- The timing of the works must be specified and agreed with the IFI in relation to fish migration and spawning periods.

Hydrocarbons

- There can be no storage of hydrocarbons or any polluting chemicals within 50m of the watercourse or any active/inactive drains connecting to the river. There must be no refuelling of vehicles/equipment within 50m of a river.
- Any diesel or fuel oils stored on site must be bunded to 110% of the capacity of the storage tank. Design and installation of fuel tanks must be in accordance with best practice guidelines BPGCS005, oil storage guidelines. Drip trays and spill kits must be kept available on site.

- All stationary plant must be placed on drip trays to prevent leaking oils reaching the river or entering groundwater.
- No washings or waste materials of any kind can be directed into the stream.
- Machinery on site must have pollution control kits on hand in the event of an emergency.

1.3.1.2 Additional Measures Specifically to Protect Fish Species and Aquatic Species

The following measures are critical for protecting fish and aquatic species:

- Works must be undertaken during a period of low flow when there is a low risk of flood events. This makes all activities and mitigations easier to implement and manage and limits the potential for generation of sediment and mobilisation of sediment and pollutants downstream.
- The placement of sandbags and capacity of the flume must be such that, in the event that a spate occurs, water can be managed so it does not flow into the works area.
- There shall be pumps on hand within the dried out streambed works area to deal with leaks through upstream and downstream dams. Leaked water can be pumped back over to the watercourse so long as it is not contaminated with pollutants/sediment from the works area. Any contaminated water must be disposed of correctly off-site. Any pumps used shall have appropriate grill or mesh screens at intake points to avoid intake of fish.
- Works shall be completed with one damming/ draw down to avoid repeated interventions that carry negative impacts on each occasion.
- Sandbagging must be carefully planned and executed as this carries a risk of negative impacts through generation or introduction of silt and sediment to the river system. Sand-bagging is less risky than other methods, but only if bags are clean and of good integrity, preferably fully sealed (i.e., composed of high grade polythene, not webbing or hessian). They should contain very clean, coarse grade sand with no fines at all. They need to be carefully handled and placed so they don't burst and no other additional material (like clay or soil etc.) should be introduced to seal gaps.
- Inland Fisheries Ireland (IFI) must be consulted prior to works commencing with regards to methods proposed and timing of works, especially with regards to fisheries restricted periods. IFI shall be informed of the existence of this report.
- Arrangement must be made to accommodate IFI staff to be on-site to supervise damming and drying out of the streambed.
- IFI will advise on whether electrofishing is required prior to drying out of the culvert reach and IFI staff should be present during the actual damming and drying out to rescue and relocate any fish that become stranded by the operation.
- The discharge point of the flume must be carefully placed so as to avoid scouring of banks and streambed. A baffle can be used to ensure water velocity at the discharge point is reduced.
- All new and old concrete debris must be collected and removed regularly during works and correctly disposed of, off-site. No debris shall enter the river.
- At any stage during works, any splashed, leaked, spilled or excess mortar must be prevented from entering the stream and/or making contact with the dry river bed or any standing water. There must be a spillage response plan in place prior to works commencing.
- Any concrete shuttering used must be secure and leak-free. Correct concrete curing times must be observed.

1.3.1.3 Mitigation of Spread of Invasive Species

No records of invasive species are known from the study area. In addition no high impact invasive species were observed in the project area during the site surveys conducted on 21st June and 27th July 2016 by the ecologist.

The presence of Japanese Knotweed has the potential to lead to an offence under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). Regulation 49 of the 2011 Regulations prohibits (unless under licence) the breeding, release, or allowing or causing the dispersal from confinement of any animal listed in the Third Schedule of the Regulations; or the planting, allowing or causing dispersal, and spreading of any plant listed in the Third Schedule. Japanese Knotweed is a plant listed in the Third Schedule.

It is an offence to plant or encourage the spread of Japanese Knotweed by moving contaminated soil from one place to another, or incorrectly handling and transporting contaminated material or plant cuttings. Persons must therefore take all reasonable steps and exercise due diligence to avoid committing an offence under the 2011 Regulations:-

- The Works Requirements must specify and the Contractor must ensure that the source locations for materials which are introduced to the site during the construction phase of the project should be free from non-native invasive species.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) must be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species such as Japanese knotweed, Rhododendron and Himalayan Balsam.

1.3.2 Measures for archaeological recording

A measured, photographic and written survey of the Bridge will be carried out prior to the site construction works by a suitably qualified archaeologist. This will provide a record of the past. This Report should be submitted to KCC Conservation Officer on completion of the works.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT

The EIA shall be carried out in accordance with relevant European and Irish legislation.

1.4.1 Mandatory EIA

EU Directive 85/337/EEC (Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment) as amended is commonly referred to as the EIA Directive and has been further codified by Directive 2011/92/EU. Directive 2011/92/EU requires a process of assessment of environmental impacts for all projects listed in the Directive which are likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location.

As set out in the Environmental Impact Assessment of National Road Schemes, A Practical Guide (NRA, 2008) insofar as roads are concerned, the EIA Directive is transposed into law in Ireland

through the Roads Act, 1993-2015 (No. 14 of 1993). The current requirements for EIA are set out in Part IV of the Roads Act, 1993, and Part V of the Roads Regulations, 1994 (S.I. No. 119 of 1994). In particular, sections 50 and 51 of the Act, as amended deal with EIA.

The overriding consideration in determining whether a road scheme should be subject to EIA is the likelihood of significant environmental effects. In interpreting which projects are likely to have significant environmental effects, the EIA Directive lists those projects for which EIA is mandatory (Annex I) and those projects for which EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination or a combination of both to assess whether these projects require EIA. For road schemes in Ireland, a combination of both is used.

The proposed project was assessed in terms of the mandatory requirements as set out in the EIA Directive and the Roads Act 1993-2015. The NRA Guidelines set out the relevant threshold for EIA Screening and can be seen in NRA Guidelines in **Table 3-1** of the document entitled 'Summary of the Legislative Requirements for the EIA Screening' and the following text is noteworthy.

- *The construction of a new bridge or tunnel which would be 100 metres or more in length.*
- *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.*

This proposal is not one which requires a Mandatory EIA i.e. does not fall in to a category as defined in Annex I or II of the Directive. However it is necessary to assess whether significant effects on the environment are likely as a result of the proposed development and if a sub-threshold EIA may be required.

1.4.2 Sub-Threshold EIA

In addition, provision is made for sub-threshold development where although not meeting or exceeding the thresholds set out in Annex II, a development could still be likely to have significant effects on the environment. The method of assessing those effects for the purposes of deciding whether or not sub-threshold development does in fact create a significant effect on the environment are set out in Annex III to Directive 2011/92/EU.

Projects which are deemed to be likely to have significant effects on the environment also require EIA as sub-threshold development. The 1997 amending Directive (97/11/EC) introduced guidance for Member States in terms of deciding whether or not a development is likely to have '*significant effects on the environment*'. The guidance is provided by way of criteria set out in Annex III of the consolidated Directive (2011/92/EU). The proposed works consulted with the requirement as laid out in the NRA Guidelines on sub threshold categories as outlined in **Table 1-1** below.

Table 1-1: Summary of Legislative Requirements (Sub-Threshold) for EIA Screening (extract from the NRA Guidelines (2008))

Sub Threshold		Regulatory Reference
(5) 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
(6) 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
(7) Where a proposed road development would be located on certain environmental sites ⁴ the road authority shall decide whether the proposed road development would be likely to have significant effects on the environment. "The sites concerned are":	(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.
	(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.	
If the road authority considers that significant environmental effects are likely, it shall inform ABP in accordance with section 50(1)(c).		

In considering whether a sub-threshold proposed road development is likely to have significant environmental effects, the road authority and the Board, under section 50 (1) (e) of the Roads Act, must have regard to the criteria set out in article 27 of the European Communities (EIA) Regulations, 1989. This article refers to the criteria for determining whether a development would or would not be likely to have significant effects on the environment set out in Annex III to the EIA Directive, as amended. These criteria are grouped into three categories as set out below:

- (i) Characteristics of the proposed development;
- (ii) Location of proposed development; and
- (iii) Characteristics of the potential impacts.

In order to inform the screening evaluation, consideration was given to the potential for impacts on particular aspects of the environment, as set out in **Section 3** of the report. These Environmental Topics are set out in the EIA Directive as follows:-

- a) Human beings, fauna and flora;
- b) Soil, water, air, climate and the landscape;
- c) Material assets and the cultural heritage; and
- d) The interaction between the factors referred to in points (a), (b) and (c).

2 PLANNING POLICY REVIEW

2.1 JUSTIFICATION FOR THE PROJECT

Kerry County Council, on behalf of Transport Infrastructure Ireland (TII – Formerly the National Roads Authority) has engaged RPS Consulting Engineers Ltd. to undertake various bridge rehabilitation schemes in Kerry, Cork and Clare. Kerry County Council is acting as the lead Local Authority (LA) for procurement and statutory process on behalf of Cork and Clare through a Section 85 Agreement.

The purpose of this scheme is to develop a bridge widening scheme that will remove an existing pinchpoint on the N70 Castlemaine - Tralee Road and improve road safety in the vicinity of the bridge. The TII (HD15 Collision Data) categorizes Safety Ranking of the N70 in the vicinity of the bridge as *‘twice above expected collision rate’*. The primary cause of the poor safety ranking is due to the existing narrow bridge as sub-standard road alignment on the bridge approach.

The primary legislative drivers for the project are as follows:

- **Water Framework Directive** - The objectives of the Water Framework Directive (WFD) are to protect the current status of all rivers in Ireland and aims to reach good or high status.
- **Safety, Health and Welfare at Work (General Application) Regulations 2007** - Under the Safety, Health and Welfare at Work Act every employer is required to carry out a risk assessment for the workplace which should identify any hazards present in the workplace, assess the risks arising from such hazards and identify the steps to be taken to deal with any risks.

2.2 COUNTY LEVEL - DEVELOPMENT PLAN PROVISIONS

The main provisions of the Kerry County Development Plan (CDP 2015-2021) relevant to this site and surrounding area are as follows:

CDP Objective

Section 7.1 of Chapter 7 Transport & Infrastructure of the Kerry CDP acknowledges that the role of the South West Regional Planning Guidelines (RPGs) list key infrastructural projects required for balanced development of the Region and emphasise the link between the provision of infrastructure and land use planning. Building on the RPGs the priority infrastructure requirements for the County over the CDP period 2015-2021 and beyond include the following schemes listed in Tables 7.1a Priority Roads Infrastructure Projects. The National Secondary Road appears on Table 7.1a.

Section 7.2.1.1 notes the importance of Secondary routes within the County:

‘These routes are of vital economic importance, linking the County with other major centres and ports and are important arteries within the County itself.’

Other Objectives as set out in the Kerry CDP in regards to roads include the following:

RD-17: Protect the capacity and safety of the national road and strategically important regional road network in the County and ensure compliance with the Spatial Planning and National Roads Planning Guidelines (January 2012) and the NRA Traffic & Transport Assessment Guidelines (2007).

RD-22: Provide a safe road system throughout the County through Road Safety Schemes encourage the promotion of road safety in the County and review existing speed limits during the lifetime of this Plan in accordance with any National Guidelines or Directives that may issue.

2.3 LOCAL LEVEL –TRALEE/KILLARNEY HUB FUNCTIONAL AREA LOCAL AREA PLAN (LAP), 2013-2019

The settlement of Castlemaine sits within the Tralee/Killarney Hub Functional Area Local Area Plan (LAP) 2013-2019. Under the Castlemaine LAP Section 1.8 Vehicular and Pedestrian Traffic it is noted that *‘due to the town’s location at the junction of the N70 and the R561 it experiences a considerable level of through traffic during the peak summer period the central core at peak traffic times can be congested’*.

2.4 USE OF ADJOINING, ABUTTING OR ADJACENT LANDS

A site visit was conducted by RPS ecologist Ms. Karen Banks on 21st June and 27th July 2016. In the vicinity of the Bridge Sycamore, Ash and Alder were noted. The Bridge is surrounded by agriculturally improved grassland and associated farm buildings and dwellings. On the north verge there is a residential access on approach (approx. 46m upstream of parapet wall) and a residential access on departure (approx. 48m downstream of parapet wall). On the south verge there is a farm access adjacent to the upstream end face of the parapet wall and a field access (approx. 52m downstream of parapet wall).

3 LIKELY EFFECTS ON THE ENVIRONMENT FROM THE PROPOSED DEVELOPMENT

3.1 INTRODUCTION

As detailed in **Section 1.4.1** the proposed project has been screened out for Mandatory EIA. Therefore it is considered that in order to inform the EIA screening evaluation, consideration was given to the potential for impacts on particular aspects of the environment, as set out below. As per Section 2.4.7 of the 'Guidelines on the Information to be Contained in Environmental Impact Statements' (EPA, 2002) where a single or limited number of environmental topics are identified as being potentially adversely affected by the development, those topics are discussed in greater detail.

The Environmental topics as set out in the EIA Directive (2011/92/EU) are as follows:-

- Human beings, fauna and flora;
- Soil, water, air, climate and the landscape;
- Material assets and the cultural heritage; and
- The interaction between the factors referred to in points (a), (b) and (c).

3.2 OVERVIEW

The Bridge is located on the N70 (National Secondary Road) and crosses a tributary of the River Maine known as the Cloghleagh Stream. It is a single span structure with a clear span of 3m located on the N70, approximately 3km north of Castlemaine.

3.3 BACKGROUND

The Bridge as seen in **Figure 1.1** is a single span structure with a clear span of 3m.

3.4 HUMAN BEINGS AND MATERIAL ASSETS

According to the TII (HD15 Collision Data) the Safety Ranking for the section of the N70 at the Bridge is given a rating of '*twice above expected collision rate*' therefore collision ranking at the structure is high. It is expected that this proposal will have a positive impact on human beings and material assets for the area by providing a safe and secure route to connect with the larger Kerry area.

The Bridge is surrounded by agriculturally improved grassland and associated farm buildings and dwellings. On the north verge are located a residential access on approach (approx. 46m upstream of parapet wall) and a residential access on departure (approx. 48m downstream of parapet wall). On the south verge are also situated a farm access adjacent to upstream end face of parapet wall, a field access (approx. 52m downstream of parapet wall).

The construction phase of the project is expected to last approximately 12-16 weeks. Any minor disturbance to residents in the area will be temporary over the period of the construction works and will likely be during normal working hours. A Bailey bridge will allow for one lane of traffic to remain

Long term impacts will be of a positive nature through provision of safer and improved access for local community and the wider Kerry area. There will be no permanent loss of agricultural property and disturbance to human beings and material assets will be minimal and temporary during the construction phase only.

The Bridge crosses the Cloghleaigh Stream. No EPA monitoring of water quality of the River Maine takes place on the stream but there is a monitoring station located on the River Maine a further 4km upstream 2004-2015 data (<http://gis.epa.ie/Envision>) which indicates a Q value of 4, 'Good' status (Refer to **Figure 3.1**). The Water Framework Directive classifies the stream with Waterbody status as 'Unassigned' for the period 2010-2012 (<http://watermaps.wfdireland.ie>). The transitional water of Castlemaine Harbour is considered to be of 'Unpolluted' status according to the EPA (2010-2012) and receives a Transitional Waterbody WFD Status (2010-2012) of 'Good' (Refer to **Figure 3.2**).

Topographic map of the Ballyvaughan area in County Clare, Ireland. The map shows the coastline, major roads (N18, N22, R56), and numerous place names including Ballyvaughan Upper/Lower, Ballyfinnane, Rathmore, Rathbeg, and Castlemaine. A scale bar at the bottom indicates 0 to 1 km. The map is sourced from EPA, OSI.

Figure 3.2: EPA Data on the Transitional Water Quality of Castlemaine Harbour

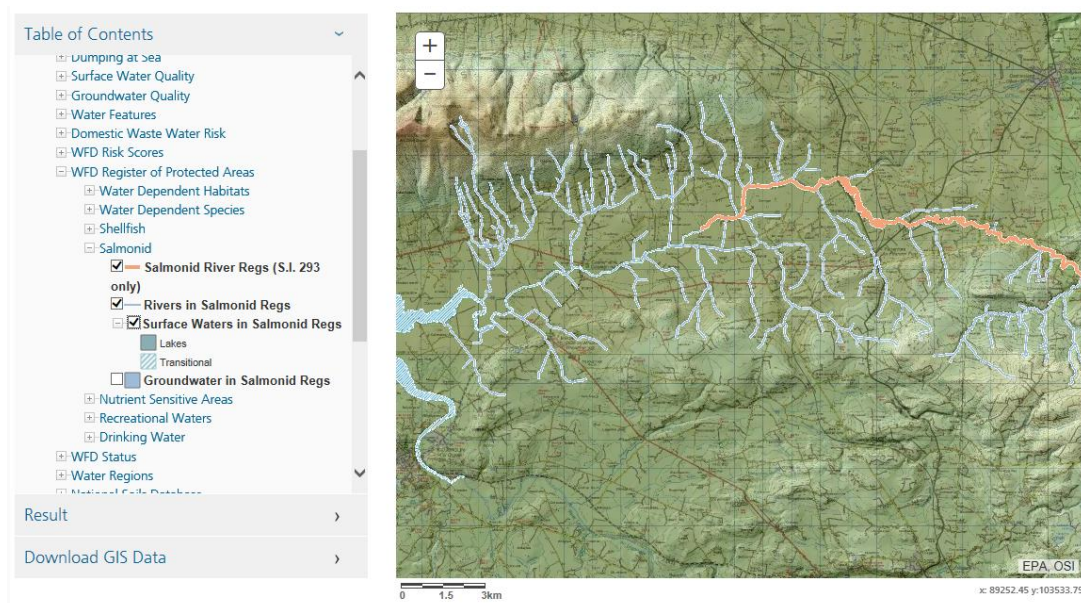


The Cloghleigh stream flows into the River Annagh, which flows into the River Maine approximately 3.9km downstream of the Bridge. The River Maine is classified under the Salmonid River Regs (S.I. 293) according to the EPA data. However, as seen in **Figure 3.3** (extract from EPA Mapviewer) the area of the River Maine included under the Salmonid River Regs. is located approximately 5.9km upstream of the confluence with the River Annagh.

Section 50 Application Report

In accordance with the Arterial Drainage Act, 1945, all works affecting watercourse crossings are subject to approval from the OPW and a Section 50 application must be completed. RPS carried out a Section 50 Application Report (Refer to **Appendix 2**) for the Bridge in November 2016 and concluded that the proposed alterations of the Ballynamona Bridge will not adversely affect flood elevations on the Ballynamona Upper River and the proposed alterations are satisfactory in reference to the requirements of Section 50 of the Arterial Drainage Act, 1945. In addition the report noted that the existing structure will remain in place with the proposed widening works on the downstream face of the existing bridge. The conveyance area of the existing bridge will not be reduced as a result of the proposed works. The soffit level of the proposed widening works will match the existing structure. This is considered sufficient to convey the 1 in 100 year flow rate while maintaining the required freeboard. As the proposed deck extensions will be constructed to match the existing soffit level, there will be no reduction to the existing levels of freeboard under the bridge.

Figure 3.3: EPA Data on the Waters in Salmonid Regs.



From this point the River Annagh confluent with the River Maine, west to Castlemaine Harbour the River Maine is classified as Transitional Surface Waters in Salmonid Regs under the WFD's Register of Protected Areas. There are no Nutrient Sensitive Rivers within the vicinity of the Bridge.

3.6 ECOLOGY

Ecology surveys were undertaken by an RPS ecologist on the 22nd and 27th of June 2016 and the following section summarises the information gathered during these site visits.

3.6.1 Terrestrial Ecology

Site visits were conducted by an RPS ecologist 21th June and 27th July 2016 and the following section summarises the information gathered during these site visits.

The Bridge is surrounded by agriculturally improved grassland and associated farm buildings and dwellings. There is a small grassy road verge to the north west of the Bridge with a garden hedge (*Cupressus* sp) and a stone wall and earth bank to the north east and south west of the Bridge, which is vegetated with Ash saplings, Nettle, Bramble and grasses. There is a grass verge, earth bank and farm access track to the south east of the Bridge.

The Bridge spans the Cloghleagh Stream. The stream is lined by a woodland strip predominantly comprised of Alder (*Alnus glutinosa*), Sycamore (*Acer pseudoplatanus*) and Ash (*Fraxinus excelsior*), with Bramble (*Rubus fruticosus*), *Fuschia* and Nettle (*Urtica dioica*) common in the shrub layer and ground flora.

No evidence of otter activity or otter holts were observed in the vicinity of the Bridge. With regards to birds, there was no nesting potential in the Bridge structure. The habitat adjacent to the Bridge is unsuitable for kingfisher; however there is some nesting potential for other species of birds in the

trees and scrub lining the stream. The Bridge is shotcreted and does not contain any cracks or crevices of potential use by bats.

No invasive non-native species were observed at the Bridge or its environs.

3.6.2 Aquatic Ecology

The Ballynamona Bridge Upper forms part of the protected species surveys undertaken as part of the Kerry, Cork and Clare Bridge Rehabilitations 2016: Protected Aquatic Species and Habitats Surveys, by Aquatic Services Unit (ASU) of University College Cork, carried out in July 2016. The surveys focused on the following species and habitats:

- Freshwater pearl mussel (*Margaritifera margaritifera*);
- Atlantic salmon (*Salmo salar*);
- Lampreys (*Lampetra* spp., *Petromyzon marinus*);
- European eel (*Anguilla anguilla*); and
- Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation.

The following section summarises the information gathered during surveying.

From 10m upstream to about 20m downstream of the bridge, milking cows use the stream bed to access milking sheds from fields north of the N70. At the time of the site visit (July 2016), there was manure in the stream and it appeared that cobbly substrates are disturbed by constant trampling. In its natural state (away from cattle influence), the stream is small (1-1.5m wide, with 0.03m riffles and small pool/runs up to 0.15m) and step-pool-cascade in nature. Substrates were cobble and gravel with a limited bryophyte community and quite dense riparian tree cover for at least the first 150m d/s of the bridge.

This is at best a small trout stream. It is too small and unstable for salmon and generally lacks the silt deposits suitable for lamprey nursery, although brook lamprey (*Lampetra planeri*) cannot be ruled out. The stream is affected by milking cows accessing this area regularly so habitat around the bridge itself is not highly suitable, even for trout.

The Bridge is not located in a *Margaritifera* sensitive area¹.

3.6.3 Brief Description of the European Sites

The potential effects on European Sites as a result of the proposed Bridge works are limited to impacts primarily related to changes in water quality. There are five SACs and three SPAs within a 15km buffer of the Bridge. **Table 3.1** lists the SACs and **Table 3.2** lists the SPAs that are within a 15km buffer of the project area, and **Figure 3.4** shows their locations in relation to the proposed widening works. The proposed works are not situated within any SACs or SPAs, therefore no direct impacts will occur through land take or fragmentation of habitats.

¹ <http://www.npws.ie/maps-and-data/habitat-and-species-data>, accessed 01/07/2016

The integrity of a European Site (referred to in Article 6.3 of the EU Habitats Directive) is determined based on the conservation status of the Qualifying Interests of the SAC or SPA. The Qualifying Interests for each site have been obtained through a review of the Conservation Objectives available from the National Parks and Wildlife Service (NPWS).

An AA screening report was prepared for the works which addressed potential for direct and indirect impacts and the assessment concluded that no elements of the proposed Bridge project are likely to cause significant effects on European Sites (refer to **Appendix 1: AA Screening Report**).

Table 3-1: SACs within 15km of the Proposed Works

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Distance From Bridge ²	Connectivity
002185	Slieve Mish Mountains SAC	Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Siliceous rocky slopes with chasmophytic vegetation [8220]	<i>Trichomanes speciosum</i> (Killarney Fern) [1421]	1.4km – North and west	No connectivity
000343	Castlemaine Harbour SAC	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) [2170] Humid dune slacks [2190] Alluvial forests with <i>Alnus glutinosa</i> and	<i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355] <i>Petalophyllum ralfsii</i> (Petalwort) [1395]	4.6km - South west	Indirect hydrological connection. The Cloghleagh Stream flows under the Ballynamona Bridge and into the Annagh River which flows in the Maine River which is part of Castlemaine Harbour SAC.

² Measured in kilometres “as the crow flies”

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Distance From Bridge ²	Connectivity
		Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]			
002112	Ballyseedy Wood SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]		6.8km – North	No connectivity
002070	Tralee Bay And Magharees Peninsula, West To Cloghane SAC	<p>Estuaries [1130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Coastal lagoons [1150]</p> <p>Large shallow inlets and bays [1160]</p> <p>Reefs [1170]</p> <p>Annual vegetation of drift lines [1210]</p> <p>Perennial vegetation of stony banks [1220]</p> <p>Salicornia and other annuals colonising mud and sand [1310]</p> <p>Atlantic salt meadows (Glauco-Puccinellietalia maritima) [1330]</p> <p>Mediterranean salt meadows (Juncetalia maritimi) [1410]</p> <p>Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]</p> <p>Dunes with Salix repens ssp. argentea (Salicion arenariae) [2170]</p> <p>Humid dune slacks [2190]</p> <p>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]</p> <p>Alluvial forests with Alnus glutinosa and</p>	Trichomanes speciosum (Killarney Fern) [1421]	7.3km - North west	No connectivity

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Distance From Bridge ²	Connectivity
		Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]			
000332	Akeragh, Banna and Barrow Harbour SAC	Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] European dry heaths [4030]		14.9km – North west	No connectivity

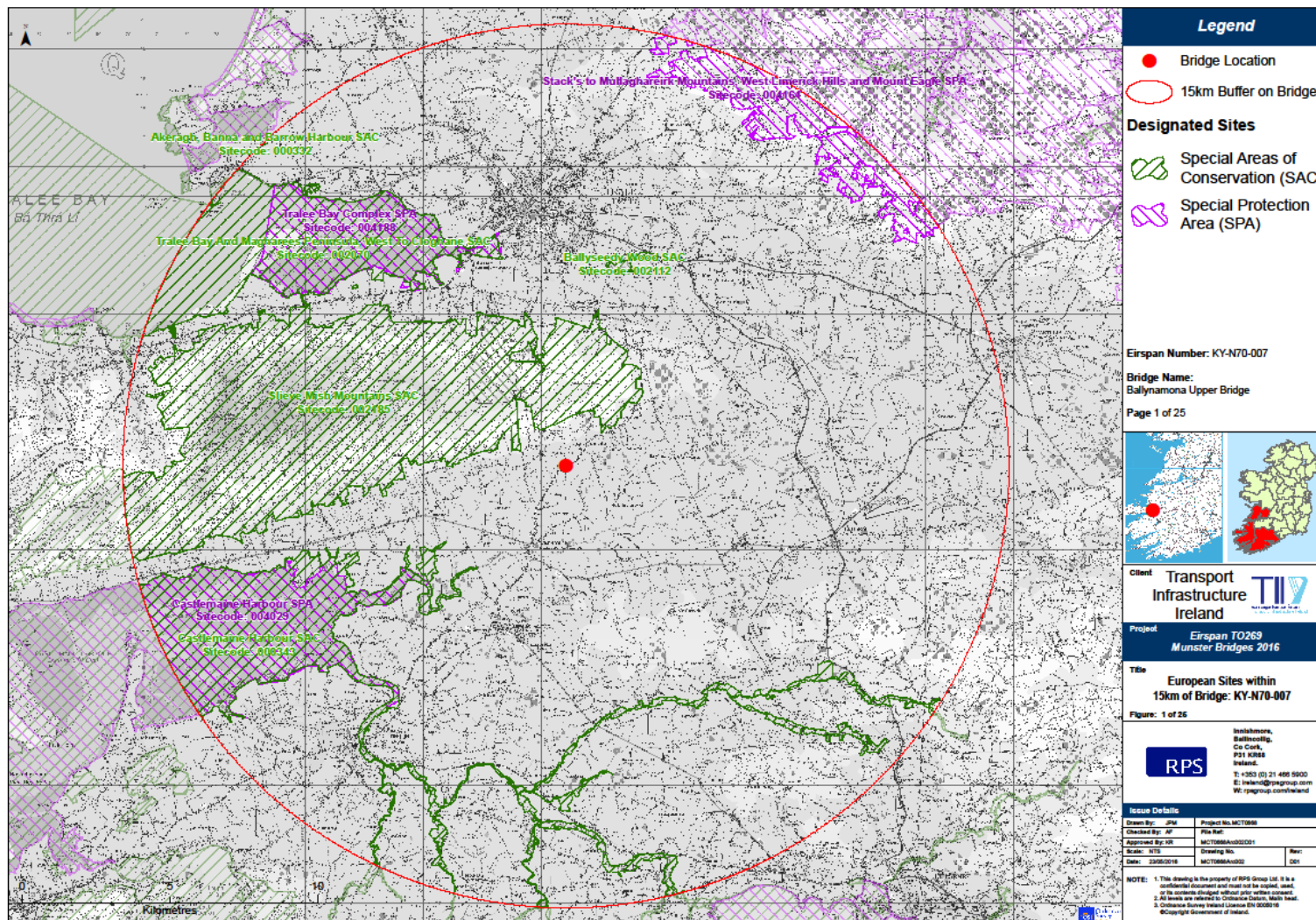
Table 3-2: SPA's within 15km of Proposed Works

Site Code	Site Name	Qualifying Feature Annex I species	Distance From Bridge	Connectivity
004029	Castlemaine Harbour SPA	Red-throated Diver (<i>Gavia stellata</i>) [A001] Cormorant (<i>Phalacrocorax carbo</i>) [A017] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Wigeon (<i>Anas penelope</i>) [A050] Mallard (<i>Anas platyrhynchos</i>) [A053] Pintail (<i>Anas acuta</i>) [A054] Scaup (<i>Aythya marila</i>) [A062]	6.1km – South west	Indirect hydrological connection. The Cloghleagh Stream flows under the Ballynamona Bridge and into the Annagh River which flows in the Maine River which is part of Castlemaine Harbour SPA.

Site Code	Site Name	Qualifying Feature Annex I species	Distance From Bridge	Connectivity
		Common Scoter (<i>Melanitta nigra</i>) [A065] Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Sanderling (<i>Calidris alba</i>) [A144] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Redshank (<i>Tringa totanus</i>) [A162] Greenshank (<i>Tringa nebularia</i>) [A164] Turnstone (<i>Arenaria interpres</i>) [A169] Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346] Wetland and Waterbirds [A999]		
004161	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Hen Harrier (<i>Circus cyaneus</i>) [A082]	12.8km – North east	No connectivity
004188	Tralee Bay Complex SPA	Whooper Swan (<i>Cygnus cygnus</i>) [A038] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Shelduck (<i>Tadorna tadorna</i>) [A048] Wigeon (<i>Anas penelope</i>) [A050] Teal (<i>Anas crecca</i>) [A052] Mallard (<i>Anas platyrhynchos</i>) [A053] Pintail (<i>Anas acuta</i>) [A054] Scaup (<i>Aythya marila</i>) [A062] Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Golden Plover (<i>Pluvialis apricaria</i>) [A140]	7.4km – North west	No connectivity

Site Code	Site Name	Qualifying Feature Annex I species	Distance From Bridge	Connectivity
		Grey Plover (<i>Pluvialis squatarola</i>) [A141] Lapwing (<i>Vanellus vanellus</i>) [A142] Sanderling (<i>Calidris alba</i>) [A144] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Turnstone (<i>Arenaria interpres</i>) [A169] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] Common Gull (<i>Larus canus</i>) [A182] Wetland and Waterbirds [A999]		

Figure 3.4: Designated Sites within a 15km Buffer of the Bridge



Key impacts during the construction phase are summarized in **Table 3.3** below. These impacts have been taken into account in the design and the detailed method statements of the Bridge which are being prepared for the project and therefore no significant effects are anticipated.

Table 3-3: Summary of Potential Impacts on Aquatic Species

Works proposed	Potential Impact on aquatic species
<p><u>Bridge Widening/Replacement</u></p> <ul style="list-style-type: none"> Provision of traffic management including a Bailey bridge, site clearance and erection of contractor's compound; Earthworks (import and export of fill materials) for the construction of the widened road base and embankments; Provision of water management: the existing river shall be dammed and flumed to allow the foundations for the bridge extension to be constructed; Excavation for the new bridge foundations; Construction of new in-situ concrete bridge foundations, abutments and bridge deck; Application of bridge deck waterproofing and installation of new bridge parapets and safety barrier; Masonry cladding to the widened reinforced concrete section; Provision of new road surfacing and lines on the widened road; Topsoiling and grass seeding of the widening bridge embankments; Demobilisation from site and removal of traffic management; and Standard Environmental Protection Measures. 	<p>This is a small, fairly low volume trout stream. Patchy spawning habitat downstream of the bridge can be negatively affected indirectly if excessive sediment or fines enter the stream during construction. Suspended solids can harm fish gills in small streams such as this, also smothering spawning/nursery habitat and altering invertebrate food supply. Without adequate protection measures there is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete (bridge widening/reinforcing/ paved verge construction) and mortar, entering the watercourse from the works area. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected would most likely be trout.</p> <p>During the operational phase, there is potential for permanent impact at a local scale if the new bridge footprint is not passable by fish. This can occur if bed reinforcement creates an overly shallow, overly wide flow regime, and especially if there is a high downstream apron that can act as an impassable barrier to trout, lampreys and eels.</p>

(refer to the AA in Appendix 1)

The aquatic survey found that the Cloghleagh Stream is at best a trout stream; however the Maine River, located approximately 3.9km downstream of the bridge supports good salmonid habitat. A reduction in water quality due to sedimentation and release of suspended solids may impair plant growth and impact on salmonid spawning habitat. This could have knock-on effects further up the food chain on invertebrates, birds, fish and mammals. A reduction in water quality may also impact on Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*), and otters within and downstream of the study area. Should large quantities of suspended solids enter waterbodies in the vicinity of the proposed development it could potentially affect the riverine habitat and associated protected species. An accidental spillage and release of hydrocarbons to sensitive watercourses in the immediate surroundings could have significant adverse impacts on protected species within the Maine River and the Castlemaine Harbour SAC. In addition, the potential spillage and release of hydrocarbons from plant equipment during the construction phase may arise.

The proposed works have been designed with stringent protective measures built into the works methodology (work during periods of low flow, careful handling of fuels and lubricants, appropriate

disposal of contaminants etc.) as detailed in **Section 1.3**. In addition, all works will be conducted in consultation with Inland Fisheries Ireland (IFI) and IFI or a suitably qualified ecologist will be present during any dewatering of the river. These measures have been designed to ensure that the water quality of the underlying watercourse is protected during the proposed works. Such measures to protect waterbodies will ensure that the water quality of the Annagh River and its tributary and the Maine River are protected from the works. Likewise, such measures will also ensure that adverse impacts to water dependent species such as salmon, lamprey and white-clawed crayfish are avoided. Should these best practice measures (as outlined in **Section 1.3**) be followed during the works, it is not anticipated that the proposed works will result in any potential discharges to the Annagh River and in turn, the Castlemaine SAC & SPA. These protective measures were built into the works design in order to protect Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*) and Salmon (*Salmo salar*) as these are qualifying species of the SAC which is hydrologically connected with the site. These measures will also in turn protect other species of concern, such as otter.

It is further noted that Castlemaine Harbour SAC is designated for transitional habitats and species associated with routine estuarine and or tidal inundations and fluctuations. To this end, habitats and species associated with these European Sites are accustomed to high levels of water turbidity, fluctuations in sediment accretion, deposition and erosion. As a result these habitats are not as sensitive (when compared to freshwater / terrestrial habitats and species) to those potential impacts associated with small scale construction works (in particular sporadic increases in sediment load). Therefore these sites would not be significantly affected by the low level or sporadic release in sediment or particulate matter associated with such works. Furthermore, the potential release of other deleterious substances such as hydrocarbons, particulate matter, wet cement etc. can be readily retained to within the footprint of the proposed works area through standardised best practice measures (see **Section 1.3**).

In relation to Castlemaine Harbour SAC and SPA should the best practice measures as built into the project design (as outlined in **Section 1.3**) be followed during the works, it is not anticipated that the proposed works will result in any potential discharges to the Annagh River and in turn, Castlemaine Harbour SAC & SPA. Furthermore, as also noted above, habitats and species associated with Castlemaine Harbour are accustomed to high levels of water turbidity, fluctuations in sediment accretion, deposition and erosion. As a result these habitats are not as sensitive (when compared to freshwater / terrestrial habitats and species) to those potential impacts associated with small scale construction works (in particular sporadic increases in sediment load). Therefore this site would not be significantly affected by the low level or sporadic release in sediment or particulate matter associated with such works.

Castlemaine Harbour SPA is located 6.1km to the south-west of Ballynamona Upper Bridge. It is extremely unlikely that the qualifying species of this SPA are using the agriculturally improved lands in the vicinity of the proposed works. It is not anticipated that the proposed works would result in a significant increase in the level of background noise disturbance in the local areas. Any disturbance to bird species within nearby European Sites as a result of the proposed works is considered extremely unlikely. Furthermore, potential disturbances will be temporary and confined to the construction phase of the development only. Therefore, it is not anticipated that the proposed works will have a significant effect on Castlemaine Harbour SPA with regards to noise disturbance of birds.

Taking into account the nature of the works, the protective measures incorporated into the project design and potential for impact downstream, it is not anticipated that the proposed rehabilitation works will have a significant effect on any European Site.

3.7 SOILS, GEOLOGY AND HYDROGEOLOGY

Information on the soils, geology and hydrogeology of the study area has been obtained from the Geological Survey of Ireland (GSI) Spatial Resources Viewer. The groundwater vulnerability in the immediate vicinity of the Bridge site is 'High'.

The area in the immediate vicinity of the Bridge is classed as being underlain by a Locally Important Aquifer – LI in which bedrock which is Moderately Productive only in Local Zones.

The GSI National Generalised Bedrock Geology Map indicates the Bridge is underlain by Cappagh Sandstone Formation – purple cross-bedded sandstone.

The Teagasc Subsoil map indicates the Bridge is located within TDSs - Sandstone till (Devonian). The soil is AminPD - Surface water Gleys / Ground water Gleys Acidic.

There is no potential for significant impacts in relation to soils, geology or hydrogeology arising from the construction activities associated with the proposed upgrade works.

3.8 AIR, CLIMATIC FACTORS, NOISE & VIBRATION

It is considered that air quality in the area is not likely to be significantly impacted upon by way of this proposal. Standard dust control construction measures, including water spraying and sweeping of roads have been incorporated into the construction method statement.

There a number of dwellings in the vicinity of the Bridge. Faunal receptors include both mobile species such as salmon and otter. Potential sources of noise and vibration during this project include dump trucks and HGV's which will operate for the construction period of the works.

The scale of the construction will comprise something in the order of 10 truckloads per day at peak times. While the activity will take place over 12-16 weeks the intensity of the activity on any day will typically be limited to a delivery of materials, some vehicle and personnel movement around the site and typical construction activities. The intensity at any instant in time will not be such to cause any significant noise or vibration impact and long periods of the construction will comprise manual labour with minimal noise and vibration impact. Given the rural, sparsely populated nature of the area and to the location of dwellings relative to the proposed works, it is considered that significant impacts on human receptors are not likely to occur in this instance. Adherence to protective measures in the method statement will ensure there are no residual impacts on sensitive aquatic species or birds.

3.9 LANDSCAPE, CULTURAL AND BUILT HERITAGE

There are 5 Sites and Monuments Records (SMRs) within 1km of the works according to the Archaeological Survey of Ireland. The closest of which is a Font (KE047-012) and a National Monument (KE04221) is less than 100m to the west of the Bridge. Other National Monuments include, a Rath with associated Rock Art and Standing Stone to the east of the Bridge. There are no Record of Protected Structures (RPS) located within the vicinity of the Bridge. There are no records from the National Inventory of Architectural Heritage are within 1km of the development. An

Archaeological Report was carried out by John Cronin Associates and notes that the Bridge itself is not included on the RMP, RPS or NIAH it does appear on first-edition OS map. Whilst there is potential for possible masonry conservation issues, the impact is not considered significant as a photographic record will be undertaken for the Bridge prior to works been undertaken.

Map 12.1f Amenities/Views and Prospects which accompanies the Kerry CDP (2015-2021) and details Amenities/Views in the vicinity of the Bridge shows that the Bridge is not located within any designated Special Amenity or View and Prospects.

Given the nature and scale of the works no significant impacts either directly or indirectly is considered likely to landscape, archaeology or built heritage.

3.10 INTERRELATIONSHIPS OF THE FOREGOING

The greater the number of different aspects of the environment which are likely to be affected and the greater the links between the effects, the more likely significant effects may occur.

Impact inter-relationships/interactions relate to the reactions between impacts within a project and the inter-relationship between impacts identified under one topic with impacts identified under another topic.

The consideration of impact inter-relationships and interactions provides an opportunity to consider the overall impacts of a project which might not be immediately apparent.

The most important interaction in this case is that between ecology and water quality. It is very important that the project is undertaken in such a manner so as to ensure that water quality of the river and downstream is not unduly harmed. It is considered that the proposal as outlined contains such safeguards as integral components of the overall project and therefore avoids the potential for interaction of impacts or associated cumulative impacts. This matter has been addressed within the proposal.

All above receptors contribute to the distinctive character of the area. Cumulative impacts on the suite of these features maybe significant in scale, nature and duration. Cumulative impacts are assessed in **Table 3-5** of this EIA Screening and **Table 3-4** of the AA Screening in **Appendix 1** and are not considered significant.

3.11 EIA SCREENING

3.11.1 Checklist of Criteria

Section 1.3 of this document outlines that this project is not considered either Annex I or Annex II to Directive 2011/92/EU.

The Checklist of Criteria for Evaluating the Significance of Environmental Effects – as per S5.39 of the ‘Environmental Impact Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development’ (DEHLG, 2003) is designed to help competent/consent authorities decide whether EIA is required based on the characteristics of the likely impacts of a project i.e. to decide whether the

effects of a project are likely to be significant. The checklist was originally proposed in 'Guidance on EIA – Screening' (June, 2001; prepared for the European Commission by ERM (UK)). Consideration has been given to the project under each question to be considered.

Table 3-4: Questions to be considered in EIA Screening

Question to be Considered	Response
1. Will there be a large change in environmental conditions?	No – the proposed works method statement has in built protective measures outlined in Section 1.3 which ensure no significant environmental effects.
2. Will new features be out-of-scale with the existing environment?	No – given that this is an upgrade/rehabilitation of an existing Bridge it is considered the proposed works will be of a scale which will not have a negative impact on the landscape.
3. Will the effect be particularly complex?	No - any adverse effects will be minor and temporary and are limited to potential effects on wildlife and humans as a result of noise disturbance. Protective measures built into the works method statement have been proposed to minimise the potential for impacts.
4. Will the effect extend over a large area?	No - effects will be limited to the immediate vicinity of the current footprint of the Bridge and resurfacing or the road immediate adjacent to the Bridge. Protective measures built into the works method statement will ensure that there are no surface water pollution effects which are transported downstream.
5. Will there be any potential for transfrontier impact?	No. Small local scale improvement works only.
6. Will many people be affected?	Local residents, commuters and tourists and businesses will benefit from this development as a result of having a safer Bridge in place. There will be a temporary negative impact as a result of noise and possibly traffic during the construction stage only.
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?	Individual species of birds and mammals may be temporarily affected due to noise disturbance from activities associated with the upgrade/rehabilitation. However, due to the short-term temporary nature of the works and the distance to designated sites from the works there will be no significant or long-term effects on these receptors. Businesses and facilities will be temporarily affected by the proposed development during the construction period only. One lane of traffic will however be maintained at all times thus avoiding any potential for significant effects.
8. Will valuable or scarce features or resources be affected?	No – the works are located in an area which is not considered to be of high quality or importance.
9. Is there a risk that environmental standards will be breached?	Instream works as part of the project are limited to water management and protective measures have been built in to the works method statement in order to minimise the potential for impacts. Therefore it is considered that environmental standards will not be breached.
10. Is there a risk that protected sites, areas, features will be affected?	An AA Screening has been prepared for the project. The AA Screening concluded that significant effects on European Sites are not considered likely.

Question to be Considered	Response
	There are no recorded archaeological features recorded in close proximity to the proposed works therefore no impacts to protected archaeological sites are considered likely. Further a photographic record of the Bridge will be undertaken prior to commencement of construction.
11. Is there a high probability of the effect occurring?	Significant negative impacts on species or habitats as a result of works are unlikely.
12. Will the effect continue for a long time?	The works are expected to last approximately 12-16 weeks. Any minor disturbance to species in the area will be temporary over the period of the construction works. The works include upgrade/rehabilitation of an existing Bridge which is already a permanent feature in the landscape.
13. Will the effect be permanent rather than temporary?	As discussed above the majority of the effects will be temporary however there will be a permanent visual impact of the upgraded Bridge, as was the case of the existing Bridge. The Bridge is not located within any designated Special Amenity or View and Prospects therefore any impacts are not considered significant.
14. Will the impact be continuous rather than intermittent?	Temporary indirect disturbance impacts on species will be intermittent while construction is ongoing.
15. If it is intermittent will it be frequent rather than rare?	For the period of construction i.e. 12-16 weeks any disturbance impacts will likely be daily during normal working hours.
16. Will the impact be irreversible?	The temporary impacts on species are reversible.
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No – this proposal is not a particularly complex or large proposal. Potential negative effects can be avoided by way of the standard environmental protection measures contained in the overall proposal.

3.11.2 Screening Selection Criteria

Article 4(3) of Directive 97/11/EC requires that Competent Authorities must take into account the selection criteria set out in Annex III of the Directive when making screening decisions on a case-by-case basis and when setting thresholds and criteria for projects requiring EIA. The criteria have been transposed in full into Irish legislation, in the Third Schedule to the European Communities (Environmental Impact Assessment) (Amendment) Regulations 1999 (S.I. No. 93 of 1999) and in Schedule 7 to the Planning and Development Regulations 2001 (S.I. No. 600 of 2001), as amended.

The criteria, as transposed in Irish legislation, are grouped under three headings viz. (i) Characteristics of Proposed Development, (ii) Location of Proposed Development and (iii) Characteristics of Potential Impacts and are detailed in the Appendix to 'Environmental Impact Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development' (Department of the Environment, Heritage and Local Government, 2003).

Competent/consent authorities must have regard to these criteria in forming an opinion as to whether or not a sub-threshold development is likely to have significant effects on the environment.

The key issue is 'are the likely effects "significant" in the context of these criteria'. These criteria are listed below and the project is considered under each criterion.

Table 3-5: Selection Criteria from Annex III of the EIA Directive

1. Characteristics of Development	
Size	This is considered to be a small scale development – comprising widening/rehabilitation to an existing Bridge.
Cumulative impacts with other developments / projects	There are a number of existing residences within 50m of the Bridge. A search of the Kerry County Council website Planning inquiry indicated no planning applications of relevance to the proposed works. The rehabilitation works themselves will result in positive impacts for future planning applications/development in the area by providing safer access. (Refer to Table 3-4 in Appendix 1: AA Screening Report for further details).
The nature of any associated demolition works	<p>The following demolition works are proposed: demolition of the existing parapet walls. The southern one is to be removed and the northern one is to be replaced.</p> <p>The potential for significant effects associated with demolition works is not considered significant given the construction methods proposed and the protective measures incorporated into the design and construction methodology.</p>
Use of natural resources	Natural resources such as aggregates (used in concrete), steel, soil and rock will be used in the proposed works as part of the Bridge works.
The production of wastes	No large-scale wastes will be generated.
Pollution and nuisances	This proposal has the potential to generate nuisances associated with noise at the construction stage. However these impacts will be temporary in nature and during the daytime only.
The risk of accidents having regard to substances or technologies used	<p>There is no hazardous activity on site posing a significant risk to a habitat or human environment.</p> <p>There is a slight risk of small scale spillage of pollutants such as concrete and oils / hydrocarbons however protective measures have been proposed to minimise those risks (See Section 1.3 and Appendix 1 for protective measures included in the AA Screening Report).</p>
2. Location of Proposed Development	
Existing land use	Local Authority Public Roadway
Previous land use	Local Authority Public Roadway
Relative abundance, quality and regenerative capacity of natural resources in the area	<p>The approximate quantity of material will be as follows: Surfacing 200m³, Imported fill 300m³ and Concrete 150 m³. There will be 100 m³ of soil, clay and rockfill excavated on site to enable the construction of the proposed works, a portion of this will be retained on site for reuse, with the remainder removed from the site. The material removed will be disposed of in accordance with best practice measures to a licensed tip or recycling facility. There will be road resurfacing and the addition of embankments of 240m in length /volume 300 m³. Any vegetation removed will be limited improved grassland, and will be re-instated. There will be removal of trees or hedgerows in the region of 480m in length. It is considered that this vegetation will recover adequately in the short term. Species in the area might be temporarily disturbed during the construction period</p>

	but with protective measures it is considered that impacts will not be significant.
<p>The existing environment and absorption capacity of the natural environment, paying particular attention to the following areas:</p> <p>Wetlands</p> <p>Coastal zones</p> <p>Mountain and forest areas</p> <p>Nature reserves and parks</p> <p>European sites</p> <p>Areas in which environmental quality standards laid down by the EU have already been exceeded</p> <p>Densely populated areas</p> <p>Landscape of historical, cultural or archaeological significance</p>	<p>Wetlands: The proposed development will primarily be located within the existing footprint of the Bridge and immediate area. There are no implications for wetland habitats as a result of the proposed development.</p> <p>Coastal Zone: There are no implications for coastal zones as a result of the proposed development.</p> <p>Mountain and forest areas: The proposed development will be located within improved agricultural grassland. There are no implications for mountain and forest areas as a result of the proposed development.</p> <p>Nature reserves and parks: The proposed development is not located within or in close proximity to any nature reserve or park.</p> <p>European Sites: No permanent significant effects are predicted (refer to AA Screening Report in Appendix 1).</p> <p>Areas in which environmental quality standards laid down by the EU have already been exceeded: None</p> <p>Densely populated areas: None</p> <p>Landscape of historical, cultural or archaeological significance: The proposed project is not located within an area designated by Kerry County Council as being of either high value, sensitivity nor importance. There are some recorded archaeological features in close proximity to the works however given the scale of the project it is considered that there is no potential for impact on the absorption capacity of the natural environment in this respect. The Bridge itself is not included on the RMP, RPS or NIAH but does appear on first-edition OS map. Whilst there is potential for possible masonry conservation issues, the impact is not considered significant as a photographic record will be undertaken for the Bridge prior to works being undertaken.</p>
<p align="center">3. Characteristics of Potential Impacts</p> <p align="center">The potential significant effects of the proposed development in relation to the criteria set out in 1 & 2 above and having particular regard to:</p>	
Extent of the Impact (geographical area and size of affected population)	<p>The proposed Bridge will be on the footprint of the existing Bridge but will increase the existing width to 20.2m.</p> <p>Any disturbance effects from the construction phase of the project may temporarily affect local individuals of species in the vicinity of the works.</p> <p>An increase in safety of the Bridge and immediate road has positive implications for the people in the area and other users of the public roadway.</p> <p>The extent of impact is generally limited to the development site itself and its immediate vicinity.</p>
Transfrontier nature of the impact	None. No cross border implications.
Magnitude and complexity of the impact	Main impacts include potential for temporary impacts to wildlife as a result of noise disturbance. These are not considered to be overly high in magnitude or complex in nature.
Probability of the impact	<p>Best practice during the works phase will mitigate potential negative effects – particularly those related to the construction phase.</p> <p>Detailed design as submitted and incorporated into the proposal reduces the probability of impacts occurring, particularly in relation to ecology.</p>

	<p>Despite this, some temporary impacts on local wildlife are likely to result from the proposed works.</p> <p>With the proposed protective measures outlined in the AA Screening Report (Appendix 1) no significant impacts to salmon or Freshwater Pearl Mussel are anticipated.</p>
Duration, frequency and reversibility of the Impact	<p>Construction risks (hydrocarbon spillages etc.) and nuisances (noise etc.) are likely to be temporary in nature. Therefore, impacts to wildlife as a result of noise disturbance will be temporary and reversible.</p> <p>Impacts with respect to construction stage noise and air and water quality are temporary in nature, in that they will cease when the works are completed.</p> <p>The temporary impacts of the proposed development are largely theoretically reversible.</p>
4. Recommendation and Conclusion	
<p>Having regard to the above, and in particular to the nature, scale and location of the proposed project, by itself and in combination with other plans and projects, it is considered that this proposal is not likely to have significant effects on the environment and that an EIA is not required in this instance.</p> <p>Implementation of the method statement including the protective measures outlined in the AA Screening Report (RPS, 2016) and Section 1.3 of this EIA Screening must be undertaken by the contractor and overseen by a Kerry County Council Representative.</p>	

APPENDIX 1

APPROPRIATE ASSESSMENT SCREENING REPORT

(Appendix A: Proposed Works Drawings

and Appendix B: Aquatic Ecology Survey)












NRA Programme of Bridge Rehabilitation Works, Counties Cork, Clare and Kerry

Appropriate Assessment Screening – Ballynamona Upper Bridge, Co. Kerry

Document Control Sheet

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1 INTRODUCTION

1.1 BACKGROUND

This report comprises information in support of screening for an Appropriate Assessment in line with the requirements of the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) for the proposed realignment works of the Ballynamona Upper Bridge (KYN-N70-007) (here after referred to as the Bridge) Co. Kerry.

1.2 EXISTING SITUATION AND SITE LOCATION

The Bridge carries the N70 over a tributary of River Maine. This tributary is referred to as the Cloghleagh Stream by the EPA (<http://gis.epa.ie/Envision>). It is a single span structure with a clear span of 3m located on the N70, approximately 3km north of Castlemaine, County Kerry (see **Figure 1.1**). The nearest European Site is the Slieve Mish Mountains SAC, which is located 1.4km to the north and west of the Bridge. The location of the Bridge is illustrated in **Figure 2.2**.

Figure 1.1: Photograph of Ballynamona Upper Bridge



Widening of the bridge is required and is the subject of this Appropriate Assessment Screening (AA).

1.3 LEGISLATIVE CONTEXT

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as “The Habitats Directive”, provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of European Sites (Annex 1.1). Article 6(3) establishes the requirement for Appropriate Assessment (AA):-

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

Article 6(4) states:-

If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

This Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna is transposed into Irish Law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) as stated above.

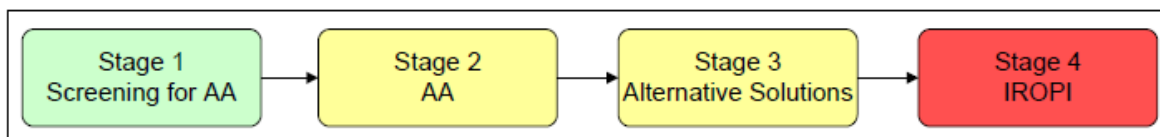
2 METHODOLOGY

2.1 STAGES OF THE APPROPRIATE ASSESSMENT

The Department of the Environment, Heritage and Local Government guidelines (DELHG, 2009, rev. 2010) outlines the European Commission's methodological guidance (EC, 2002) promoting a four-stage process to complete the Appropriate Assessment (AA), and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in **Figure 2.1**. Stages 1-2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4):-

Figure 2.1: Four Stages of Appropriate Assessment



Stages 1 and 2 relate to Regulation 42 of the Birds and Natural Habitats Regulations; and Stage 2 relates to Article 6(3) of the Habitats Directive; and Stages 3 and 4 to Article 6(4) of the Habitats Directive.

Stage 1 - Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):-

- i. Whether a plan or project (in this instance the proposed works) is directly connected to or necessary for the management of the European Sites, and
- ii. Whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on the European Sites in view of their conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). This report fulfils the information necessary to enable the competent authority to screen the proposal for the requirement to prepare an Appropriate Assessment.

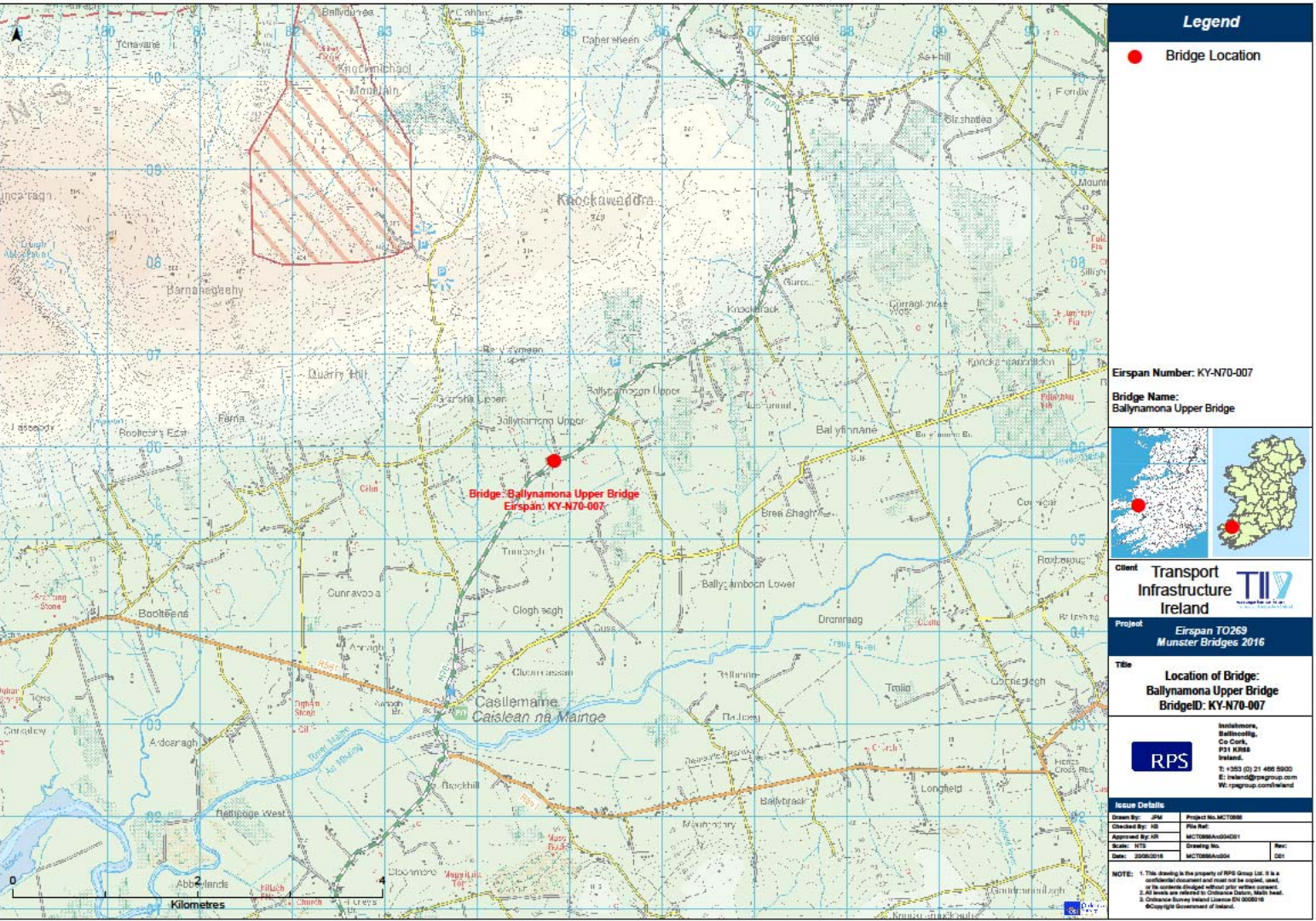
This report forms Stage 1 of the AA process and sets out the following information:-

- Description of the proposed bridge works,
- Characteristics of the proximal European Sites, and
- Assessment of Significance of the proposed works on the European Sites in question.

This report has been prepared having regard to the following:-

- Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (DOEHLG 2009, Rev 2010);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC, 2000);
- Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC, 2002);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; (EC, 2007);
- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission 2013;
- The European Union (Environmental Impact Assessment and Habitats) Regulations 2011;
- The European Communities (Birds and Natural Habitats) Regulations 2011, and
- The Planning and Development Act 2000-2015.

Figure 2.2: Location of Ballynamona Upper Bridge



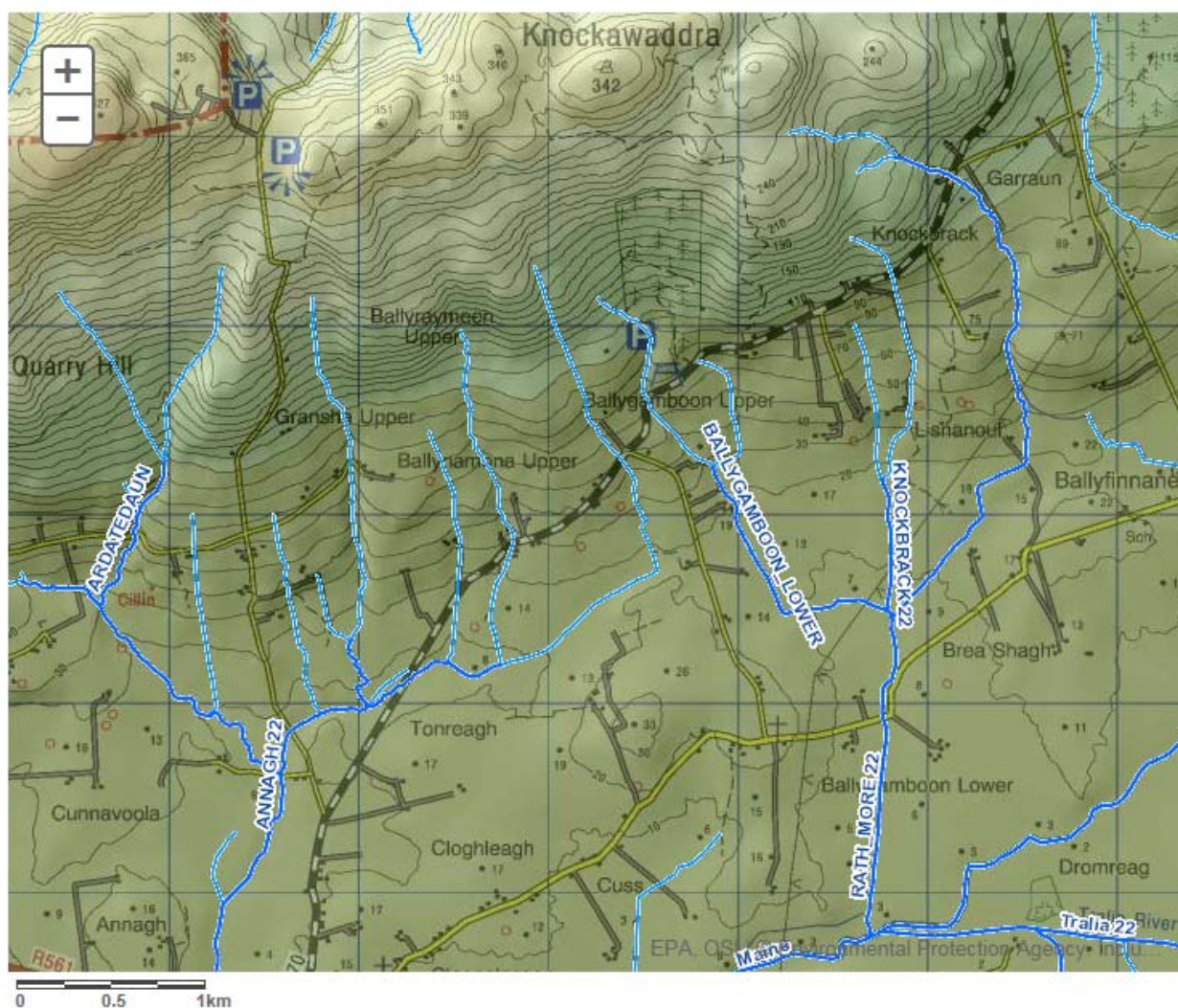
3 SCREENING

3.1 EXISTING ENVIRONMENT

The bridge is a single span masonry arch bridge spanning the Cloghleagh Stream, which is a tributary of the River Annagh.

The River Annagh flows southwards to the West of Castlemaine, enters the River Maine and then flows into Castlemaine Harbour. The water quality of the tributary is not monitored by the EPA (the WFD has classified the tributary and much of the River Maine as unassigned water quality status). The EPA map (**Figure 3.1** below) illustrates the River Annagh. At the coast, Castlemaine Harbour is considered to be of 'Unpolluted' status according to the EPA Transitional Water Quality 2010-2012 (**Figure 3.2**)¹.

Figure 3.1: EPA Data on Water Courses and Water Quality in the Vicinity of the Proposed Bridge Works



¹ <http://gis.epa.ie/Envision>, accessed 30/06/2016

Figure 3.2: EPA data on Transitional Water Quality



Site visits were conducted by an RPS ecologist on 21st June and 27th July 2016. An Aquatic survey was conducted by the Aquatic Service Unit in July 2016. **Section 3.1.1** and **Section 3.1.2** summarises the information gathered during the respective site visits.

3.1.1 Terrestrial Flora and Fauna

Ballynamona Upper Bridge is surrounded by agriculturally improved grassland and associated farm buildings and dwellings. There is a small grassy road verge to the north west of the bridge with a garden hedge (*Cupressus* sp); and a stone wall and earth bank to the north east and south west of the bridge, which is vegetated with Ash saplings, Nettle, Bramble and grasses. There is a grass verge, earth bank and farm access track to the south east of the bridge.

Ballynamona Upper Bridge spans the Cloghleaugh Stream. The stream is lined by a woodland strip predominantly comprised of Alder (*Alnus glutinosa*), Sycamore (*Acer pseudoplatanus*) and Ash (*Fraxinus excelsior*), with Bramble (*Rubus fruticosus*), *Fuschia* and Nettle (*Urtica dioica*) common in the shrub layer and ground flora. There is a semi-mature ivy covered Ash tree on the downstream side of the bridge that has potential features of use by bats as roosting or resting places such as cracks, crevices or thick ivy cover.

No evidence of otter activity or otter holts was observed in the vicinity of the bridge. With regards to birds, there was no nesting potential in the bridge structure. The habitat adjacent to the bridge is unsuitable for kingfisher. There is some nesting potential for other bird species in the trees and scrub lining the stream. The Bridge is shotcreted (sprayed with concrete) and does not contain any cracks or crevices of potential use by bats.

No invasive non-native species were observed at the culvert or its environs.

3.1.2 Aquatic Ecology

From 10m upstream to about 20m downstream of the bridge, milking cows use the stream bed to access milking sheds from fields north of the N70. At the time of the site visit (July 2016), there was manure in the stream and it appeared that cobbly substrates are disturbed by constant trampling. In its natural state (away from cattle influence), the stream is small (1-1.5m wide, with 0.03m riffles and small pool/runs up to 0.15m) and step-pool-cascade in nature. Substrates were cobble and gravel with a limited bryophyte community and quite dense riparian tree cover for at least the first 150m d/s of the bridge.

This is at best a small trout stream. It is too small and unstable for salmon and generally lacks the silt deposits suitable for lamprey nursery, although brook lamprey (*Lampetra planeri*) cannot be ruled out. The stream is affected by milking cows accessing this area regularly so habitat around the bridge itself is not highly suitable, even for trout.

The Bridge is not located in a *Margaritifera* sensitive area².

3.2 DESCRIPTION OF PROJECT

3.2.1 Proposed Works

The proposed works include the online realignment of approximately 240m of the existing N70. The works shall also include the construction of an insitu reinforced concrete bridge widening the existing bridge; the widened bridge shall be (0.2m long and 3m wide). The works shall include, *inter alia* the following activities:-

- Provision of traffic management including a bailey bridge, site clearance and erection of contractor's compound;
- Earthworks (import and export of fill materials) for the construction of the widened road base and embankments;
- Provision of water management: the existing river shall be dammed and flumed to allow the foundations for the bridge extension to be constructed;
- Excavation for the new bridge foundations;
- Construction of new in-situ concrete bridge foundations, abutments and bridge deck;
- Application of bridge deck waterproofing and installation of new bridge parapets and safety barrier;
- Masonry cladding to the widened reinforced concrete section;

² <http://www.npws.ie/maps-and-data/habitat-and-species-data>, accessed 01/07/2016

- Provision of new road surfacing and lines on the widened road;
- Topsoiling and grass seeding of the widening bridge embankments; and
- Demobilisation from site and removal of traffic management.
- Standard Environmental Protection Measures

The sequence of work activities shall be dependent on the on the contractor's proposed construction sequence.

A description of works is included in **Appendix A**.

3.2.2 Design and Construction Methodology

The proposed works will be carried out by a competent contractor experienced in this type of work and who has undertaken this type of work at other bridge locations. This contractor will be suitably appointed through a tendering process and will meet the requirements of the construction measures outlined below, together with the requirements of the method statements provided to each contractor at the tendering stage.

The following guidelines and documents will inform the method statements and should be consulted during the detailed planning of the works phase:

- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA) in particular:-
 - IFI (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, Dublin;
 - Irish Water (2016). *Information and Guidance Document on Japanese knotweed Asset Strategy and Sustainability*;
 - NRA (2008) *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin;
 - NRA (2010) *Guidelines for the Management of Noxious Weeds and Non- Native Invasive Plant Species on National Roads*. National Roads Authority, Dublin;
 - NRA (2008) 'Environmental Impact Assessment of National Road Schemes, A Practical Guide' National Roads Authority, Dublin;
 - Murphy, D. (2004) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*. Eastern Regional Fisheries Board, Dublin;
 - DOMNR (1998). *Fishery guidelines for Local Authority works*. Department of the Marine and Natural Resources, Dublin;
 - H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors (C532)*, CIRIA;
 - E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects. Technical guidance (C648)*, CIRIA; and
 - E. Murnane et al., (2006) *Control of water pollution from linear construction projects. Site guide (C649)*, CIRIA.

3.2.2.1 General Measures

The following text sets out in summary the general measures that will be incorporated into the Contractor Method Statements and how they will be implemented on site:-

- Except where absolutely necessary, machinery will operate from the bank side and not in-stream;
- Machinery used will not be refuelled near the river and no fuels, oils etc. will be stored on-site;
- No hedgerows or trees will be removed between 1st March and 31st August as per the Wildlife Act;
- Wash-down water from exposed bridge surfaces will be trapped to allow sediment to settle out and reach neutral pH before clarified water is released to the river or drain system or allowed to percolate into the ground;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Fuels, lubricants and hydraulic fluids for equipment used on the site, as well as any solvents, oils, and paints shall be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice;
- Any spillage of fuels, lubricants or hydraulic oils must be immediately contained and the contaminated soil removed from the site and properly disposed of;
- Waste oils and hydraulic fluids must be collected in leak-proof containers and removed from the site for disposal or re-cycling;
- Mixing of concrete must be carried out away from watercourses;
- Run off from machine service and concrete mixing areas must not enter the watercourse;
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) must be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species such as Japanese knotweed, Rhododendron and Himalayan Balsam; and
- Generation of dust will be controlled during the demolition of the bridge structure through use of bowsers/wetting down as appropriate.

3.2.2.2 Additional Measures Specifically to Protect Water Quality

The following measures are critical for preserving water quality and aquatic habitats:-

Water Management

- Damming of a watercourse must occur at low flow.
- It is essential that sufficient pump or flume capacity is on hand before operations commence to ensure that: (a) upstream flows can be adequately transferred, and (b) downstream flows are not stopped or significantly interrupted.
- Sandbagging (damming) must carefully planned and executed as this carries a risk of negative impacts through generation or introduction of silt and sediment to the river system (if bags burst, for example).

- Sand-bags must be clean and of good integrity, preferably fully sealed (i.e., composed of high grade polythene, not webbing or hessian).
- Sand-bags must be filled with very clean, coarse grade sand with no fines at all. They need to be carefully handled and placed so they don't burst and no other additional material (like clay or soil etc.) should be introduced to seal gaps.
- Small (1/4 filled) sandbags must be on hand to seal gaps/leaks in dams as they arise – this will discourage the use of clay or soil to seal gaps.

With any works involving river damming there is always a need for additional pumping from the works area to retain dry conditions. Complete drying out of instream working areas is a difficult task. Even tiny leaks through dams can lead to pooling of water over time, requiring intermittent or continual pumping out. This water can easily become contaminated with sediment or substances that are harmful to aquatic life (cement, oils etc.).

- At no time should contaminated water from the working area be pumped directly to the river/stream.
- Water contaminated with sediment must be pumped through a series of settlement tanks before it is discharged back to the waterbody.
- Water contaminated with spilled or leaked concrete or even water that leaks and surrounds newly dry concrete can be very alkaline. It must be pumped into barrels and removed off-site to an appropriate disposal facility.

Concrete

- Wet concrete and cement/mortar are very alkaline and corrosive and can cause serious pollution to watercourses.
- Disposal of raw or uncured waste concrete must be controlled to ensure that the watercourse will not be impacted.
- Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times must be adhered to.
- Where shuttering is used, measures must be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils.
- Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline. Lorries and mixers and all concrete delivery equipment (wheelbarrows, buckets etc.) must be washed out off site.
- Cement dust must be controlled as it is alkaline and harmful to the surrounding ecology. Activities which result in the creation of cement dust must be controlled by dampening down areas.
- The timing of the works must be specified and agreed with the IFI in relation to fish migration and spawning periods.

Hydrocarbons

- There can be no storage of hydrocarbons or any polluting chemicals within 50m of the watercourse or any active/inactive drains connecting to the river. There must be no refuelling of vehicles/equipment within 50m of a river.
- Any diesel or fuel oils stored on site must be bunded to 110% of the capacity of the storage tank. Design and installation of fuel tanks must be in accordance with best practice guidelines BPGCS005, oil storage guidelines. Drip trays and spill kits must be kept available on site.

- All stationary plant must be placed on drip trays to prevent leaking oils reaching the river or entering groundwater.
- No washings or waste materials of any kind can be directed into the stream.
- Machinery on site must have pollution control kits on hand in the event of an emergency.

Construction Waste

- The demolished bridge must be collected by an excavator and disposed of correctly offsite so that they don't enter river channels.
- All construction related waste, e.g., plastics, cable ties, geotextile etc. must be collected and disposed of correctly offsite so that they don't enter river channels.

3.2.2.3 Additional Measures Specifically to Protect Fish Species and Aquatic Species

The following measures are critical for protecting fish and aquatic species:-

- Works must be undertaken during a period of low flow when there is a low risk of flood events. This makes all activities and mitigations easier to implement and manage and limits the potential for generation of sediment and mobilisation of sediment and pollutants downstream.
- The placement of sandbags and capacity of the flume must be such that, in the event that a spate occurs, water can be managed so it does not flow into the works area.
- There shall be pumps on hand within the dried out streambed works area to deal with leaks through upstream and downstream dams. Leaked water can be pumped back over to the watercourse so long as it is not contaminated with pollutants/sediment from the works area. Any contaminated water must be disposed of correctly off-site. Any pumps used shall have appropriate grill or mesh screens at intake points to avoid intake of fish.
- Works must be completed with one damming/ draw down to avoid repeated interventions that carry negative impacts on each occasion.
- Sandbagging must be carefully planned and executed as this carries a risk of negative impacts through generation or introduction of silt and sediment to the river system. Sand-bagging is less risky than other methods, but only if bags are clean and of good integrity, preferably fully sealed (i.e., composed of high grade polythene, not webbing or hessian). They should contain very clean, coarse grade sand with no fines at all. They need to be carefully handled and placed so they don't burst and no other additional material (like clay or soil etc.) should be introduced to seal gaps.
- Inland Fisheries Ireland must be consulted prior to works commencing with regards to methods proposed and timing of works, especially with regards to fisheries restricted periods. IFI shall be informed of the existence of this report.
- Arrangement must be made to accommodate IFI staff to be on-site to supervise damming and drying out of the streambed.
- IFI will advise on whether electrofishing is required prior to drying out of the culvert reach and IFI staff should be present during the actual damming and drying out to rescue and relocate any fish that become stranded by the operation.
- The discharge point of the flume must be carefully placed so as to avoid scouring of banks and streambed. A baffle can be used to ensure water velocity at the discharge point is reduced.

- At any stage during works, any splashed, leaked, spilled or excess mortar must be prevented from entering the stream and/or making contact with the dry river bed or any standing water. There must be a spillage response plan in place prior to works commencing.
- Any concrete shuttering used must be secure and leak-free. Correct concrete curing times must be observed.

3.2.2.4 Special Measures for Invasive Species

No records of invasive species are known from the study area. In addition no high impact invasive species were observed in the project area during the site surveys conducted on 22th June and 27th July 2016.

The presence of invasive species has the potential to lead to an offence under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). Regulation 49 of the 2011 Regulations prohibits (unless under licence) the breeding, release, or allowing or causing the dispersal from confinement of any animal listed in the Third Schedule of the Regulations; or the planting, allowing or causing dispersal, and spreading of any plant listed in the Third Schedule. Japanese Knotweed is a plant listed in the Third Schedule.

It is an offence to plant or encourage the spread of invasive species by moving contaminated soil from one place to another, or incorrectly handling and transporting contaminated material or plant cuttings. Persons must therefore take all reasonable steps and exercise due diligence to avoid committing an offence under the 2011 Regulations:-

- The Works Requirements must specify and the Contractor must ensure that the source locations for materials which are introduced to the site during the construction phase of the project should be free from non-native invasive species.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) must be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species such as Japanese knotweed, Rhododendron and Himalayan Balsam.

3.2.2.5 Special Measures for Bats

All bats are protected under the Wildlife (Amendment) Act 2000 and Annex IV of the Habitats Directive 1992.

- The removal of mature Ivy covered trees adjacent to the bridge will be avoided where feasible. Should removal of mature Ivy covered trees be unavoidable, all trees scheduled for removal shall be checked for suitability as a bat roost by an experienced bat ecologist.
- Where removal of mature trees that have been identified as having potential bat roosts is unavoidable, these trees shall ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per NRA guidelines³. Tree felling shall be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Once felled,

³ National Roads Authority (2005): Guidelines for the Treatments of Bats Prior to the Construction of National Road Schemes. National Roads Authority, Dublin.

trees that have potential bat roost features shall be left intact on-site for 24 hours prior to disposal to allow bats to escape overnight.

- Where bats are identified within a tree, it will be necessary to seek derogation from the National Parks and Wildlife Services to exclude the bats and fell. The roost must not be altered or affected in any way prior to the time and using the measures stipulated in the licence for the exclusion of bats and felling must be carried out under the supervision of a bat specialist named on the licence.

3.3 BRIEF DESCRIPTION OF THE EUROPEAN SITES

Table 3.1 lists the SACs and **Table 3.2** lists the SPAs that are within 15km of the project area, and **Figure 3.1** shows their locations in relation to the proposed realignment works. There are five SACs and three SPAs within 15km of the Bridge.

The integrity of a European Site (referred to in Article 6.3 of the EU Habitats Directive) is determined based on the conservation status of the Qualifying Interests of the SAC or SPA. The Qualifying Interests for each site have been obtained through a review of the Conservation Objectives available from the National Parks and Wildlife Service (NPWS).

Table 3.1: SACs within 15km of the Proposed Bridge Realignment Works

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Distance From Bridge ⁴	Connectivity
002185	Slieve Mish Mountains SAC	Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Siliceous rocky slopes with chasmophytic vegetation [8220]	<i>Trichomanes speciosum</i> (Killarney Fern) [1421]	1.4km – North and west	No connectivity
000343	Castlemaine Harbour SAC	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) [2170] Humid dune slacks [2190]	<i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra fluviatilis</i> (River Lamprey) [1099] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355] <i>Petalophyllum ralfsii</i> (Petalwort) [1395]	4.6km - South west	Indirect hydrological connection. The Cloghleagh Stream flows under the Ballynamona Bridge and into the Annagh River which flows in the Maine River which is part of Castlemaine Harbour SAC.

⁴ Measured in kilometres “as the crow flies”

Site Code	Site Name	Qualifying Habitats	Qualifying Species	Distance From Bridge ⁴	Connectivity
		Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0]			
002112	Ballyseedy Wood SAC	Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) [91E0]		6.8km – North	No connectivity
002070	Tralee Bay And Magharees Peninsula, West To Cloghane SAC	<p>Estuaries [1130]</p> <p>Mudflats and sandflats not covered by seawater at low tide [1140]</p> <p>Coastal lagoons [1150]</p> <p>Large shallow inlets and bays [1160]</p> <p>Reefs [1170]</p> <p>Annual vegetation of drift lines [1210]</p> <p>Perennial vegetation of stony banks [1220]</p> <p>Salicornia and other annuals colonising mud and sand [1310]</p> <p>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]</p> <p>Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]</p> <p>Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (Salicion arenariae) [2170]</p> <p>Humid dune slacks [2190]</p> <p><i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) [6410]</p>	<i>Trichomanes speciosum</i> (Killarney Fern) [1421]	7.3km - North west	No connectivity

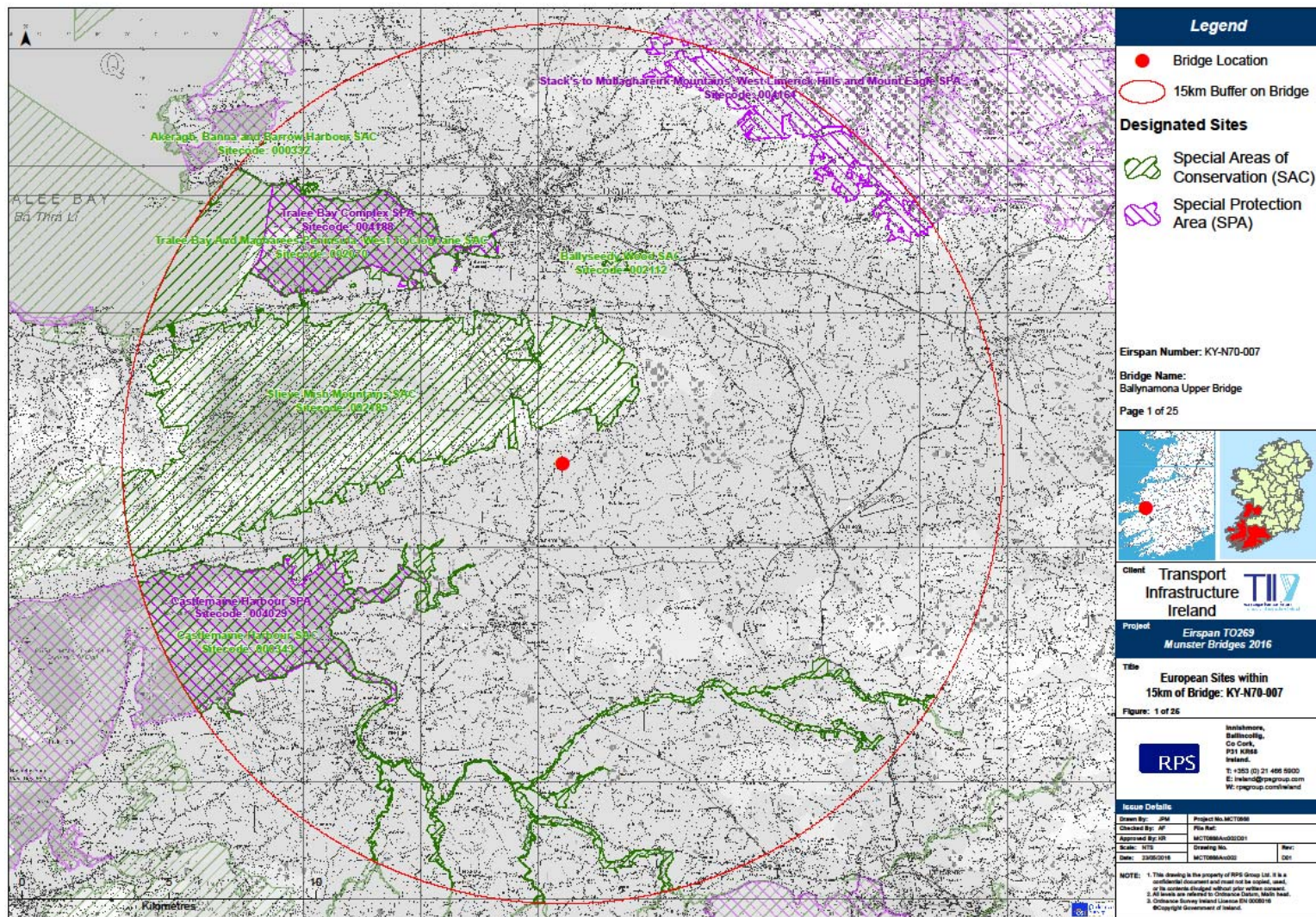
Site Code	Site Name	Qualifying Habitats	Qualifying Species	Distance From Bridge ⁴	Connectivity
		Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>) [91E0]			
000332	Akeragh, Banna and Barrow Harbour SAC	Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] European dry heaths [4030]		14.9km – North west	No connectivity

Table 3.2: SPAs within 15km of the Proposed Bridge Realignment Works

Site Code	Site Name	Qualifying Feature Annex I species	Distance From Bridge	Connectivity
004029	Castlemaine Harbour SPA	Red-throated Diver (<i>Gavia stellata</i>) [A001] Cormorant (<i>Phalacrocorax carbo</i>) [A017] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Wigeon (<i>Anas penelope</i>) [A050] Mallard (<i>Anas platyrhynchos</i>) [A053] Pintail (<i>Anas acuta</i>) [A054] Scaup (<i>Aythya marila</i>) [A062] Common Scoter (<i>Melanitta nigra</i>) [A065] Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Sanderling (<i>Calidris alba</i>) [A144] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Redshank (<i>Tringa totanus</i>) [A162] Greenshank (<i>Tringa nebularia</i>) [A164] Turnstone (<i>Arenaria interpres</i>) [A169] Chough (<i>Pyrrhocorax pyrrhocorax</i>) [A346] Wetland and Waterbirds [A999]	6.1km – South west	Indirect hydrological connection. The Cloghleaigh Stream flows under the Ballynamona Bridge and into the Annagh River which flows in the Maine River which is part of Castlemaine Harbour SPA.
004161	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Hen Harrier (<i>Circus cyaneus</i>) [A082]	12.8km – North east	No connectivity
004188	Tralee Bay Complex SPA	Whooper Swan (<i>Cygnus cygnus</i>) [A038] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Shelduck (<i>Tadorna tadorna</i>) [A048] Wigeon (<i>Anas penelope</i>) [A050]	7.4km – North west	No connectivity

Site Code	Site Name	Qualifying Feature Annex I species	Distance From Bridge	Connectivity
		Teal (<i>Anas crecca</i>) [A052] Mallard (<i>Anas platyrhynchos</i>) [A053] Pintail (<i>Anas acuta</i>) [A054] Scaup (<i>Aythya marila</i>) [A062] Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Golden Plover (<i>Pluvialis apricaria</i>) [A140] Grey Plover (<i>Pluvialis squatarola</i>) [A141] Lapwing (<i>Vanellus vanellus</i>) [A142] Sanderling (<i>Calidris alba</i>) [A144] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Turnstone (<i>Arenaria interpres</i>) [A169] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] Common Gull (<i>Larus canus</i>) [A182] Wetland and Waterbirds [A999]		

Figure 3.1: European Sites within 15km of the Bridge Works



3.4 ASSESSMENT CRITERIA

3.4.1 Direct, Indirect or Secondary Impacts

Tables 2.1 and **2.2** list the European Sites within 15km of the proposed works. There are eight sites in all, five SACs and three SPAs. The proposed bridge works are not situated within any SACs or SPAs therefore there are no direct impacts to any European Sites through landtake or fragmentation of habitats.

There is no hydrological connectivity between the proposed works and Slieve Mish Mountains SAC, Ballyseedy Wood SAC, Tralee Bay And Magharees Peninsula, West To Cloghane SAC and Akeragh, Banna and Barrow Harbour SAC. Furthermore, these SAC's are situated a significant distance from the proposed works (between 1.4- 14.9km) and will not be impacted either directly or indirectly. Therefore potential significant effects to these sites are no longer considered as part of this assessment.

Likewise, there is no hydrological connectivity to Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and Tralee Bay Complex SPA, and it is extremely unlikely that the qualifying species of this SPA are using the agriculturally improved lands in the vicinity of the proposed works. It is not anticipated that the proposed works would result in a significant increase in the level of background noise disturbance in the local areas. Any disturbance to bird species within nearby European Sites as a result of the proposed works is considered extremely unlikely. Furthermore, potential disturbances will be temporary and confined to the construction phase of the development only. Therefore, it is not anticipated that the proposed works will have a significant effect on Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and Tralee Bay Complex SPA with regards to noise disturbance of birds.

The potential significant effects on European sites as a result of the proposed N70 bridge realignment works are primarily limited to those incurred due to a change in water quality in the underlying water course and in turn the Castlemaine Harbour SAC and SPA, as detailed below.

Castlemaine Harbour SAC

Castlemaine Harbour is a large site located on the south-east corner of the Dingle Peninsula, Co. Kerry. It consists of the whole inner section of Dingle Bay, i.e. Castlemaine Harbour, the spits of White Strand/ Rosbehy and a little of the coastline to the west. The River Maine, almost to Castlemaine, and much of the River Laune catchment, including the Gaddagh, Gweestion, Glanooragh, Cottoner's River and the River Loe are also included within the site. Castlemaine Harbour is of major ecological importance. It contains a range of coastal habitats of excellent quality, including many that are on Annex I of the E.U. Habitats Directive, and two which are listed with priority status (fixed dunes and alluvial forests). It also includes long stretches of river and stream which are excellent habitats for Salmon, Lamprey and Otter. Part of the site is designated a Special Protection Area (SPA) and is listed as a site under the Ramsar Convention. Part of Castlemaine Harbour is a Statutory Nature Reserve, while Inch and Rosbehy are Wildfowl Sanctuaries.

The site specific and detailed conservation objectives for Castlemaine Harbour SAC are provided in the Conservation Objectives document available on the NPWS website, as follows: http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000343.pdf. For this report the version consulted was: Version 2.0, 19th July 2011.

The qualifying habitats and species of Castlemaine Harbour SAC are listed in **Table 3.1**.

An aquatic ecology survey conducted at Ballynamona Upper Bridge in July 2016 found that the Cloghleagh Stream is a small, fairly low volume stream that may support trout downstream of the bridge. It is too small and unstable for salmon and generally lacks silt deposits suitable for lamprey nursery, although brook lamprey (*Lampetra planeri*) cannot be ruled out. The stream is currently affected by milking cows accessing regularly therefore habitat around the bridge itself is not highly suitable, even for trout. There is a risk of indirect impact to aquatic habitats downstream of the bridge as a result of construction activities, as detailed in **Table 3.2**.

Table 3.2: Summary of Potential Impacts on Aquatic Species

Works Proposed	Potential Impact on Aquatic Species
<p><u>Bridge Widening/Replacement</u></p> <ul style="list-style-type: none"> Provision of traffic management including a bailey bridge, site clearance and erection of contractor's compound; Earthworks (import and export of fill materials) for the construction of the widened road base and embankments; Provision of water management: the existing river shall be dammed and flumed to allow the foundations for the bridge extension to be constructed; Excavation for the new bridge foundations; Construction of new in-situ concrete bridge foundations, abutments and bridge deck; Application of bridge deck waterproofing and installation of new bridge parapets and safety barrier; Masonry cladding to the widened reinforced concrete section; Provision of new road surfacing and lines on the widened road; Topsoiling and grass seeding of the widening bridge embankments; and Demobilisation from site and removal of traffic management. Standard Environmental Protection Measures 	<p>This is a small, fairly low volume trout stream. Patchy spawning habitat downstream of the bridge can be negatively affected indirectly if excessive sediment or fines enter the stream during construction. Suspended solids can harm fish gills in small streams such as this, also smothering spawning/nursery habitat and altering invertebrate food supply. Without adequate protection measures there is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete (bridge widening/reinforcing/ paved verge construction) and mortar, entering the watercourse from the works area. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected would most likely be trout.</p> <p>During the operational phase, there is potential for permanent impact at a local scale if the new bridge footprint is not passable by fish. This can occur if bed reinforcement creates an overly shallow, overly wide flow regime, and especially if there is a high downstream apron that can act as an impassable barrier to trout, lampreys and eels.</p>

As noted above, the aquatic survey found that the Cloghleagh Stream is at best a trout stream; however the Maine River, located approximately 3.9km downstream of the bridge supports good salmonid habitat. A reduction in water quality due to sedimentation and release of suspended solids may impair plant growth and impact on salmonid spawning habitat. This could have knock-on effects further up the food chain on invertebrates, birds, fish and mammals. A reduction in water quality may also impact on Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*), and otters within and downstream of the study area. Should large quantities of suspended solids enter waterbodies in the vicinity of the proposed development it could potentially affect the riverine

habitat and associated protected species. An accidental spillage and release of hydrocarbons to sensitive watercourses in the immediate surroundings could have significant adverse impacts on protected species within the Maine River and the Castlemaine Harbour SAC. In addition, the potential spillage and release of hydrocarbons from plant equipment during the construction phase may arise.

The proposed realignment works have been designed with stringent protective measures built into the works methodology (work during periods of low flow, careful handling of fuels and lubricants, appropriate disposal of contaminants etc.) as detailed in **Section 2.2.2**. In addition, all works will be conducted in consultation with Inland Fisheries Ireland (IFI) and IFI or a suitably qualified ecologist will be present during any dewatering of the river. These measures have been designed to ensure that the water quality of the underlying watercourse is protected during the proposed works. Such measures to protect waterbodies will ensure that the water quality of the Annagh River and its tributary and the Maine River are protected from the works. Likewise, such measures will also ensure that adverse impacts to water dependent species such as salmon, lamprey and white-clawed crayfish are avoided. Should these best practice measures (as outlined in **Section 2.2.2**) be followed during the works, it is not anticipated that the proposed works will result in any potential discharges to the Annagh River and in turn, Castlemaine Harbour SAC & SPA. These protective measures were built into the works design in order to protect Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*) and Salmon (*Salmo salar*) as these are qualifying species of the SAC which is hydrologically connected with the site. These measures will also in turn protect other species of concern, such as otter.

It is further noted that Castlemaine Harbour SAC is designated for transitional habitats and species associated with routine estuarine and or tidal inundations and fluctuations. To this end, habitats and species associated with this European Site are accustomed to high levels of water turbidity, fluctuations in sediment accretion, deposition and erosion. As a result these habitats are not as sensitive (when compared to freshwater / terrestrial habitats and species) to those potential impacts associated with small scale construction works (in particular sporadic increases in sediment load). Therefore this site would not be significantly affected by the low level or sporadic release in sediment or particulate matter associated with such works. Furthermore, the potential release of other deleterious substances such as hydrocarbons, particulate matter, wet cement etc. can be readily retained to within the footprint of the proposed works area through standardised best practice measures (see **Section 2.2.2**)

Castlemaine Harbour SPA

Castlemaine Harbour SPA is a large coastal site occupying the innermost part of Dingle Bay. It extends from the lower tidal reaches of the River Maine and River Laune to west of the Inch and Rosbehy peninsulas. The site comprises the estuaries of River Maine and River Laune, both substantial rivers, and has extensive areas of intertidal sands and mud flats. A number of other rivers e.g. the Caragh and the Emlagh, flow into the site, as well as numerous small streams. Conditions in the bay are very sheltered due to the presence of three protruding sand spits on its seaward side. Salt marshes fringe much of the shoreline. A very large dune system occurs on the Inch peninsula. A substantial area of shallow marine water is included in the site.

Castlemaine Harbour is one of the most important sites for wintering waterfowl in the south-west. It provides habitat for an excellent diversity of waterbirds, including divers and seaduck. It is of international importance for its Light-bellied Brent Goose population, as well as nationally important populations of a further fourteen waterbird species.

The site specific and detailed conservation objectives for Castlemaine Harbour SPA are provided in the Conservation Objectives document available on the NPWS website, as follows: http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000343.pdf. For this report the version consulted was: Version 2.0, 19th July 2011.

The qualifying species of Castlemaine Harbour SPA are listed in **Table 3.2**.

As noted above, should the best practice measures built into the project design (as outlined in **Section 2.2.2**) be followed during the works, it is not anticipated that the proposed works will result in any potential discharges to the Annagh River and in turn, Castlemaine Harbour SAC & SPA. Furthermore, as also noted above, habitats and species associated with Castlemaine Harbour are accustomed to high levels of water turbidity, fluctuations in sediment accretion, deposition and erosion. As a result these habitats are not as sensitive (when compared to freshwater / terrestrial habitats and species) to those potential impacts associated with small scale construction works (in particular sporadic increases in sediment load). Therefore this site would not be significantly affected by the low level or sporadic release in sediment or particulate matter associated with such works.

Castlemaine Harbour SPA is located 6.1km to the south-west of Ballynamona Upper Bridge. It is extremely unlikely that the qualifying species of this SPA are using the agriculturally improved lands in the vicinity of the proposed works. It is not anticipated that the proposed works would result in a significant increase in the level of background noise disturbance in the local areas. Any disturbance to bird species within nearby European Sites as a result of the proposed works is considered extremely unlikely. Furthermore, potential disturbances will be temporary and confined to the construction phase of the development only. Therefore, it is not anticipated that the proposed works will have a significant effect on Castlemaine Harbour SPA with regards to noise disturbance of birds.

Taking into account the nature of the works, the protective measures incorporated into the project design and potential for impact downstream, it is not anticipated that the proposed realignment works will have a significant effect on any European Site.

3.4.2 Cumulative and in Combination Impacts

It is a requirement of Appropriate Assessment that the cumulative or in-combination effects of the proposed development together with other plans or projects are assessed. Cumulative impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments, or as the combined effect of a set of developments, taken together⁵.

The measures incorporated into the methodology for the proposed bridge realignment works were developed to ensure the protection of all waterbodies. It is not anticipated that the proposed works will result in any impacts on any European Site. **Table 3.3** lists those potential Projects or Plans which may contribute to cumulative or in-combination impacts.

⁵ Scottish Natural Heritage (2012) Guidance: Assessing the cumulative impact of onshore energy developments. SNH.

Table 3.3: List of Potential Plans and Projects which may contribute to Cumulative Impacts

Name of Plan or Project	Key Issues Directly Linked to Relevant European Sites	Potential Cumulative or In-Combination Impacts
Kerry County Development Plan 2014-2020	<p>The core strategy of the plan includes:-</p> <ul style="list-style-type: none"> Set out a vision and blueprint for the future sustainable development of the County Protect and conserve the heritage of the County Protect and support rural areas through careful management of physical and environmental resources Support sustainable agriculture and agricultural related development in County Kerry Support sustainable tourism development in Kerry Promote and support the integration of land use and transport Integrate measures to adapt to and mitigate against climate change in all policies Ensure that future development patterns accord with the sustainable management of water resources. 	Positive Impacts
South West River Basin Management Plan	The RBMPs aim to protect, improve and manage the water bodies within each river basin sustainably.	Positive Impacts
NPWS Conservation Management Plans	Conservation objectives have been published for the Castlemaine Harbour SAC.	Positive Impacts
<p>Planning Search – Kerry County Council: accessed 13th October 2016)</p> <p>http://www.kerrycoco.ie/en/allservices/planning/onlineplanningenquiry/</p>	<p>Local planning applications that may have a cumulative or in-combination impact with the proposed emergency works.</p> <p>No planning applications of relevance to the proposed realignment works were found.</p>	None

All possible sources of effects from the proposed works, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans have been identified. The proposed bridge replacement works have robust protective measures built into the project design (see **Section 3.2.2**). No other pathway has been identified by which any plan or project could have a significant cumulative or in combination effect on Castlemaine Harbour SAC. Therefore, no significant adverse cumulative or in-combination effects are anticipated to Castlemaine Harbour SAC or any other European Site.

Table 3.4 identifies the direct, indirect and secondary impacts of the proposed bridge works on European Sites within a 15km buffer zone of the bridge.

Table 3.4: Potential Significant Effects on European Sites from the Proposed Realignment Works

Site Name	Direct Impacts	Indirect/ Secondary	Resource Requirements (Drinking Water Abstraction, etc.)	Emissions (Disposal to Land, Water or Air)	Excavation Requirements	Transportation Requirements	Duration of Construction, Operation, Decommissioning
Slieve Mish Mountains SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Castlemaine Harbour SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Ballyseedy Wood SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Tralee Bay And Magharees Peninsula, West To Cloghane SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Akeragh, Banna and Barrow Harbour SAC	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Castlemaine Harbour SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest
Tralee Bay Complex SPA	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest	No impact on qualifying interest

3.4.3 Likely Changes to the European Site(s)

The likely changes that will arise from the proposed bridge widening works have been examined in the context of a number of factors that could potentially affect European Sites. Overall, it has been found that the implementation of the proposed works to the Bridge will not have a significant effect on European Sites (**Table 3.5**).

Table 3.5: Likely Effect on European Sites

Site Name	Reduction of Habitat Area	Disturbance to Key Species	Habitat or Species Fragmentation	Reduction in Species Density	Changes in Key Indicators of Conservation Value (Water Quality, etc.)	Climate Change
Slieve Mish Mountains SAC	None	None	None	None	None	None
Castlemaine Harbour SAC	None	None	None	None	None	None
Ballyseedy Wood SAC	None	None	None	None	None	None
Tralee Bay And Magharees Peninsula, West To Cloghane SAC	None	None	None	None	None	None
Akeragh, Banna and Barrow Harbour SAC	None	None	None	None	None	None
Castlemaine Harbour SPA	None	None	None	None	None	None
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	None	None	None	None	None	None
Tralee Bay Complex SPA	None	None	None	None	None	None

3.4.4 Elements of the Project where the Effects are Likely to be Significant

No elements of the proposed bridge widening works are likely to cause significant effects on European Sites.

4 SCREENING CONCLUSIONS AND STATEMENT

The likely impacts that will arise from the proposed widening works to the Ballynamona Upper Bridge (KY-N70-007) near Castlemaine Co. Kerry have been examined in the context of a number of factors that could have a significant effect on European Sites. None of the sites within 15km of the works area, or any other European Site, will be adversely affected. A finding of No Significant Effects Matrix has been completed and is presented in Section 4 of this Screening Statement.

On the basis of the findings of this Screening for Appropriate Assessment of European Sites, it is concluded that the proposed widening works to the Ballynamona Upper Bridge (KYN-N70-007) near Castlemaine, Co. Kerry will not have a significant effect on the Natura 2000 network and a Stage 2 Appropriate Assessment is not required.

5 FINDING OF NO SIGNIFICANT EFFECTS REPORT MATRIX

Name of Project or Plan	AA Screening of Bridge Widening Works to Ballynamona Upper Bridge
Name and Location of European Site	<ul style="list-style-type: none"> ▪ Slieve Mish Mountains SAC ▪ Castlemaine Harbour SAC ▪ Ballyseedy Wood SAC ▪ Tralee Bay And Magharees Peninsula, West To Cloghane SAC ▪ Akeragh, Banna and Barrow Harbour SAC ▪ Castlemaine Harbour SPA ▪ Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA ▪ Tralee Bay Complex SPA
Description of the Project or Plan	<p>The proposed works include the online realignment of approximately 240m of the existing N70. The works shall also include the construction of an insitu reinforced concrete bridge widening the existing bridge; the widened bridge shall be (20.2m long and 3m wide). The works shall include, inter alia the following activities:</p> <ul style="list-style-type: none"> ▪ Provision of traffic management including a bailey bridge, site clearance and erection of contractor's compound; ▪ Earthworks (import and export of fill materials) for the construction of the widened road base and embankments; ▪ Provision of water management: the existing river shall be dammed and flumed to allow the foundations for the bridge extension to be constructed; ▪ Excavation for the new bridge foundations; ▪ Construction of new in-situ concrete bridge foundations, abutments and bridge deck; ▪ Application of bridge deck waterproofing and installation of new bridge parapets and safety barrier; ▪ Masonry cladding to the widened reinforced concrete section; ▪ Provision of new road surfacing and lines on the widened road; ▪ Topsoiling and grass seeding of the widening bridge embankments; and ▪ Demobilisation from site and removal of traffic management.
Is the project or plan directly connected with or necessary to the management of the site?	No.
Are there other projects or plans that together with the project or plan being assessed could affect the site?	No.
The Assessment of Significance of Effects	
Describe how the project or plan (alone or in combination) is likely to affect the European Site.	The proposed realignment works to the Ballynamona Upper Bridge (KYN-N70-007), Co. Kerry are not likely to affect any site that makes up the Natura 2000 network.

Name of Project or Plan	AA Screening of Bridge Widening Works to Ballynamona Upper Bridge
<p>Explain why these effects are not considered significant.</p>	<p>The proposed bridge works are not situated within any SACs or SPAs therefore there are no direct impacts to any European Sites through landtake or fragmentation of habitats.</p> <p>There is no hydrological connectivity between the proposed works and Slieve Mish Mountains SAC, Ballyseedy Wood SAC, Tralee Bay And Magharees Peninsula, West To Cloghane SAC and Akeragh, Banna and Barrow Harbour SAC. Furthermore, these SAC's are situated a significant distance from the proposed works (between 1.4- 14.9km) and will not be impacted either directly or indirectly.</p> <p>Likewise, there is no hydrological connectivity to Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and Tralee Bay Complex SPA, and it is extremely unlikely that the qualifying species of this SPA are using the agriculturally improved lands in the vicinity of the proposed works. It is not anticipated that the proposed works would result in a significant increase in the level of background noise disturbance in the local areas. Any disturbance to bird species within nearby European Sites as a result of the proposed works is considered extremely unlikely. Furthermore, potential disturbances will be temporary and confined to the construction phase of the development only. Therefore, it is not anticipated that the proposed works will have a significant effect on Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and Tralee Bay Complex SPA with regards to noise disturbance of birds.</p> <p>The potential significant effects on European sites as a result of the proposed N70 bridge rehabilitation works are primarily limited to those incurred due to a change in water quality in the underlying water course and in turn the Castlemaine Harbour SAC and SPA.</p> <p>The proposed rehabilitation works have been designed with stringent protective measures built into the works methodology (work during periods of low flow, careful handling of fuels and lubricants, appropriate disposal of contaminants etc.) as detailed in Section 2.2.2. In addition, all works will be conducted in consultation with Inland Fisheries Ireland (IFI) and IFI or a suitably qualified ecologist will be present during any dewatering of the river. These measures have been designed to ensure that the water quality of the underlying watercourse is protected during the proposed works. Such measures to protect waterbodies will ensure that the water quality of the Annagh River and its tributary and the Maine River are protected from the works. Likewise, such measures will also ensure that adverse impacts to water dependent species such as salmon, lamprey and white-clawed crayfish are avoided. Should these best practice measures (as outlined in Section 2.2.2) be followed during the works, it is not anticipated that the proposed works will result in any potential discharges to the Annagh River and in turn, the Castlemaine SAC & SPA. These protective measures were built into the works design in order to protect Sea Lamprey (<i>Petromyzon marinus</i>), River Lamprey (<i>Lampetra fluviatilis</i>) and Salmon (<i>Salmo salar</i>) as these are qualifying species of the SAC which is hydrologically connected with the site. These measures</p>

Name of Project or Plan	AA Screening of Bridge Widening Works to Ballynamona Upper Bridge
	<p>will also in turn protect other species of concern, such as otter.</p> <p>It is further noted that Castlemaine Harbour SAC is designated for transitional habitats and species associated with routine estuarine and or tidal inundations and fluctuations. To this end, habitats and species associated with these European Sites are accustomed to high levels of water turbidity, fluctuations in sediment accretion, deposition and erosion. As a result these habitats are not as sensitive (when compared to freshwater / terrestrial habitats and species) to those potential impacts associated with small scale construction works (in particular sporadic increases in sediment load). Therefore these sites would not be significantly affected by the low level or sporadic release in sediment or particulate matter associated with such works. Furthermore, the potential release of other deleterious substances such as hydrocarbons, particulate matter, wet cement etc. can be readily retained to within the footprint of the proposed works area through standardised best practice measures (see Section 2.2.2).</p> <p>Castlemaine Harbour SPA is located 6.1km to the south-west of Ballynamona Upper Bridge. It is extremely unlikely that the qualifying species of this SPA are using the agriculturally improved lands in the vicinity of the proposed works. It is not anticipated that the proposed works would result in a significant increase in the level of background noise disturbance in the local areas. Any disturbance to bird species within nearby European Sites as a result of the proposed works is considered extremely unlikely. Furthermore, potential disturbances will be temporary and confined to the construction phase of the development only. Therefore, it is not anticipated that the proposed works will have a significant effect on Castlemaine Harbour SPA with regards to noise disturbance of birds.</p> <p>Taking into account the nature of the works, the protective measures incorporated into the project design and potential for impact downstream, it is not anticipated that the proposed realignment works will have a significant effect on any European Site.</p>
List of agencies consulted: provide contact name and telephone or e-mail address.	Inland Fisheries Ireland Sunnyside House, Macroom, Co. Cork.
Response to consultation.	None to date- consultation will be ongoing.
Data Collected to Carry Out the Assessment	
Who carried out the assessment?	RPS
Sources of data	NPWS database Information from RPS Engineering Department.
Level of assessment completed	Desktop
Where can the full results of the assessment be accessed and viewed?	Kerry County Council

Name of Project or Plan	AA Screening of Bridge Widening Works to Ballynamona Upper Bridge
Overall Conclusion	Stage 1 Screening indicates that the proposed widening works on the Ballynamona Upper Bridge (KYN-N70-007) Co. Kerry will not have a significant negative impact on the Natura 2000 network. Therefore, a Stage 2 'Appropriate Assessment' under Article 6(3) of the Habitats Directive 92/43/EEC is not required.

APPENDIX A

PROPOSED WORKS DRAWINGS



KERRY COUNTY COUNCIL

Kerry, Cork & Clare Bridge Rehabilitation Works 2016 - Part 8 Planning

ST4 Ballynamona Upper Bridge KY-N70-007

DECEMBER 2016

DRAWINGS :-

BR0000b	ST4 Ballynamona Upper Bridge KY-N70-007
BR0007b	ST4 Ballynamona Upper Bridge KY-N70-007
BR0403	ST4 Ballynamona Upper Bridge KY-N70-007
BR0404	ST4 Ballynamona Upper Bridge KY-N70-007
BR0405	ST4 Ballynamona Upper Bridge KY-N70-007

INDEX SHEET

BRIDGE LOCATION

PROPOSED OVERALL LAYOUT

PROPOSED BRIDGE (Sheet 1 of 2)

PROPOSED BRIDGE (Sheet 2 of 2)

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KERRY
COUNTY
COUNCIL

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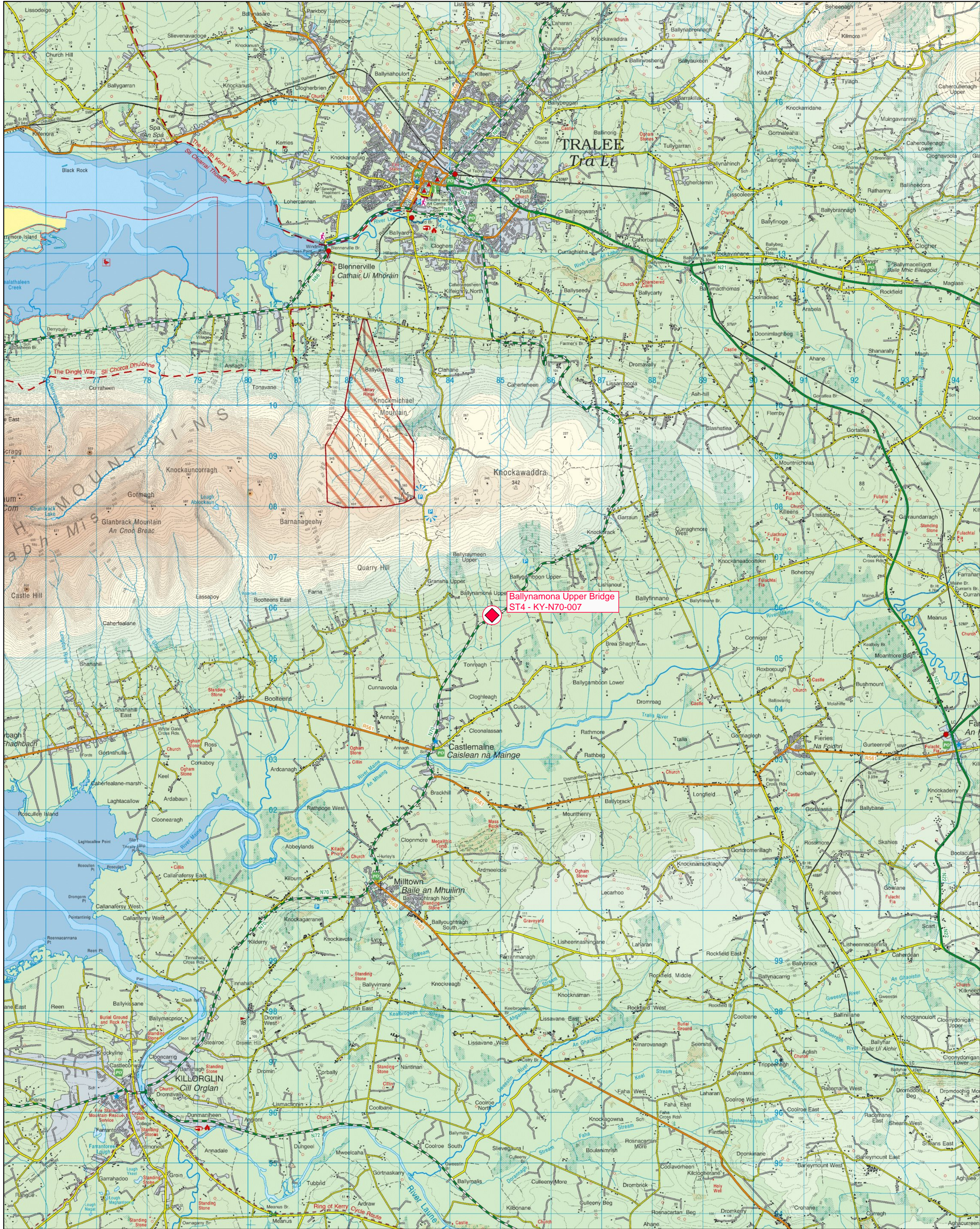
No.	Date	by	chk	Amendment / Issue	App
P03	Dec.'16	DC	EC	Issue For Part 8	KR
P02	Nov.'16	DC	EC	Issue For Part 8	KR
P01	Nov.'16	DC	EC	Issue For Part 8	KR



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Drawn DC	Project
Checked TC	Eirspan TO 269
Approved KR	Kerry, Cork & Clare Bridge Rehabilitation Works 2016
Date Nov. 2016	Title
Scale Half @ A3 Shown @ A1	ST4 Ballynamona Upper Bridge KY-N70-007 Index Sheet
Job No. MCT0668	File Ref. MCT0668BR0000.dwg
	Drg. No. BR0000b
	Rev P03



LOCATION PLAN
(Scale 1 : 50,000)



LOCATION PLAN
(Scale 1 : 2,500)

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P01	Nov.'16	DC	Issue For Part 8	KR	
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Date	Nov. 2016
Scale	Half @ A3
Shown	@ A1
Job No.	MCT0668

Project	Eirspan TO 269 Kerry, Cork & Clare Bridge Rehabilitation Works 2016
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Bridge Location
File Ref.	MCT0668BR0007.dwg
Drg. No.	BR0007b
Rev	P02



PLAN LAYOUT - OVERALL SCHEME
(Scale 1 : 350)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

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No.	Date	Dr/Chk	Amendment / Issue	App	

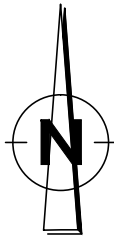


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Drawn	DC	Project	Eirspan TO 269	
Checked	TC		Kerry, Cork & Clare Bridge Rehabilitation Works 2016	
Approved	KR			
Date	Oct. 2016	Title	ST4 Ballynamona Upper Bridge KY-N70-007 Proposed Overall Layout	
Scale	Half @ A3 Shown @ A1	Job No.	MCT0668	File Ref. BR0403 KY-N70-007.dwg
		Drg. No.	BR0403	Rev P02

PROPOSED EXTENSION
PROPOSED RAISED VERGE



PLAN LAYOUT
(Scale 1 : 100)

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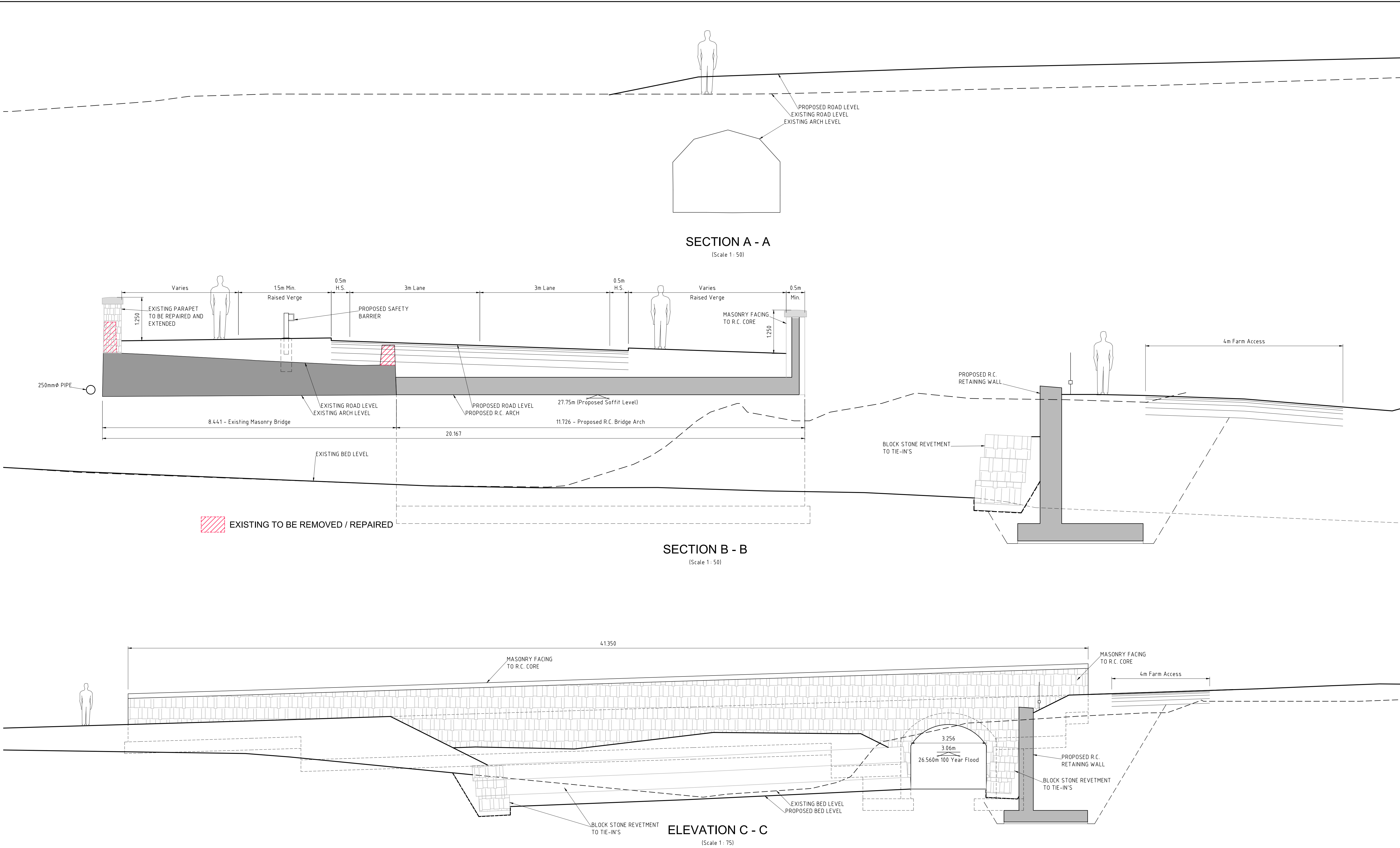
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Project	Eirspan TO 269 Kerry, Cork & Clare Bridge Rehabilitation Works 2016
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Proposed Bridge (Sheet 1 of 2)
File Ref.	BR0403 KY-N70-007.dwg
Drg. No.	BR0404
Rev	P02

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D01	Ocl.'16	DC	DC	KR
No.	Date	by	chkd	App



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Project	Eirspan TO 269 Kerry, Cork & Clare Bridge Rehabilitation Works 2016
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Proposed Bridge (Sheet 2 of 2)
File Ref.	BR0403 KY-N70-007.dwg
Drg. No.	BR0405
Rev	P02

APPENDIX B

AQUATIC ECOLOGY SURVEY REPORT

Kerry, Cork and Clare Bridge rehabilitations 2016

Protected Aquatic Species and Habitats Surveys



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Project Title:	Kerry, Cork and Clare Bridge rehabilitations, 2016
Document Title:	Protected Aquatic Species and Habitats Surveys

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			<i>LW</i>		
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1 INTRODUCTION

The Aquatic Services Unit (ASU) were commissioned to: (i) carry out protected aquatic species/habitats surveys, (ii) conduct ecological impact assessments, and (iii) make recommendations for mitigation in relation to proposed bridge maintenance works at 17 bridge sites in Counties Kerry (12), Cork (1) and Clare (4). All necessary field studies were conducted during good weather conditions in July 2016.

A number of aquatic species and habitats are protected under the provisions of the Wildlife Acts (1976 and Amendment 2000) and Annex I, II and V of the EU Habitats Directive (1992/43/EEC). In relation to the current studies, these include the following groups:

- Freshwater pearl mussel (*Margaritifera margaritifera*)
- Atlantic salmon (*Salmo salar*)
- Lampreys (*Lampetra* spp., *Petromyzon marinus*)
- European eel (*Anguilla anguilla*)
- Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation.

The Freshwater pearl mussel is an endangered freshwater bivalve listed under Annex II and V of the EU Habitats Directive (92/43/EEC) and protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Berne). The 2007 Habitats Directive Article 17 reports classified the pearl mussel as in unfavourable-bad conservation status in all EU regions (<http://biodiversity.eionet.europa.eu/article17/>). There are two species in Ireland, *Margaritifera margaritifera* and *M. durrovensis*, both of which are critically endangered on the Irish Regional non-marine mollusc red list (Byrne *et al.*, 2009) and at unfavourable-bad status in Ireland (NPWS, 2013). It is legally protected in Ireland under Schedule 1 of the Wildlife Act (1976) (S. I. 112 of 1990); the European Communities (Natural Habitats) Regulations (S. I. 477 of 2011), and the Water Framework Directive through the EC Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009).

Atlantic salmon and lampreys, in freshwater, are Annex II species under the EU Habitats Directive, protected within designated SACs. With reference to the current studies, salmon and all three lamprey species are qualifying interests of Killarney National Park, Macgillicuddy's Reeks and Caragh River Catchment SAC (000365) and the Lower River Shannon SAC (002165).

The European eel is IUCN 'Critically endangered' and its conservation is currently of high priority throughout Europe owing to dramatic population declines in recent years. It is 'Critically endangered' according to Ireland's Red List No. 5 (King *et al.*, 2011). Although not statutorily protected, the species is of considerable ecological and conservation importance.

Listed under Annex I of the EU Habitats Directive “Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation [3260]” are characterised by a range of submerged and floating leaved aquatic vegetation. Classification of the annexed habitat covers a range of sub-types reflecting a range of river flow types and geology. Plants associated with Habitat 3260 are: *Ranunculus saniculifolius*, *R. trichophyllus*, *R. fluitans*, *R. peltatus*, *R. penicillatus* ssp. *penicillatus*, *R. penicillatus* spp. *pseudofluitans*, *R. aquatilis*, *Myriophyllum* spp., *Callitriche* spp., *Berula erecta*, *Zannichellia palustris*, *Potamogeton* spp. and *Fontinalis antipyretica*. The annexed habitat covers river types ranging from nutrient poor, fast flowing upland bryophyte rivers to large *Ranunculus fluitans* rivers to eutrophic, lowland *Potamogeton* rivers (Hatton-Ellis & Grieve, 2003).

The current study involved: (i) collation of existing records and information on protected species in the relevant watercourses/catchments; (ii) field studies covering reaches around and downstream of each bridge; (iii) impact assessment and mitigation recommendations in relation to aquatic habitats and species.

2 METHODOLOGY

2.1 Desk study

A thorough search of available databases, reports and journals was conducted to establish existing and records for protected aquatic species at and downstream of each of the seventeen bridges, and within the greater downstream catchment. Data sources included:

- Inland Fisheries Ireland (IFI) Water Framework Directive (WFD) Fish Sampling data;
- Environmental Protection Agency (EPA) river monitoring data - <http://gis.epa.ie/Envision>;
- National Biodiversity Data Centre Maps - <http://maps.biodiversityireland.ie/>;
- National Parks and Wildlife Mapviewer - <http://webgis.npws.ie/npwsviewer/>;
- Peer reviewed scientific literature.

2.2 Survey Locations

Bridge locations and maps were as provided by RPS Group Ltd and listed in Table 1.

Table 1 - Bridge Locations

BridgeID	Bridge Name	Easting ITM	Northing ITM	Catchment
KY-N70-007	Ballynamona Upper Bridge	484806.28	605898.09	Maine
KY-N23-005	Dysert	498584.71	608085.69	Maine
KY-N71-001	McCarthy O'Leary Bridge	496678.58	589550.58	Flesk (Laune)
KY-N72-009	Beheenagh Bridge	509723.76	590971.24	Flesk (Laune)
KY-N72-003	Ballymalis Bridge	484221.34	594497.54	Laune
KY-N72-001	Coolroe South Bridge	483059.6	595521.33	Laune
KY-N69-011.3	Palas Bridge	493826.41	626008.72	Feale
KY-N72-004	Pallis Bridge	488582.37	592699.92	Laune
KY-N86-005	Enrights Bridge	480008.36	611888.44	Tralee Bay
KY-N86-039	Clooncurra Bridge	450198.26	601004.12	Dingle Bay
KY-N86-043	Garfinny Bridge	448081.7	601034.23	Dingle Bay
KY-N86-034	Gort na Gcrann Bridge	456925.4	601480.15	Dingle Bay
CC-N72-033	Downeys Bridge	593324.6	596052.93	Bride (Blackwater)
CL-N67-012	MountRivers Bridge	99112.767	166006.135	Creegh
CL-N67-019	Moy River Bridge	109482.385	185910.823	Moy (Clare)
CL-N68-005	Liscasey Bridge East	121907.124	166584.171	Owenslieve/ Shannon
CL-N85-009	Cullenagh Bridge	115353.274	186806.251	Inagh

2.3 General Habitat Descriptions

General habitat characteristics were recorded including: substrate and flow types, depth and width, shading, surrounding land-use and general morphological character. The latter were assessed, generally based on criteria for river hydromorphology using the principles of the Rapid Hydromorphological Assessment Technique (RHAT) (Anon, 2009).

2.4 Fisheries Habitat Assessment

Pre-existing fisheries information was ascertained through desk studies, mainly based on WFD fish survey data. Field-based fisheries habitat assessments involved bankside walkover and in-channel investigations along the full survey reach visually assessing the principle in-channel and bank-side habitats (e.g., substrates, flow type, width, depth, marginal vegetation etc.), and the suitability of these as spawning, nursery and holding sites for fish, principally those that are relevant to protected aquatic species: salmon, river/brook/sea lamprey and freshwater pearl mussel.

2.5 Stage 1 FPM Survey

Stage 1 FPM surveys were conducted downstream of four bridges: Beheenagh, McCarthy O'Leary (Flesk) and Pallis Bridges in Co. Kerry and Mountrivers Bridge in Co. Clare. Surveys adhered to standard methodology as set out in Anon. (2004), carried out by highly experienced surveyors under NPWS Licence No. C028/2016 (exp. Dec 31st, 2016). The rivers were viewed using bathyscopes (underwater viewers) in wadeable reaches and snorkelling in deeper areas. River levels were low and there had been no recent spates prior to surveying. For each survey, water clarity was excellent and conditions were clear. Photographs and upstream/downstream coordinates for each survey reach were taken.

3 RESULTS

3.1 Desk study

Flesk/Laune Catchment [Beheenagh, McCarthy O'Leary, Pallis, Ballymalis, Coolroe South Bridges]

Five of the bridges occur in the greater River Laune catchment which includes the River Flesk and the Beheenagh River, the latter an upper tributary of the Owneyskeagh which flows into the Flesk. The Flesk flows through Killarney and into Lough Leane. The lake outflow forms the River Laune, travelling 20km north-west to Castlemaine Harbour near Killorglin.

During WFD fish sampling in 2008 (CRFB, 2009) salmon, eel and brown trout were recorded on the Flesk just upstream of McCarthy O'Leary Bridge (Flesk Bridge). As part of the same sampling round, salmon, brown trout, sea trout and eel were recorded on the Gweestin River, a tributary of the Laune which is located 0.75km downstream of Ballymalis Bridge.

In studies by O'Gorman *et al.* (2015) River and Brook lamprey (*Lampetra fluviatilis*; *Lampetra planeri*) occurred on the Beheenagh, Flesk and Laune Rivers, with ammocoetes recorded by in large numbers at certain sites in 2014. *Lampetra* spp. were also present in the Gweestin River. In the same study, Sea lamprey (*Petromyzon marinus*) occurred in small numbers on main channels of Rivers Laune and Flesk.

Freshwater pearl mussels occur in the Laune catchment, and were recorded in small numbers on the River Flesk downstream of McCarthy O'Leary Bridge (Flesk Bridge) during Catchment Flood Risk Management Studies conducted by the Office of Public Works (OPW) (Ecofact, 2012).

Maine Catchment [Dysert Br., Ballynamona Upper Br.]

Two bridges occur on unnamed tributaries of the River Maine: Dysert Bridge Trib. (confluences just west of Castleisland) and Ballynamona Upper Trib. (confluences downstream of Castlemaine). WFD fish sampling in 2008 recorded salmon, lamprey, brown trout, sea trout and eel on the main channel of the River Maine (CRFB 2009). Brook lampreys have been observed spawning in the catchment, while river lampreys are present in the Maine downstream of the N22 Bridge - the bridge bed structure is apparently a barrier to migrating lamprey passage (Ecofact, 2014). Freshwater pearl mussels are present in small numbers in the River Maine around the confluence with the Brown Flesk River, but are considered to perhaps have been washed out from the small population that occurs in the Brown Flesk. A few scattered adults were found downstream of the Brown Flesk confluence during surveys by Ross (2009), but habitat was deemed largely unsuitable owing to high levels of filamentous algae and silt.

Feale Catchment [Palas Br.]

Palas Bridge is located on a headwater tributary of the River Brick which adjoins Lixnaw Canal and flows into the main channel of the River Feale near Ballyduff. Although there are FPM records for the Feale (Ross, 2009), these are well upstream of the River Brick confluence and the species would not be expected to occur in the very lower (tidal) reaches of the Feale. Habitat in the River Brick is highly canalized and also unsuitable.

The main channel of the River Feale is a designated salmonid water listed in the First Schedule of the Quality of Salmonid Waters Regulations. It is reported to be one of the best sea trout and salmon fisheries in Ireland. During WFD fish sampling, six species of fish were recorded on the Feale. Atlantic salmon, sea trout, brown trout, lamprey and eel were recorded (CRFB, 2008). The River Feale has a lower density and more restricted distribution of lampreys compared to other large Irish rivers (O'Connor, 2006) owing to the dominance of high gradient channels and erosive nature of spate flows that characterize the system. Presence of Sea and/or River and Brook Lampreys have been reported for the main channel of the Feale almost as far downstream as the River Brick confluence (O'Connor, 2006).

Creegh River Catchment [Mountrivers Br.]

The Creegh River is known for good stocks of sea trout and small runs of salmon during floods in early summer. It was surveyed in its lower middle reaches (Drumellihy Br.) in 2009 and 2012 by IFI as part of their WFD fish monitoring programme (Kelly *et al.*, 2013a). A good population of brown trout (5 age-classes) and salmon (3 age-classes) were recorded along with sea trout, eel, and flounder, the latter indicative of tidal influence in the lower reaches of the river.

Inagh River Catchment [Cullenagh Br.]

There is a fish pass on the falls at Ennistimon. Salmon, trout and eel are recorded on the Inagh River and the river is part of IFI's eel monitoring programme. The Inagh is currently better known as a coarse fishery (rudd and pike).

Owenslieve River Catchment [Liscasey Br. East]

Discharging directly to the Shannon Estuary, the Owenslieve River has a population of river lamprey occurring up as far as an impassible barrier located 2km upstream of the tidal head (Igoe *et al.*, 2004), which is a few kilometers downstream of the bridge in question.

Bride River Catchment [Downeys Br.]

Downeys Bridge crosses a small headwater tributary of the Bride River, the main channel of which forms part of the Blackwater River (Cork/Waterford) SAC (002170) with freshwater qualifying interests including freshwater pearl mussel, white-clawed crayfish, lampreys and Annex I Habitat 3260. The Bride confluences with the estuarine reaches of the Blackwater main channel, thus being hydrologically downstream of freshwater pearl mussel populations of the SAC. There are no existing records of crayfish in the Bride catchment. Two sites were electric fished on the River Bride as part of 2012 WFD surveillance monitoring. Both sites were upstream of the Downeys Bridge tributary confluence. Salmon (various size-classes), sea trout, brown trout, juvenile lamprey, eel and stone loach were captured and the river merited Good Ecological Status according to fish (Kelly *et al.*, 2013b).

3.2 Field Studies

3.2.1 Beheenagh Bridge [KY-N72-009]

Survey Reach Coordinates	X (ITM)	Y (ITM)
U/S	509698	591012
D/S	509515	591055
Location	Co Kerry. Irish Grid Square: W09. Just east of Barraduff town on N72. Surveyed from 30m u/s to 300m downstream of bridge.	
Surveys Conducted	Stage 1 Freshwater Pearl Mussel, Fisheries Habitat Assessment, General Habitat Description.	
Habitat Description	Moderate sized river (5-6m width and 0.25m depth on average) with high energy series of rapid/riffles and runs over mainly cobble and small boulder substrates with a bryophyte plant community, mainly <i>Fontanalis squamosa</i> . Some interstitial deposits of clean, fine bed material (gravel/coarse sand). Natural, woodland riparian tree cover.	
Evidence of FPM	None.	
Habitat potential for FPM	Limited potential owing to high energy nature of river which does not facilitate accumulation of finer bed materials (gravel/coarse sand) suitable for mussels. There were some patches of suitable habitat where fine bed material had deposited at margins and behind larger boulders, but no mussels were observed.	
Existing FPM records	None for Beheenagh River. No records for the downstream Owneyskeagh River.	
Other protected species/habitats	Numerous salmonids observed in runs. Ideal salmonid nursery habitat with pockets of spawning habitat potential for salmon, trout and lampreys. Lamprey nursery habitat was lacking owing to the high energy nature of the channel and general absence of accumulated silty sediments in which ammocoetes could burrow. The plant community would pertain to Callitricho-Batrachion sub-type CB6a of Annex I Habitat 3260 characteristic of fast flowing, bryophyte dominated, upland rivers (Hatton-Ellis & Grieve, 2003). This vegetation type, mainly represented by bryophytes such as <i>Fontanalis</i> spp., occurs in the Beheenagh River beginning just downstream of the bridge and continues downstream over the surveyed reach. It does not occur within the footprint of the proposed bridge extension upstream of the existing structure. This is the typical habitat of this type of high energy, upland river and has a wide distribution.	





Plate 1: Beheenagh River from d/s of N72 bridge

Plate 2: Beheenagh River - high energy, fast

showing fast flowing rapid/riffle habitat. No mussels. (15/07/2016)	flowing rapid/run habitat with natural riparian cover. (15/07/2016)
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3.2.2 McCarthy O'Leary Bridge [KY-N71-001]

Survey Reach Coordinates	X (ITM)	Y (ITM)
U/S	496720	589430
D/S	96410	89440
Location	Co. Kerry. Irish Grid Square: V98. Flesk Bridge at Woodlawn, 1km south of Killarney town centre. Surveyed from 30m u/s to 300m downstream of bridge.	
Surveys Conducted	Stage 1 Freshwater Pearl Mussel, Fisheries Habitat Assessment, General Habitat Description	
Habitat Description	A broad, wide river (>20m) with limited scour pools (1.5m deep); extended riffle sections downstream of the bridge (0.15m deep) and glides (0.40-0.75m deep). A low, constructed weir is located about 50m downstream of the bridge but this would be passable to most fish species.	
Evidence of FPM	5 large, scattered adults on True Right (TR) side of channel between the bridge and the weir + 2 dead shells in glide d/s of mid-channel islands.	
Habitat potential for FPM	Good habitat potential in pockets where finer bed material had accumulated behind boulders and towards river margins. River margins were depositing with too much fine silt. Macrophyte cover was generally low in more suitable glide habitat, and no excessive amount of filamentous algae was observed.	
Existing FPM records	2 mussels reported in Ecofact (2012) downstream of the bridge in a similar location as the current survey.	
Other Protected Species/ Habitats	An abundance of young salmon were observed during snorkelling surveys, along with eel and trout. Substrates were conducive to and salmonid spawning and would also hold potential for lamprey spawning. There was potential lamprey nursery habitat present, i.e., accumulated sediments near river margins. The plant community had a patchy distribution, with large areas of little or no plant cover. Overall, the community pertained to fragmented Annex I Habitat 3260, dominated by <i>Ranunculus</i> spp., and <i>Fontinalis antipyretica</i> (and other bryophytes) with a little <i>Sparganium emersum</i> and <i>Myriophyllum alterniflorum</i> noted in glide habitat.	

	
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<p>Plate 3: View u/s over glide/riffle habitat in the upper section of the survey reach d/s of bridge. Circle marks location of 5 mussels. (19/07/2016)</p>	<p>Plate 4: Lower end of survey reach comprising a long glide/run over cobble/gravel/boulder substrates. No mussels (19/07/2016)</p>
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3.2.3 Pallis Bridge [KY-N72-004]

Survey Reach Coordinates	X (ITM)	Y (ITM)
U/S	488610	592665
D/S	488346	592556
Location	Co. Kerry. Irish Grid Square: V89, Pallis townland, 7km west of Killarney town centre on N72.	
Surveys Conducted	Stage 1 Freshwater Pearl Mussel, Fisheries Habitat Assessment, General Habitat Description	
Habitat Description	Small, slow flowing riffle/run type stream with substrates of cobble, gravel and coarse sand. Water was turbid (grey-white) at time of surveying, with 100% cover of thick filamentous algal cover (mainly diatom + <i>Vaucheria</i> spp.) (Plate 6), suggesting a pollution point source upstream. The stream was 2-4m wide with shallow riffles & 0.30m pool/glides with a high degree of riparian tree cover. Bridge footprint - solid concrete (Plate 5).	
Evidence of FPM	None	
Habitat potential for FPM	Completely unsuitable - too small with poor water quality.	
Existing FPM records	None	
Other Protected Species/Habitats	<p>Most likely a trout stream, although salmon from the main channel of the Laune may use the lower reaches for nursery habitat (moving in from the Laune). Potential for brook and/or river lamprey spawning and nursery - although limited owing to paucity of fine sediments for ammocoetes.</p> <p>The stream confluent with the Laune c.300m downstream where there is excellent salmon and lamprey habitat and is within the Castlemaine Harbour SAC. Sea and river lampreys, and salmon, are qualifying interests of the SAC.</p>	



Plate 5: Footprint of bridge showing concrete bed reinforcement. No mussels. (19/07/2016)



Plate 6: Excessive filamentous algal growth on all substrates. Completely unsuitable for mussels. Poor quality habitat for salmonids. (19/07/2016)

3.2.4 MountRivers Bridge [CL-N67-012]

Survey Reach Coordinates	X (ITM)	Y (ITM)
U/S	99128	165988
D/S	98963	166249
Location	Co. Clare. Irish Grid Square: Q96. Bridge over Creegh/Skivileen River located c.2km east of Doonbeg village.	
Surveys Conducted	Stage 1 Freshwater Pearl Mussel, Fisheries Habitat Assessment, General Habitat Description.	
Habitat Description	Moderate sized, lowland river (8m) with a combination of shallower riffle/runs (0.15m) and deeper glides (0.03-1.0m). Deeply drained historically and embanked. Slow glide habitat dominated downstream of the bridge. Survey was conducted at low tide, as the river is tidally influenced. Substrates are mainly cobble embedded in heavy clay with occasional deposits of gravel/sand and a lot of fine silt. Water colour was high. Shallow reaches had 100% cover of <i>Ranunculus</i> spp., <i>Potamogeton perfoliatus</i> , <i>Potamogeton crispus</i> , <i>Myriophyllum alterniflorum</i> and <i>Cladophora</i> .	
Evidence of FPM	None	
Habitat potential for FPM	Unsuitable for mussels – silty, sluggish and embedded clay substrates.	
Existing FPM records	None. A previous survey of the Creegh River catchment skipped this reach as habitat was deemed unsuitable.	
Other Protected Species/Habitats	The primary importance of the channel downstream of the bridge is as a migration route for salmon and sea trout. There is some suitable salmonid nursery habitat just downstream of the bridge. The presence of larger resident brown trout in deeper reaches downstream of the bridge cannot be ruled out. Eels were abundant downstream of the bridge.	



Plate 7: View from u/s of MountRivers Bridge showing in channel growth of emergent vegetation. Unsuitable for mussel (22/07/2016)



Plate 8: Highly coloured, sluggish glide over embedded clay/cobble substrates with layer of silt. Unsuitable for mussels (22/07/2016)

3.2.5 Dysert Bridge [KY-N23-005]

Survey Coordinates	Reach	X	Y
U/S		498626	608008
D/S		498574	608179
Location	Co. Kerry. Irish Grid Square: Q90. Unnamed tributary of the River Maine near Ballygree townland, c.2km southwest of Castleisland.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	The stream is highly modified by drainage, especially downstream of the bridge where it is mostly canalised. Upstream and for a short distance downstream of the bridge there were braided gravelly channels. The bridge footprint has a concrete reinforced bed. The stream was generally 3.5m wide and 0.15-0.35m deep with steep clay banks overgrown with bramble and tall herb. In general there was no riparian tree cover. Substrates comprised some cobble and pebble embedded in clay with a layer of loose fine silt. There were patches of cleaner gravels nearer the bridge which would be suitable for salmonid spawning (mainly trout) and nursery and perhaps lamprey spawning. <i>Oenanthe crocata</i> and <i>Ranunculus</i> spp. were present. There was good eel habitat and it is considered a very good trout nursery stream.		
Protected Habitats	Species/	Probably unsuitable for salmon, but they cannot be ruled out from occupying limited, though suitable salmonid nursery habitat just upstream of the bridge. Brook lampreys (<i>Lampetra planeri</i>) are likely to be present, although there was limited availability of sediment deposits in reaches downstream of the bridge as the channel appears scoured back to hard clay as a result of drainage/contained flow. Desk studies suggest that River and Sea Lampreys cannot pass the N22 bridge across the Maine River (>10km downstream), so would not be present.	



Plate 9: View d/s towards Dysert Bridge showing braided gravelly channel suitable as with *Ranunculus* and *Oenanthe crocata*. Suitable salmonid nursery habitat. (15/07/2016)



Plate 10: Turbid, sluggish glide typical d/s of Dysert Bridge. Not suitable spawning or nursery habitat for salmonids and limited suitability for brook lamprey nursery. (15/07/2016)

3.2.6 Ballynamona Upper Bridge [KY-N70-007]

Survey Coordinates	Reach	X	Y
U/S		484823	605869
D/S		484807	605768
Location	Co. Kerry. Irish Grid Square: Q80. Unnamed tributary of the River Maine at Ballynamona Upper townland, 3km NE of Castlemaine.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	From 10m upstream to about 20m downstream, milking cows use the stream bed beneath the bridge to access milking sheds from fields north of the N70. There is manure in the stream and cobbly substrates are disturbed by constant trampling. In its natural state (away from cattle influence), the stream is small (1-1.5m wide, with 0.03m riffles and small pool/runs up to 0.15m) and step-pool-cascade in nature. Substrates were cobble and gravel with a limited bryophyte community and quite dense riparian tree cover for at least the first 150m d/s of the bridge.		
Protected Habitats	Species/	This is at best a small trout stream. It is too small and unstable for salmon and generally lacks silt deposits suitable for lamprey nursery, although brook lamprey (<i>Lampetra planeri</i>) cannot be ruled out. The stream is affected by milking cows accessing regularly so habitat around the bridge itself is not highly suitable, even for trout.	



Plate 11: View u/s towards Ballynamona Upper Bridge showing the route that milking cows take along the streambed and through the bridge (15/07/2016).

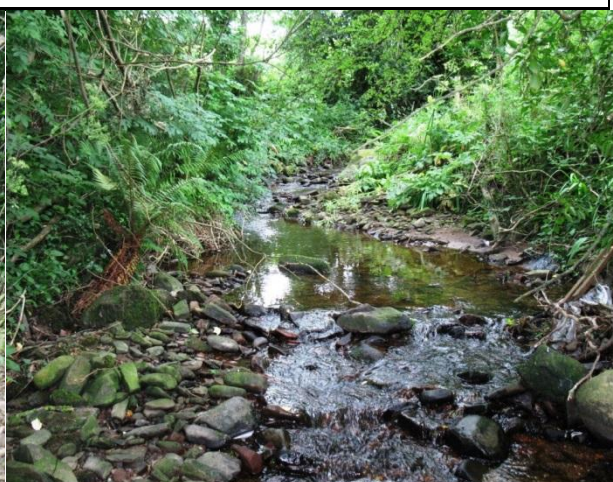




Plate 12: Typical habitat of the stream where a juvenile trout was captured (15/07/2016).

3.2.7 Ballymalis Bridge [KY-N72-003]

Survey Coordinates	Reach	X	Y
U/S		484221	594497
D/S		484129	594494
Location	Co. Kerry. Irish Grid Square: V89. N72 bridge over Dorrnagh Stream in townland of Ballymalis between Killarney and Killorglin.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	The stream is highly modified by drainage, being canalised in nature. Upstream of the bridge there is a stagnant glide, while habitat downstream alternates between sluggish glide and reaches of pebble/gravel riffle. It was 2.5m wide and 0.05m in riffles. There were growths of brown filamentous diatom, and little other instream vegetation. It was challenging to access the stream in downstream reaches from the bridge as it is very overgrown with bramble and is deeply incised into the landscape making access almost impossible. The footprint of the bridge was strewn with large mossy cobbles. The river had a fetid smell and was highly turbid, suggesting a point source of pollution upstream. It was deemed unsafe to investigate this stream too closely owing to the obvious pollution level. Trout, which have lower water quality requirements than salmon are likely to present.		
Protected Habitats	Species/	The site is within the Castlemaine Harbour SAC and is a tributary of the Gweestin River (1km downstream of Ballymalis Bridge) which has a salmon and river/brook lamprey population. The stream in question, however, is likely to be too polluted in reaches downstream of the bridge to sustain salmon, although their presence cannot be ruled out. River/brook lamprey are likely to be present, as are eel.	
			
Plate 13: View d/s from Ballymalis Bridge showing turbid, fetid smelling waters forming a sluggish glide (22/07/2016)		Plate 14: Faster flowing pebble/gravel reaches downstream of the bridge which would be suitable (probably trout) nursery habitat (22/07/2016)	

3.2.8 Coolroe South Bridge [KY-N72-001]

Survey Coordinates	Reach	X	Y
U/S		483090	595478
D/S		482960	595356
Location	Co. Kerry. Irish Grid Square: V89. N72 bridge over Kealbrogheen Stream in townland of Coolroe South between Killarney and Killorglin.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	The stream is highly modified by drainage, having been straightened, embanked and canalised in nature downstream of the bridge. Upstream of the bridge there is a stagnant glide, while habitat downstream alternates between sluggish glide and reaches of pebble/gravel riffle within the previously deepened channel. The stream was generally 2.5m wide and 0.05m deep in riffles. There were growths of brown filamentous diatoms on most substrates, and little other instream vegetation. It was challenging to access the stream in downstream reaches from the bridge as it is very overgrown with bramble and is deeply incised into the landscape making access impossible. The stream was highly turbid and there were loose silty deposits on benthic substrates.		
Protected Habitats	Species/	This stream is a tributary of the Laune (c.0.4km downstream of the bridge) which has a salmon and sea/river/brook lamprey population. The stream in question, however, does not possess very suitable salmon spawning or nursery habitat, although they cannot be ruled out from using some patches of faster flowing water with gravels, >100m downstream of the bridge. Lamprey spawning and nursery also cannot be ruled out, mainly brook lamprey (<i>Lampetra planeri</i>), ammocoetes of which may be present in silty deposits. Water quality is questionable in the stream, which is another factor that may exclude presence of salmon in the surveyed reaches.	



Plate 15: View d/s from Coolroe South Bridge showing general nature of drained stream with steep unstable banks, limited flow and substrate diversity and turbid waters (22/07/2016)



Plate 16: View u/s from the bridge showing turbid, sluggish glide with limited flow diversity and open banks (22/07/2016)

3.2.9 Palas Bridge [KY-N69-011.3]

Survey Coordinates	Reach	X	Y
U/S		493866	625963
D/S		493778	626029
Location	Co. Kerry. Irish Grid Square: Q92. N69 bridge near Pallas townland (northeast of Tralee) over unnamed headwater tributary of River Brick which flows to the Feale.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Small step/cascade-riffle/run type stream (1.6m wide, 0.05m deep in runs). Substrates of pebble, gravel, small cobble and coarse sand. No instream vegetation, but with good riparian tree cover. Clear water, low volume and trickle flows. Upstream of the bridge, the stream follows bedrock chutes in a V-shaped wooded gully. The footprint of the bridge has a reinforced bed made of stones. The stream was historically drained (deepened) but has recovered within the deepened channel.		
Protected Habitats	Species/	This headwater stream is almost certainly too small and unstable to support salmon. It is likely to be a good trout stream. Brook lamprey cannot be ruled out, although they are unlikely owing to the limited availability of stable silt deposits for nursery habitat. The SAC boundary is c1.2km downstream, but this stream is not considered to be of significant ecological importance with respect to aquatic qualifying interests of the SAC (salmon, lampreys).	

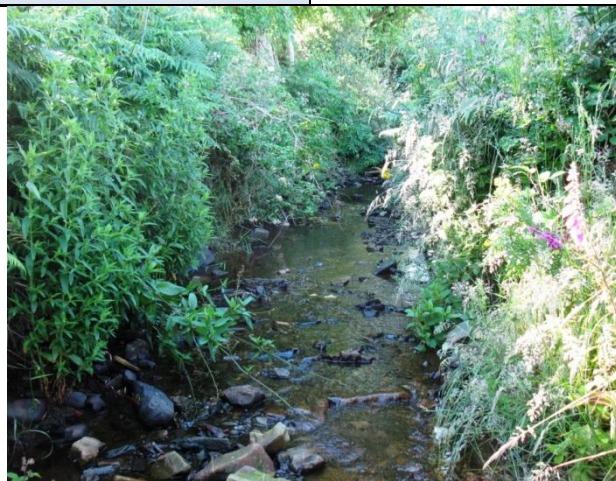




Plate 17: Typical habitat d/s of Pallas Bridge showing pebble/gravel substrates and riffle/run nature which has recovered within the historically drained channel (14/07/2016).



Plate 18: View u/s towards the bridge (14/07/2016).

3.2.10 Enrights Bridge [KY-N86-005]

Survey Coordinates	Reach	X	Y
U/S		480035	611818
D/S		479820	611910
Location	Co. Kerry. Irish Grid Square: Q81. N86 bridge over unnamed stream in townland of Annagh, west of Blennerville, Tralee.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Small, slow flowing stream (1.8m wide; 0.1m deep). Realigned and deepened downstream of the road bridge. Substrates generally coarse cobble immediately d/s of bridge, but then becoming more evenly graded with pebble and gravels. There was no instream vegetation recorded in the first 100m d/s of the bridge. The stream becomes tidally influenced c.100m d/s of the bridge, with high instream levels of the ephemeral algae, <i>Enteromorpha</i> spp., present. This plant species signifies tidal influence, which is clearly evident further downstream where lower stream reaches were essentially estuarine with anoxic muds. Considered to be good trout and eel habitat.		
Protected Habitats	Species/	The short reach of non-tidally influenced habitat downstream of the bridge is probably unsuitable for protected aquatic species. It is considered a trout stream. Suitable silty deposits for lamprey ammocoetes were lacking.	
			
Plate 19: Typical habitat d/s of Enrights Bridge showing pebble/gravel substrates and riffle/run nature which has recovered within the historically realigned and deepened channel (14/07/2016)		Plate 20: View downstream from c300m d/s of the bridge showing estuarine nature of the streams tidal head (14/07/2016)	

3.2.11 Gort na Gcrann Bridge [KY-N86-034]

Survey Coordinates	Reach	X	Y
U/S		456925	601480
D/S		457050	601152
Location	Co. Kerry. Irish Grid Square: Q81. N86 bridge over unnamed stream in townland of Gort na Chorráin, 2km west of Annascaul.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Small, low volume, slow flowing stream (1.2m wide; 0.07m deep). Upstream of the road was a steep mossy bedrock cascade. The stream is culverted beneath the road in a large concrete pipe. Downstream of the road the stream formed a series of step/cascade and riffle/run sequences with cobble, pebble and gravel substrates. It was heavily overgrown with Fuschia, gorse and brambles and was largely inaccessible. There was no instream vegetation.		
Protected Habitats	Species/	The stream may have limited value for trout, but is otherwise of low, local ecological value.	





Plate 21: View of Gort na Chorráin stream looking upstream into N86 culvert (13/07/2016)





Plate 22: Nature of substrates downstream of the road (13/07/2016)

3.2.12 Clooncurra Bridge [KY-N86-039]

Survey Coordinates	Reach	X	Y
U/S		450246	600966
D/S		450072	600800
Location	Co. Kerry. Irish Grid Square: Q50. N86 bridge over unnamed tributary of Owenlondrig River in townland of Clooncurra, 1.5km west of Lispole.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Small, medium volume, moderately-fast flowing stream (1.5m wide; 0.10m deep). Downstream of the road the stream was fairly uniform in nature having been historically deepened and probably straightened. It formed a continuous riffle/run sequence with cobble, pebble and gravel substrates. It was heavily overgrown with (invasive) <i>Montbretia</i> , <i>Fuschia</i> and brambles and was largely inaccessible owing to deepened nature and heavy, impenetrable bank cover. There was no instream vegetation.		
Protected Habitats	Species/	The stream may have value for trout, but is otherwise of low, local ecological value. Eel were present.	
			
Plate 23: View of Clooncurra Bridge looking u/s showing low clearance (13/07/2016)		Plate 24: Channel d/s of the bridge showing typical riffle/run nature of stream over cobble/pebble/gravel substrates (13/07/2016)	



3.2.13 Garfinny Bridge [KY-N86-09]

Survey Coordinates	Reach	X	Y
U/S		4	6
D/S		4	6
Location	Co. Kerry. Irish Grid Square: Q81. N86 bridge over unnamed stream in townland of Gort na Chorráin, 2km west of Annascaul.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Small, medium volume, moderately-fast flowing stream (1.5m wide; 0.10m deep). Downstream of the road the stream was fairly uniform in nature having		

		been historically deepened and probably straightened. It formed a continuous riffle/run sequence with cobble, pebble and gravel substrates. Water was very clear and flows were swift. The channel was quite overgrown at banks with (invasive) <i>Montbretia</i> , <i>Fuschia</i> and brambles with Willow common. Instream vegetation was generally limited to the aquatic moss, <i>Fontanalis squamosa</i> .
Protected Habitats	Species/	The stream has potential for salmon to be present owing to presence of clean gravels, although it may be too unstable owing to swift flows caused by channelisation as a result of historical drainage. It would certainly support trout and eel, and possibly lamprey species also, although soft sediments were lacking and therefore not ideal lamprey nursery habitat.
		
Plate 25: View of Garfinny Bridge looking d/s from just above the road (13/07/2016)		Plate 26: Channel d/s of the bridge showing typical riffle/glide nature of stream over cobble/pebble/gravel substrates (13/07/2016)

3.2.14 Liscasey Bridge East [CL-N68-005]

Survey Coordinates	Reach	X	Y
U/S		121914	166615
D/S		121943	166349
Location	Co. Clare. Irish Grid Square: R26. N68 bridge over unnamed tributary stream of Owenslieve River at Lisseycasey village.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Small, medium volume, slow-moderate flowing stream (1.5m wide; 0.07m deep). The stream was culverted under the road. There have been a numerous hydromorphological alterations to this stream and there is an impassable fish barrier c.100m d/s of the road. In general the first 100m forms a series of cascade-pool-runs over cobble/bedrock substrates. There is a high weir with a pipe inserted @100m, after which the stream has a lower gradient and forms pebble/gravel riffle-runs. In general there is a hedgerow of riparian tree cover, quite dense in the first 50m d/s of the road owing to presence of conifers and cherry laurel. There was no instream vegetation noted other than some liverworts and mosses. Water was clear, but moderately coloured (humic).		
Protected Habitats	Species/	The channel has been realigned and deepened in the past, but instream habitat has recovered somewhat lending itself to being trout nursery habitat. Brook	

lampreys may be present downstream of the weir utilising a few patches of gravel for spawning and fine sediments for nursery.	
	
Plate 27: View of Liscasey Bridge East looking u/s showing cobbly substrates and bank reinforcement (22/07/2016)	Plate 28: Channel d/s of the weir showing typical riffle/run nature of stream over cobble/pebble/gravel substrates (22/07/2016)

3.2.15 Moy River Bridge [CL-N67-019]

Survey Coordinates	Reach	X	Y
U/S		109406	185932
D/S		109406	186055
Location	Co. Clare. Irish Grid Square: R08. N67 bridge over Moy River, just south of Lahinch.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Medium sized river (2-3m wide; 0.10m riffles; 0.80m pools). Tidally influenced up to about 250m d/s of the bridge. Just downstream of the bridge the channel is more incised and there were deeper, bouldery run-glides. From about 70m d/s of the bridge habitat was pool-riffle-run type up to the point where a tidal influence begins. From there downstream to the sea there is a series of slow flowing glide/pools. In the riverine reach up to the road, substrates were a combination of cobble, gravel and sand with deposits of fine sediment at margins and in pools. Natural woodland riparian vegetation shades the channel, but not excessively. Water was clear and slightly coloured (humic). Filamentous green algae (<i>Cladophora</i> spp.) formed a fine wispy layer on some substrates but there was no other significant instream vegetation apart from some mosses on boulder/ bedrock chutes upstream of the road bridge.		
Protected Habitats	Species/	There were patches of good salmonid spawning and nursery habitat between the bridge and the tidal reaches. While trout would certainly be present, salmon migration may be affected by the nature of the river outflow which was subterranean through the boulder beach where it meets the sea. Lamprey may be present – Brook lamprey more likely, although the river is not ideal for this species owing to the spatey nature which would periodically scour fine sediment away. Eel were captured.	



Plate 29: Typical habitat c.150m d/s of bridge showing riffle-run over pebble, gravel substrates (22/07/2016)

Plate 30: Channel viewed looking u/s towards the bridge with boulder run/glide habitat and natural riparian cover (22/07/2016)

3.2.16 Cullenagh Bridge [CL-N85-009]

Survey Coordinates	Reach	X	Y
U/S		115352	186843
D/S		115249	186706
Location	Co. Clare. Irish Grid Square: R18. N85 bridge over unnamed tributary stream of the Inagh River in Cullenagh townland, c.3km east of Ennistymon.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	Moderately small stream (2.5m wide; 0.06m riffles). Historically deepened and realigned from the road to the Inagh main channel, meaning that is quite uniform in its cross section and flow type. Instream habitat has recovered somewhat within the drained channel and there was generally a continuous series of quite fast riffle/run reaches over pebble/gravel substrates. There was an abundance of <i>Oenanthe crocata</i> growing instream, which is typical of drained streams that self-narrow over time after drainage. Around the bridge was a stagnant pool/glide with sandy silty deposits. Steep banks were heavily overgrown with grasses, rushes, willow, bramble and tall herb. Water was slightly turbid and slightly coloured (humic). There was a layer of brown filamentous diatom growth over most substrates and a fine layer of deposited silt.		
Protected Habitats	Species/	It cannot be ruled out that salmon may enter from the Inagh main channel to spawn, but it is not considered to be a salmon stream. Brook lamprey may be present, utilising good spawning substrates in parts and patches of silty deposits. Eel are very likely to be present.	





Plate 31: Channel d/s of bridge showing riffle-run over cobble, pebble, gravel substrates (22/07/2016)



Plate 32: Channel further downstream showing deeply drained nature with overgrown banks (22/07/2016)

3.2.17 Downey's Bridge [CC-N72-033]

Survey Coordinates	Reach	X	Y
U/S		593374	595894
D/S		593523	595628
Location	Co. Cork. Irish Grid Square: W99. N72 bridge over unnamed tributary stream of the Collatrim Stream (Trib. of Bride River) in townland of Moydilliga, 2km east of Currabehea village.		
Surveys Conducted	Fisheries Habitat Assessment, General Habitat Description		
Habitat Description	<p>The stream varies from 0.7-1.7m wide over the surveyed length. It is generally shallow with a substrate dominated by small and large cobble, gravel & pebble and coarse sand/fine silty sand. The majority of the habitat is shallow riffle (riffle/run), cascade, shallow run/glide and pool.. The channel is largely plant free due to the nature of the flow and the heavy flow, however, the green alga <i>Vaucheria</i> sp was frequently present just downstream of the bridge, mainly in small amounts but occasionally locally common in slack-flow, unshaded stretches. <i>Apium nodiflorum</i> (fool's watercress) and <i>Rorippa nasturtium-aquaticum</i> agg. (watercress) are present along some margins but never to excess.</p> <p>The initial 110m downstream of the bridge is a moderately sinuous stretch which is well shaded with heavy tree cover along both banks (alder mainly) the next 40m has been straightened with all cover removed from both banks. The substrate in this stretch is ideal for trout spawning. Farther downstream to the end of the survey reach, the stream is again enclosed along both banks by a heavy tree cover, which heavily shades the sinuous channel. There were a few pockets of fine silty substrate which are likely to contain lamprey ammocoetes. Cattle access the stream in three places along the surveyed reach.</p> <p>The stream is overall in a fairly natural condition despite some channel re-alignment and can be considered principally a trout stream and although salmon could occasionally enter it to spawn, it wouldn't be considered a salmon stream. There are suitable fish holding, nursery and spawning conditions for trout. Lamprey, most likely <i>Lampetra planeri</i> (brook lamprey) are also likely to be</p>		

		present, given that there is suitable habitat present.
Protected Habitats	Species/	Lamprey most likely <i>Lampetra planeri</i> (brook lamprey)
		
Plate 33: View u/s to bridge (26/07/2016)		Plate 34: Cleared and straightened stretch (26/07/2016)

4 IMPACT ASSESSMENT

4.1 Potential Impacts and Recommendations

Potential impacts on protected aquatic species associated with engineering works can be either **direct** (physical disturbance or direct mortality) and/or **indirect** (downstream impacts as a result of changes to water flow and/or water quality as a result of works).

In general, indirect negative impacts arise in three ways: (1) sediment release to the watercourse; (2) toxic chemical release (e.g., concrete, hydrocarbons) to the watercourse and in relation to freshwater pearl mussels; (3) negative impacts on salmonid host fish.

4.1.1 Beheenagh Bridge [KY-N72-009]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<u>Bridge Widening/Replacement</u> <ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Site clearance and earthworks for new road embankment. Construction of new or widened reinforced concrete bridge. Provision of road surfacing, paved 	<p>This is a locally high value salmonid river (including for salmon). There is potential for indirect medium term negative impacts downstream of the bridge in association with wet concrete and mortar usage (bridge widening/reinforcing/ paved verge construction, repointing), entering the watercourse from the works area. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Species affected in Beheenagh River would be Annex II species, Atlantic salmon, and other salmonids (brown trout) and possibly Annex II species river/brook lampreys.</p> <p>Slight temporary negative impacts</p>	<p><u>Construction Method Statement:</u> A detailed method statement should be drawn up by the contractor indicating what standard measures will be taken to avoid: (i) sediment or soil loss, and (ii) cement and hydrocarbon release, associated with all aspects of the construction phase. It must include details of the water management strategy including number of pumps required and all other aspects to ensure a dry working environment.</p> <p><u>Water management:</u> An appropriate method must be selected for dewatering of the works area during construction. The river is quite high energy with spate flows and would be subject to flashy floods. Use of a dam and pump over set up is unlikely to be feasible. A bypass channel would be most desirable at this location. The empty flood eye at the eastern side (True Right) of the bridge could be utilised for this. A bypass channel could be excavated from upstream to downstream using dry land beneath this empty flood eye. The bypass channel</p>	<p>The Beheenagh River has high local fisheries importance and further discussion regarding options for water management during construction works is required as well as discussion informing the new bridge design, with particular regards to fish passage issues during operation.</p> <p>Consultation with IFI is essential and agreement on construction methods/materials and bridge design must be sought with them. IFI must be made aware of the existence of this report. A meeting that includes a suitably qualified and experienced ecologist, IFI staff and the (RPS) bridge design team is</p>

<p>verges and safety barriers.</p>	<p>could arise locally from sediment washout to the river associated with site clearance for bridge/road widening. The majority of the riverine habitat downstream of the bridge is fast flowing and would not favour silt accumulation and smothering of habitat, but elevated levels of suspended solids (>25mg/l) can stress and abrade gills of salmonid fishes.</p> <p>There could be a direct impact on migration of salmonids (salmon) and lampreys depending on timing of works owing to a high level of engineering activity at the bridge.</p> <p>Bridge widening/replacement will require that the works area be dewatered meaning a temporary loss of habitat for fish beneath the bridge. Although the existing bridge footprint is reinforced masonry/stone blockwork, salmonids may use this area and would certainly be present in the downstream riffle area. When dams are introduced, fish may be trapped within the proposed dry working area and they will die when the channel is dewatered.</p> <p>The aquatic plant community present downstream of the bridge (pertaining to Habitat 3260 Type CB6a) is considered by Hatton-Ellis & Grieve (2003) to be less vulnerable to indirect adverse impacts as a result of any sediment loss that may arise during</p>	<p>would need to be lined with geotextile (staked down) and coarse locally sourced stone should be placed along the bottom of it to secure it. A dam can then be placed at the upstream side of the bridge to channel flow towards the bypass channel. The entrance to the bypass channel must remain plugged until the channel is fully secured with geotextile/stone. The earthen plug should only be removed once the dam is placed. A dam would be necessary downstream, however, there is a natural fall in the river longitudinal gradient and the bypass channel could discharge downstream of this. Further discussion on the water management regime at this bridge is recommended, and must be agreed with IFI, as the river has high, local fisheries importance. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Bridge footprint design</u>: The widened bridge footprint within the river should be of a similar nature to that already in existence which allows for fish migration through the central arches. Flat concrete bed reinforcement is not acceptable as it may affect the success of lampreys, eels and salmonids in passing the bridge. A bed design must allow for passage of all species and should incorporate protruding rocks to provide refugia in fast flows. Further discussion on the bridge design in terms of long-term fish passage issues is recommended with input from IFI and a suitably qualified freshwater ecologist, as the river has high local fisheries importance.</p> <p><u>Habitat reinstatement</u>: Once the new bridge is in place and instream works completed, all debris/residue from the works must be removed from the river bed. The bed level should be set to a similar level as currently exists with the cobbly riffle section reinstated downstream of the bridge.</p>	<p>recommended before residual impacts can be concluded.</p>
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	<p>works given the high energy river type in which it occurs. There may be a direct, but temporary loss of a very small area of this habitat in the immediate footprint of works, but in general it does not occur in the main footprint of the new bridge upstream of the existing structure. Any temporary loss of this habitat is a minor to negligible impact given that regrowth will occur fairly quickly once works are complete (within 1 or 2 growing seasons).</p> <p>During the operational phase, there is potential for significant impact at a local scale if the new bridge footprint is not passable by fish. This can occur if bed reinforcement creates an overly shallow, overly wide flow regime, and especially if there is a high downstream apron that can act as an impassable barrier to lampreys and salmon.</p>	<p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Fisheries</u> – Inland Fisheries Ireland (Macroom) must be consulted in the design phase with regards to construction methods and materials proposed, and bridge design (especially the with regards to residual bed levels and ensuring fish passage). IFI must be informed of the existence of this report.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that IFI or a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel upstream of works.</p> <p><u>Timing of works:</u> significant instream works such as those associated with concrete invert lining and channel dewatering must be agreed with IFI and should observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Use of wet concrete/mortar:</u> See Notes on Best Practise – Cement/Mortar, Section 4.2.2, below. If mortar and concrete are used over water on parapets and wing walls, there must be a plastic or webbing tarpaulin sheet laid on scaffold beneath works to prevent spills and leaks entering the watercourse.</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> See Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p>	
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4.1.2 McCarthy O'Leary Bridge [KY-N71-001]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Removal of the existing road surface and footways. Provision of bridge deck waterproofing and new bridge joints. Reinstatement road surfacing, paved verges and safety barriers. 	<p>There is potential for indirect negative impacts associated with debris (old concrete etc.) and/or toxic substances, such as wet concrete (paved verge construction) and waterproofing materials, entering the watercourse from the works area. Wet concrete, in particular, is highly alkaline and if it enters the watercourse can cause serious fish and invertebrate kills. Old concrete debris can also cause pH changes in watercourses and be toxic to fish and invertebrates. It is considered that the risk of such an impact is low from a well-managed work site.</p> <p>The site is located within the SAC. A small number of Freshwater Pearl Mussel located just downstream of the bridge could be affected. Juvenile salmon in ideal nursery habitat for some distance downstream of the bridge may also be affected. Both groups are qualifying interests of the SAC.</p>	<p>Removal of old concrete and road surfacing debris: All old concrete and road surface debris must be collected and removed regularly during works and correctly disposed of, off-site. No debris shall enter the river. Works should occur during good weather with speedy removal of debris including removal of dust and fines from the road surface. Dust should be damped down if necessary to prevent it mobilising to the water surface below the road bridge.</p> <p>Use of wet concrete: See Notes on Construction Best Practise – Concrete, Section 4.2.2, below.</p> <p>Deck waterproofing substances: must be applied carefully avoiding drips, leaks and spills that could enter the drains or the river directly.</p> <p>Fisheries: This reach of the Flesk comprises high value salmon and lamprey habitat and there are a few pearl mussel present. For this reason, even though there are no instream works proposed, IFI (Macroon) should be furnished with a copy of the Construction Method Statement and be made aware of the existence of this report. In the absence of instream works, there should be no issue with the timing of works in terms of salmonid restricted periods, but the timing should be agreed with IFI.</p>	<p>The key to mitigation is ensuring that no old road or concrete debris dust or sediment; wet concrete or waterproofing substances are allowed to enter the river during the works period.</p> <p>It is feasible that this can be achieved using Construction Best Practise in the area of run off control and careful use of wet concrete around watercourses. IFI must be consulted prior to works proceeding and furnished with a copy of the construction method statement.</p> <p>The risk of negative indirect impact on qualifying interests of the SAC is low using a thoroughly planned construction operation and a well-managed construction site. The impact on aquatic qualifying interests of the SAC (pearl mussel, salmon, lampreys, Annex I Habitat 3260) will be neutral with all recommendations implemented.</p>

4.1.3 Pallis Bridge [KY-N72-004]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of paved verges and safety barriers. Construction of new reinforced concrete parapet walls clad in masonry. Demolition of existing up stream wingwalls and construction of new rc wingwalls. Construction of new concrete lining to the invert of culvert units. 	<p>Potential for indirect negative impacts downstream associated with debris (old concrete etc.) and/or toxic substances, such as wet concrete (paved verge construction) and mortar, entering the watercourse from the works area. Wet concrete and mortar, in particular, are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Old concrete debris can also cause pH changes in watercourses and be toxic to fish and invertebrates.</p> <p>Instream works involving use of wet concrete (invert lining) carry potential for moderate temporary impacts on salmon and lampreys (qualifying interests of the SAC) in a local area downstream of the stream confluence with the River Laune. The site is located c.200m upstream of the SAC. While the stream itself is not considered to be important habitat for qualifying interests of the SAC, the Laune confluence is only 300m downstream and possesses ideal habitat for aquatic protected species (salmon, lamprey). Young salmon may forage in the lower</p>	<p><u>Construction Method Statement:</u> A detailed method statement should be drawn up by the contractor indicating what standard measures will be taken to avoid: (i) sediment or soil loss, and (ii) cement and hydrocarbon release, associated with all aspects of the construction phase. It must include details of the water management strategy including number of pumps required and all other aspects to ensure a dry working environment.</p> <p><u>Removal of old concrete and masonry:</u> All old concrete and masonry debris must be collected and removed regularly during works and correctly disposed of, off-site. No debris shall enter the river.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Water management:</u> Concrete invert lining works must occur in the dry to avoid potential for transport of toxic substances downstream to the SAC. A suitable method of dewatering the channel must be selected. Habitat beneath the bridge is not significant for fisheries or benthos. At low flow, stream volumes could feasibly be dammed upstream and down and flumed or piped through the existing culvert to dewater the works area. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fisheries</u> – Inland Fisheries Ireland should be consulted prior to works commencing with regards to construction methods proposed and with regard to the design of invert lining such that fish passage is maintained or enhanced. IFI shall be informed of the existence of this report.</p>	<p>The primary issue at this site is ensuring that pollutants and sediment are not allowed to enter the stream from the works area to potentially be exported into the River Laune / Castlemaine Harbour SAC a short distance downstream.</p> <p>Fish rescue/removal is not required at this site as there is very little habitat for fish within the existing culvert. The risks are low for downstream fisheries values and freshwater life stages of qualifying interests of the SAC (salmon, sea and river lampreys) if a suitable water management method is selected and operations are well planned and executed. Provided the recommendations are adhered to, and Construction Best Practise implemented, the impact on aquatic protected species of this stream, and the SAC downstream, will be neutral.</p>

	<p>reaches of the stream in question, moving up from the Laune.</p> <p>There is potential for permanent negative impact to the ecology of the stream if the design of new concrete invert lining along the culvert in any way prevents upstream or downstream fish movement.</p>	<p><u>Timing of works:</u> significant instream works such as those associated with concrete invert lining and channel dewatering must be agreed with IFI and should observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Use of wet concrete/mortar:</u> At any stage during works, any splashed, leaked, spilled or excess concrete must be prevented from entering the river or drains and storm water pipes that connect to the river. There must be a feasible spillage response plan in place prior to works commencing. See Notes on Construction Best Practise – Concrete, Section 4.2.2, below.</p>	
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4.1.4 Mountrivers Bridge [CL-N67-012]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<p><u>Bridge Widening/Replacement</u></p> <ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Site clearance and earthworks for new road embankment. Construction of new or widened reinforced concrete bridge. Provision of road surfacing, paved verges and safety barriers. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete (bridge widening/reinforcing/ paved verge construction) and mortar, entering the watercourse from the works area. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Species affected could be salmon (and other salmonids – sea and brown trout), eels and flounder.</p> <p>Slight temporary negative impacts</p>	<p><u>Construction Method Statement:</u> A detailed method statement should be drawn up by the contractor indicating what standard measures will be taken to avoid: (i) sediment or soil loss, and (ii) cement and hydrocarbon release, associated with all aspects of the construction phase. It must include details of the water management strategy including number of pumps required and all other aspects to ensure a dry working environment.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Water management:</u> A suitable method of dewatering the channel must be selected so that works occur in the dry, thus avoiding potential for export of toxic substances and</p>	<p>Providing all recommendations are implemented and methods and materials are agreed with IFI, there will be a low risk of negative impacts downstream of the proposed bridge works. Consultation and agreement with IFI and correct timing of works to comply with salmonid restrictions is essential, as is the selection of a suitable method of maintaining a dry works area during the construction phase. With Construction Best Practise employed as set out, and fish removal / rescue during the</p>

	<p>could arise locally from sediment washout to the river associated with site clearance for bridge/road widening. The majority of the riverine habitat downstream of the bridge is depositing, so siltation is not the major concern, but high levels of suspended solids can stress and abrade gills of salmonid fishes.</p> <p>There could be a direct impact on migration of salmonids (salmon, sea trout) depending on timing of works owing to a high level of engineering activity at the bridge, which is situated at the outlet of the whole Creegh catchment.</p> <p>Bridge widening/replacement will require that the works area be dewatered meaning temporary loss of habitat and migration route for fish beneath the bridge. Habitat beneath the bridge has limited fisheries value per se, but there is suitable salmonid nursery habitat in the 10m reach downstream of the bridge. When dams are introduced, fish may be trapped within the proposed dry working area and they will die when the channel is dewatered.</p>	<p>sediment downstream. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fisheries</u>: Inland Fisheries Ireland (Limerick) should be consulted prior to works commencing to seek agreement on the proposed construction methods. IFI must be informed of the existence of this report.</p> <p><u>Fish removal/rescue</u>: must be carried out within the dammed section around the bridge prior to dewatering. This will require that IFI or a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel upstream of works.</p> <p><u>Timing of works</u>: significant instream works such as those associated with channel dewatering and bridge widening/replacement must be agreed with IFI and must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Use of wet concrete/mortar</u>: See Notes on Construction Best Practise – Concrete, Section 4.2.2, below.</p> <p><u>Avoiding hydrocarbon loss to watercourse</u>: See Notes on Construction Best Practise – Hydrocarbon Loss, Section 4.2.3, below.</p>	<p>dewatering stage, there will be a neutral impact on fisheries values (which includes Annex II species, Atlantic salmon).</p>
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4.1.5 Dysert Bridge [KY-N23-005]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<p><u>Bridge Widening/Replacement</u></p> <ul style="list-style-type: none"> Site clearance and earthworks for new road embankment. Construction of new widened bridge. The existing bridge shall be demolished and a new single span bridge shall be provided, it will be a similar length but double the width. Widening of the road/embankment on both sides of the bridge will be undertaken. A large diameter flume pipe will be set up c.10m upstream, and the river blocked with 1 tonne sandbags, the pipe will stop approximately 10m downstream. Excavation for half of the new bridge foundations will then be undertaken and the new foundations and abutments will be cast insitu. The precast beams will then be 	<p>Old concrete/masonry debris and dust generated as the bridge is removed has the potential to alter stream pH locally and be toxic to fish and invertebrates. This could affect salmonid spawning/nursery near the bridge on the upstream side.</p> <p>Dewatering of the channel to conduct works in the dry presents potential for direct mortality of salmonids, eels and brook lampreys. Fish will die if left stranded within the dammed channel reach as the working area is pumped dry.</p> <p>If machinery and equipment are tracking instream to demolish the bridge, the physical structure and integrity of salmonid habitat (gravels) upstream of the bridge may be disturbed or removed and lead to loss of this moderately important habitat unit within the otherwise largely drained channel.</p> <p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete (bridge widening/reinforcing/ paved verge construction) and mortar, entering the watercourse from the works area. Wet concrete and mortar are</p>	<p><u>Construction Method Statement:</u> A detailed method statement should be drawn up by the contractor indicating what standard measures will be taken to avoid: (i) sediment or soil loss, and (ii) cement and hydrocarbon release, associated with all aspects of the construction phase. The method statement must include details of the water management strategy, including step by step approach, number of pumps required and all other aspects to ensure both a dry working environment and a continuous downstream flow during bridge widening works.</p> <p><u>Water management:</u> Instream works must occur in the dry. Given there is a need for machine tracking instream it is probably advisable that once the streambed is pumped out, that geotextile and hardcore is placed on machine track routes across the river bed. This will limit the generation of sediment laden water that needs to be pumped out. Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that IFI or a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel upstream of works.</p> <p><u>Habitat reinstatement:</u> Once the new bridge is in place and instream works completed, all debris/residue from the works must be removed from the river bed. The bed level should be set to a similar level as currently</p>	<p>The risk of any significant negative impacts at the bridge itself is relatively low because the habitat is not high quality, particularly downstream of the bridge where historical drainage has canalised the stream. A primary issue is the stringent avoidance of export of suspended sediment and pollutants (cement, hydrocarbons) downstream to the River Maine main channel (1.5km d/s) where salmon occur.</p> <p>Providing all recommendations are implemented, especially those concerning timing restrictions in salmonid habitat and consultation with IFI, and with Construction Best Practise applied, there will be a neutral impact on ecological values of the stream, and a neutral impact on freshwater life stages of aquatic qualifying interests (salmon; river and sea lamprey) of the Castlemaine Harbour SAC (c.20km downstream).</p>

<p>landed and the deck will cast in-situ. Once half of the bridge is complete traffic will be diverted on to this allowing the old bridge to be demolished. Demolition will likely be with a rockbreaker on a large excavator.</p> <ul style="list-style-type: none"> Provision of road surfacing, paved verges and safety barriers. 	<p>highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected could likely be trout, brook lampreys and eels, although salmon cannot be ruled out upstream of the bridge.</p>	<p>exists with the gravelly riffle section reinstated around the bridge. If geotextile and hardcore is used to secure access along the riverbed, this must all be removed and disposed offsite, with existing river gravels redistributed evenly across the bed prior to channel rewatering.</p> <p><u>Fisheries</u> – Inland Fisheries Ireland (Macroom) should be consulted prior to works commencing to seek agreement on the proposed construction methods. IFI must be informed of the existence of this report.</p> <p><u>Timing of works:</u> significant instream works such as those associated with bridge removal must be agreed with IFI and must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Use of wet concrete:</u> Although the new bridge is single span and precast, any additional wet concrete used during the construction must be cast while the riverbed is dry. See Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> See Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p>	
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4.1.6 Ballynamona Upper Bridge [KY-N70-007]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<p><u>Bridge Widening/Replacement</u></p> <ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including 	<p>This is a small, fairly low volume trout stream. Patchy spawning habitat downstream of the bridge can be negatively affected indirectly if excessive sediment or fines enter</p>	<p><u>Construction Method Statement:</u> A detailed method statement should be drawn up by the contractor indicating what standard measures will be taken to avoid: (i) sediment or soil loss, and (ii) cement and hydrocarbon release, associated with all aspects of the construction</p>	<p>If all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream, and no</p>

<p>removal of vegetation.</p> <ul style="list-style-type: none"> • Site clearance and earthworks for new road embankment. • Construction of new or widened reinforced concrete bridge. • Provision of road surfacing, paved verges and safety barriers. 	<p>the stream during construction. Suspended solids can harm fish gills in small streams such as this, also smothering spawning/nursery habitat and altering invertebrate food supply. There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete (bridge widening/reinforcing/ paved verge construction) and mortar, entering the watercourse from the works area. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected would most likely be trout.</p> <p>During the operational phase, there is potential for permanent impact at a local scale if the new bridge footprint is not passable by fish. This can occur if bed reinforcement creates an overly shallow, overly wide flow regime, and especially if there is a high downstream apron that can act as an impassable barrier to trout, lampreys and eels.</p>	<p>phase.</p> <p><u>Water management:</u> An appropriate method of damming and pumping or piping through of the stream must be selected. It is a small stream, meaning sandbags in low flows ought to be sufficient. In addition - apply Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Timing of works:</u> instream works such as those associated with this bridge widening must be agreed with IFI and must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Fisheries:</u> Inland Fisheries Ireland (Macroom) should be consulted at the design stage of the bridge to seek agreement on the proposed construction methods and to ensure that fish passage is maintained through appropriate bridge bed design (level and type). IFI must be informed of the existence of this report.</p> <p><u>Use of wet concrete:</u> See Notes on Construction Best Practise – Cement, Section 4.2.2, below.</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> See Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p>	<p>impact on freshwater life stages of aquatic qualifying interests (salmon; river and sea lamprey) of the Castlemaine Harbour SAC (4.6km downstream).</p>
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4.1.7 Ballymalis Bridge [KY-N72-003]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar (masonry repairs), entering the watercourse as a result of works. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected here would most likely be trout and eel, but possibly salmon and lampreys also.</p>	<p><u>Water Management:</u> If masonry repairs are required below the waterline the stream must be dammed and water pumped or piped over the works area. The stream is reasonably small and sandbagging during low flows should be an appropriate option. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> if instream works are involved (channel dewatering), then the salmonid restricted period must be observed (no instream works between October 1st and May 1st).</p> <p><u>Fish removal/rescue:</u> in the case that instream works are required fish removal must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Fisheries:</u> IFI should be notified prior to the works and made aware of the existence of this report.</p>	<p>This site is within the Castlemaine Harbour SAC, and although it appeared polluted at the time of surveying, it must be assumed that aquatic qualifying interests of the SAC (salmon; river/sea lampreys) may occur, or at least migrate through the area. Providing all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream and a neutral impact on aquatic qualifying interests of the SAC (including those residing in the Gweestin & Laune Rivers downstream).</p>

4.1.8 Coolroe South Bridge [KY-N72-001]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar (masonry repairs), entering the watercourse as a result of works. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected here would most likely be trout, eel and perhaps brook lamprey. With its proximity to the River Laune, it cannot be ruled out that young salmon could forage into the lower reaches of the tributary.</p>	<p><u>Water Management:</u> If masonry repairs are required below the waterline the stream must be dammed and water pumped or piped over the works area. The stream is reasonably small and sandbagging during low flows should be an appropriate option. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works (water management, masonry repairs) must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge.</p>	<p>Provided all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream, and no impact on the Laune River or the SAC a number of kilometres downstream.</p>

4.1.9 Palas Bridge [KY-N69-011.3]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Reinstatement of the riverbed. Provision of paved verges and safety barriers. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar (masonry repairs), entering the watercourse as a result of works. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected here would most likely be trout and perhaps brook lamprey.</p>	<p><u>Water Management:</u> masonry repairs are required below the waterline within the stream, therefore it must be dammed and water pumped or piped over the works area so that works occur in the dry. The stream is reasonably small and sandbagging during low flows should be an appropriate option. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified well prior to the works and</p>	<p>Provided all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream, and a neutral impact on the River Brick and aquatic qualifying interests of the SAC a short distance downstream.</p>

		<p>made aware of the existence of this report.</p> <p><u>Habitat reinstatement:</u> the reinstated riverbed beneath the bridge should be passable by salmonids and brook lampreys. This requires that there is no extended apron with a significant drop to the river downstream of the bridge. The bed reinforcement should ideally not be flat, but slightly V-shaped towards the centre to facilitate low flows with some depth. Small boulders/rock should be set into the reinforced riverbed to create current diversity and refugia for fish movement.</p>	
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4.1.10 Enrights Bridge [KY-N86-005]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of paved verges and safety barriers. Demolition of existing concrete deck extension and construction of new concrete deck. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar (masonry repairs), entering the watercourse as a result of works. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected here would most likely be trout and eel.</p>	<p><u>Water Management:</u> masonry repairs are required below the waterline within the stream, therefore it must be dammed and water pumped or piped over the works area so that works occur in the dry. The stream is reasonably small and sandbagging during low flows should be an appropriate option. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best</p>	<p>Overall there is low risk of negative impacts on aquatic species at this site given its proximity to the tidal head and sub-optimal fisheries habitat.</p> <p>Providing all recommendations are implemented and Construction Best Practise is employed, there will be a neutral impact on ecological values of the stream and a low risk of export of pollutants downstream to the SAC.</p>

		<p>Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse: Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</u></p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.</p> <p><u>Habitat reinstatement:</u> the reinstated riverbed beneath the bridge should be passable by trout and brook lampreys. This requires that there is no extended apron with a significant drop to the river downstream of the bridge. The bed reinforcement should ideally not be flat, but slightly V-shaped towards the centre to facilitate low flows with some depth. Small boulders/rock should be set into the reinforced riverbed to create current diversity and refuge for fish movement.</p>	
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4.1.11 Gort na Gcrann Bridge [KY-N86-034]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of paved verges and safety barriers. 	There is very low risk of impact on aquatic ecological values of this stream owing to the unsuitability of habitat for fish and invertebrates around the bridge. However, if concrete or mortar needs to be used below the waterline then there is a	<p><u>Water Management:</u> if masonry repairs are required below the waterline within the stream, water must be managed so that works occur in the dry. Flows are so low through this culverted bridge that it may be feasible to sandbag within the mouth of the culvert upstream and pipe flows through to obtain dry conditions. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p>	Overall there is low risk of negative impacts on aquatic species at this site because it is a very small stream with low volume where water management should be relatively straightforward. Provided all recommendations are

	<p>risk of short term slight negative impact downstream of the bridge. Wet concrete/mortar (masonry repairs) are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected here would most likely be trout.</p>	<p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.</p>	<p>implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream and a low risk of transport of sediment and pollutants further downstream in the catchment.</p>
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4.1.12 Clooncurra Bridge [KY-N86-039]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of paved verges and safety barriers. Infill of scour hole with mass concrete. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar (masonry repairs, infill of scour hole), entering the watercourse as a result of works. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and</p>	<p><u>Water Management:</u> wet concrete use is required below the waterline within the stream, therefore water must be managed so that works occur in the dry. The low volume of the stream makes it conducive to sandbagging and pump over during low flow (the bridge clearance is very low and may not be possible to pipe/pump through). An appropriate method must be selected to obtain dry conditions for concrete usage. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed</p>	<p>Providing all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream and a low risk of export of pollutants downstream to the SAC.</p>

	<p>invertebrate kills. Fish species affected here would most likely be trout and eel.</p>	<p>vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.</p>	
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4.1.13 Garfinny Bridge [KY-N86-043]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of paved verges and safety barriers. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar (masonry repairs & repointing), entering the watercourse as a result of works. Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills. Fish species affected here would most likely be trout, although</p>	<p><u>Water Management:</u> wet concrete use is required below the waterline within the stream, therefore water must be managed so that works occur in the dry. The stream is fairly high energy meaning that sandbagging would need to be well planned and implemented a good few metres upstream of the bridge where flows are slacker. An appropriate method must be selected to obtain dry conditions for masonry repairs below the waterline. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur.</p>	<p>Providing all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream and a low risk of export of pollutants to the SAC downstream.</p>

	salmon cannot be entirely ruled out.	<p>Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.</p>	
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4.1.14 Liscasey Bridge East [CL-N68-005]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of paved verges and safety barriers. Construction of new 	There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar entering the watercourse as a result of works (masonry repairs & repointing; new concrete invert lining). Wet	<u>Water Management:</u> wet concrete use is required below the waterline for concrete invert lining, therefore water must be managed so that works occur in the dry. The stream is low volume and conducive to sandbagging and pipe through/pump over. An appropriate method must be selected to obtain dry working conditions. There is no significant fisheries habitat within the culverted reach, so fish removal/rescue is not necessary at this site. See Notes on	Providing all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream and a low risk of export of pollutants to the Lower Shannon River SAC (c.6.5km) downstream.

concrete lining to the invert of culvert units.	<p>concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills downstream. Fish species affected here would most likely be trout.</p> <p>There is potential for permanent negative impact to the ecology of the stream if the design of new concrete invert lining along the culvert in any way prevents upstream or downstream fish movement.</p>	<p>Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected and the invert lining ensures at least the current level of fish passage.</p>	
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4.1.15 Moy River Bridge [CL-N67-019]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Extensive site clearance to improve sightlines on approach to the structure. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar entering the watercourse as a result of works (masonry repairs & repointing; new concrete invert lining). Wet</p>	<p><u>Water Management:</u> in the case that wet concrete/mortar use is required below the waterline, water must be managed so that works occur in the dry. The river is fairly high energy upstream of the bridge and an appropriate method must be selected to obtain dry conditions for any repairs below the waterline. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> must be carried out within the dammed</p>	<p>Providing all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream.</p>

	<p>concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills downstream. Fish species affected here would most likely be trout.</p>	<p>section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries:</u> IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.</p>	
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4.1.16 Cullenagh Bridge [CL-N85-009]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. 	There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar entering the watercourse as a result of works	<u>Water Management:</u> in the case that wet concrete/mortar use is required below the waterline, water must be managed so that works occur in the dry. The river is fairly low energy and low volume up- and downstream of the bridge for a short distance and ought to be conducive to	Providing all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the

	<p>(masonry repairs & repointing). Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills downstream. Fish species affected here would most likely be trout.</p>	<p>damming (sandbagging) and piping through or pumping over. An appropriate method must be selected to obtain dry conditions for any repairs below the waterline. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue</u>: There is a large area of slack water beneath the bridge that could hold eel and larger trout so fish rescue must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation</u>: Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar</u>: Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse</u>: Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works</u>: instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p> <p><u>Fisheries</u>: IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.</p>	<p>stream and a low risk of export of pollutants to the Inagh River a short distance downstream.</p>
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4.1.17 Downeys Bridge [CC-N72-033]

Proposed Works	Potential Impact	Recommendations	Residual Impact
<ul style="list-style-type: none"> Masonry Repair & Repointing throughout the Bridge including removal of vegetation. Provision of tie bars. 	<p>There is potential for indirect short term negative impacts downstream of the bridge in association with wet concrete/mortar entering the watercourse as a result of works (masonry repairs & repointing). Wet concrete and mortar are highly alkaline and if they enter the watercourse can cause serious fish and invertebrate kills downstream. Fish species affected here would most likely be trout.</p> <p>Concrete dust generated through horizontal drilling to insert tie bars carries a similar risk to wet concrete usage as it can alter stream pH locally and negatively affect fish and invertebrates.</p>	<p><u>Water Management:</u> in the case that wet concrete/mortar use is required below the waterline, water must be managed so that works occur in the dry. The river is fairly low energy and low volume up- and downstream of the bridge for a short distance and ought to be conducive to damming (sandbagging) and piping through or pumping over. An appropriate method must be selected to obtain dry conditions for any repairs below the waterline. See Notes on Construction Best Practise – Water Management, Section 4.2.1, below.</p> <p><u>Fish removal/rescue:</u> There is an area of slack water beneath the bridge that could hold eel and larger trout so fish rescue must be carried out within the dammed section around the bridge prior to dewatering. This will require that a suitably qualified ecologist with electrofishing experience be on hand on the day that dewatering will occur. Fish must be removed using depletion electrofishing methods and fish returned to the channel up- or downstream of works.</p> <p><u>Removal of vegetation:</u> Ideally vegetation should be removed by hand, not through use of herbicide sprays. All removed vegetation, debris and dirt must be gathered and disposed of offsite.</p> <p><u>Use of concrete/mortar:</u> Notes on Construction Best Practise – Cement, Section 4.2.2, below</p> <p><u>Avoiding hydrocarbon loss to watercourse:</u> Notes on Construction Best Practise – Hydrocarbons, Section 4.2.3, below.</p> <p><u>Timing of works:</u> instream works must observe salmonid restricted periods (no instream works between October 1st and May 1st).</p>	<p>If all recommendations are implemented and Construction Best Practise is applied, there will be a neutral impact on ecological values of the stream and a very low risk of export of pollutants to the River Bride and SAC downstream.</p>

		<u>Fisheries</u> : IFI should be notified well prior to the works and made aware of the existence of this report. There is no requirement for further IFI consultation for works at this bridge so long as timing restrictions are respected.	
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4.2 Construction Best Practise Notes

4.2.1 Water Management

- Damming of a watercourse should occur at low flow.
- It is essential that sufficient pump or flume capacity is on hand before operations commence to ensure that: (a) upstream flows can be adequately transferred, and (b) downstream flows are not stopped or significantly interrupted.
- Sandbagging (damming) must be carefully planned and executed as this carries a risk of negative impacts through generation or introduction of silt and sediment to the river system (if bags burst, for example).
- Sand-bags (small or 1-tonne) must be clean and of good integrity, preferably fully sealed (i.e., composed of high grade polythene, not webbing or hessian).
- Sand-bags must be filled with very clean, coarse grade sand with no fines at all. They need to be carefully handled and placed so they don't burst and no other additional material (like clay or soil etc.) should be introduced to seal gaps.
- Small (1/4 filled) sandbags should be on hand to seal gaps/leaks in dams as they arise – this will discourage the use of clay or soil to seal gaps.
- In large, high energy rivers such as the Beheennagh, the use of cofferdam construction may be necessary to ensure water-tightness around the instream works area. Given the high energy nature of the river and the potential for impacts on salmonid habitats downstream, it is not feasible to seal gaps in 1-tonne sandbag dams with clay or soil. This would introduce high levels of fines to the system and would easily erode under elevated flows.

With any works involving river damming – there is always a need for additional pumping from the works area to retain dry conditions. Complete drying out of instream working areas is a difficult task. Even tiny leaks through dams can lead to pooling of water over time, requiring intermittent or continual pumping out. This water can easily become contaminated with sediment or substances that are harmful to aquatic life (cement, oils etc.).

- At no time should contaminated water from the working area be pumped directly to the river/stream.
- Water contaminated with sediment should be pumped through a series of settlement tanks before it is discharged back to the waterbody.
- Water contaminated with spilled or leaked concrete or even water that leaks and surrounds newly dry concrete can be very alkaline. It must be pumped into barrels and removed off-site to an appropriate disposal facility.

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During dewatering, pumps used on-site should have a grill to help prevent fish being sucked into pipes.

4.2.2 Concrete/Mortar

- Wet concrete and cement/mortar are very alkaline and corrosive and can cause serious pollution to watercourses.
- Disposal of raw or uncured waste concrete must be controlled to ensure that the watercourse or karst features will not be impacted.

- Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times.
- Where shuttering is used, measures should be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils.
- Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline. Lorries and mixers and all concrete delivery equipment (wheelbarrows, buckets etc.) must be washed out off site.
- Cement dust must be controlled as it is alkaline and harmful to the surrounding ecology. Activities which result in the creation of cement dust must be controlled by dampening down areas.
- The timing of the works must be specified and agreed with the IFI in relation to fish migration and spawning periods.
-

4.2.3 Hydrocarbons

- There can be no storage of hydrocarbons or any polluting chemicals within 50m of the watercourse or any active/inactive drains connecting to the river. There must be no refuelling of vehicles/equipment within 50m of a river.
- Any diesel or fuel oils stored on site must be bunded to 110% of the capacity of the storage tank. Design and installation of fuel tanks must be in accordance with best practice guidelines BPGCS005, oil storage guidelines. Drip trays and spill kits must be kept available on site.
- All stationary plant should be placed on drip trays to prevent leaking oils reaching the river or entering groundwater.
- No washings or waste materials of any kind can be directed into the stream.
- Machinery on site must have pollution control kits on hand in the event of an emergency.

4.2.4 Construction Waste

All construction related waste, e.g., plastics, cable ties, geotextile etc. must be collected and disposed of correctly so that they don't enter river channels.

4.2.5 Fish Passage

Highlighted above are the bridges where new or widened bridge structures are proposed and fish passage is an important consideration. However, any of the sites where below water line masonry repairs to an existing concrete or stone bed reinforcement set-up are required must take fish passage issues into account.

- Masonry repairs should be in keeping with the existing bed form and should maintain or enhance the potential for upstream/downstream fish movement. Flat masonry bed reinforcement can be fitted with a low flow notch, and/or stones set into the concrete to encourage turbulence and create refugia for fish movement through the structure.
- Flat, overly-wide, uniform concrete bed designs must be avoided as these promote extremely shallow flows and can discourage or prevent fish movement.

- Protruding, high downstream bridge bed aprons or culvert overhangs are unacceptable as these discourage or prevent fish movement.
- IFI should be consulted in any case where significant bed reinforcement works are required.

5 CONCLUSIONS

The above sets out, exhaustively, the issues arising in relation to aquatic ecological values and protected species (where relevant) at seventeen national road bridges where maintenance and repair works are proposed.

At all but one bridge it can be concluded that, providing site specific recommendations are implemented utilising good forward planning (detailed Construction Method Statement) and Construction Best Practise, the impact on local and downstream aquatic ecological values (including instream protected species and habitats and SACs) will be neutral.

In the case of Beheenagh Bridge, Co. Kerry, further discussion is required regarding an appropriate water management strategy and the new (widened) bridge design. It is recommended that the discussions involve Inland Fisheries Ireland. The river has high fisheries value and it is important that the new bed level design, for example, maintains or enhances fish passage for lampreys, salmon and eels beneath the widened bridge. The Beheenagh is the most sensitive of the sites assessed in terms of the quality of the habitat and the scale and magnitude of works proposed.

A key to successful mitigation of potentially negative impacts at all sites, is in the selection and correct implementation of a water management strategy appropriate to each river/stream type such that works can occur in the dry. With regards water management strategy preparation and planning, the Construction Method Statements must detail the approach clearly **and** list all necessary equipment required on-site to ensure, for example: (i) adequate pumping capacity for stream volumes taking into account the potential for unexpected flooding, (ii) effective sediment/pollutant removal from water pumped out from the active works area, (iii) adequate numbers of sand bags of different sizes to ensure gaps can be filled without using clay or soil.

Stage 1 freshwater pearl mussel surveys conducted in the 300m downstream reach at four bridge sites (McCarthy O'Leary Br., Pallis Br., Beheenagh Br. and MountRivers Br.) revealed a handful of scattered adult mussels (5 in total) a short distance downstream of only McCarthy O'Leary Bridge, on the Flesk River. There are no instream works required at this bridge, and the risk of indirect impacts on mussels as a result of the type /scale of works proposed is very low. The remaining three sites investigated were negative for pearl mussel, either largely lacking in suitable habitat (Beheenagh Br.) or completely unsuitable for the species (MountRivers Br., Pallis Br.).

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APPENDIX 2

SECTION 50 APPLICATION REPORT



Ballynamona Bridge, Co. Kerry

Section 50 Application Report

Document Control Sheet

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1 INTRODUCTION

1.1 BACKGROUND

Kerry County Council, on behalf of Transport Infrastructure Ireland (TII – Formerly the National Roads Authority) has engaged RPS Consulting Engineers Ltd. to undertake various bridge rehabilitation schemes in Kerry, Cork and Clare. Kerry County Council has proposed to widen an existing masonry arch bridge on the N70 at Ballynamona in order to improve road safety and provide an improved carriageway cross section. The proposed works will involve widening the existing bridge on the downstream side of the existing structure.

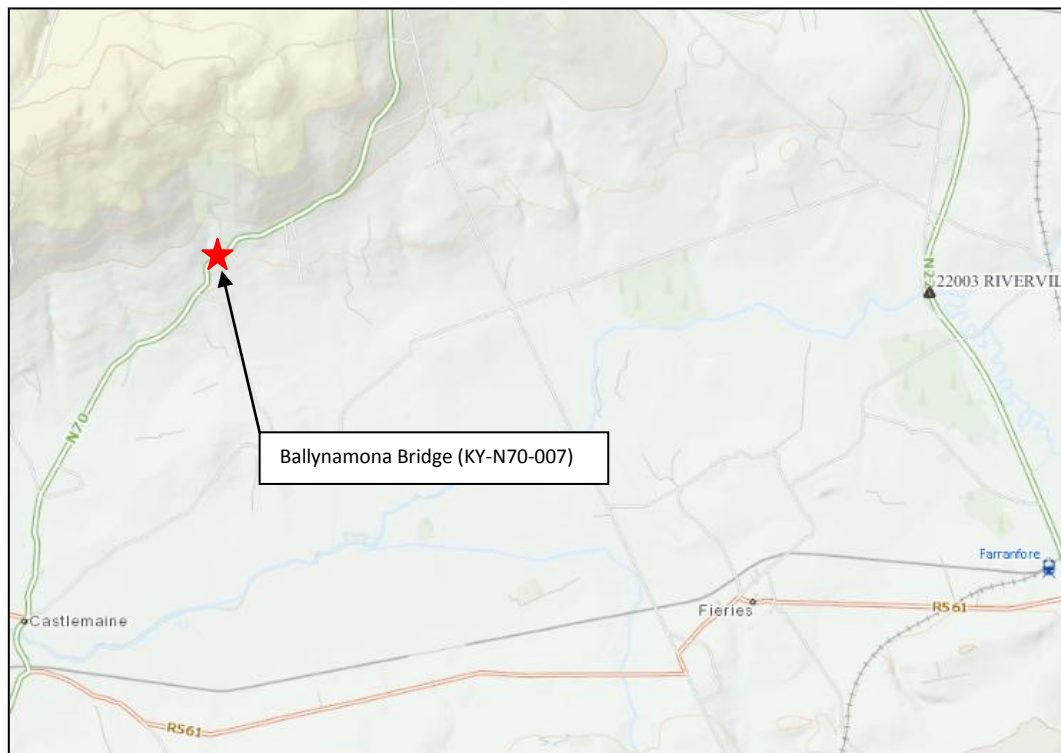
In accordance with the Arterial Drainage Act, 1945, all works affecting watercourse crossings are subject to approval from the OPW and a Section 50 application must be completed.

2 CATCHMENT DETAILS

2.1 BRIDGE LOCATION

The bridge crossing is on the Cloghleagh Stream (as named by the EPA – Maps Web Portal <http://gis.epa.ie/Envision>) on the N70 approximately 3 km north east of Castlemaine, Co. Kerry. The location of the bridge is illustrated in **Figure 2.1** and in **Appendix A**.

Figure 2.1 – Ballynamona Bridge Location



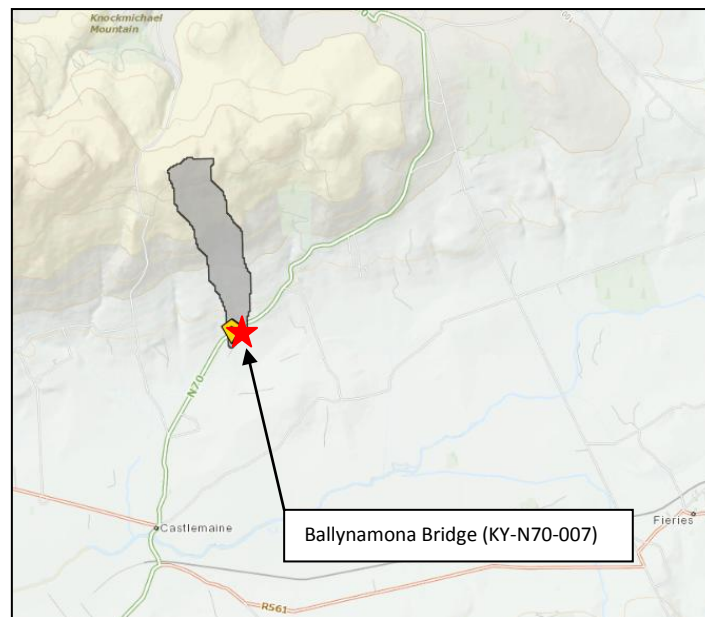
2.2 CATCHMENT DESCRIPTION

The contributing catchment area of the Cloghleagh Stream at the bridge crossing is approximately 1.3 km². The river rises approximately 1.8 km north of Ballynamona Bridge (KY-N70-007) in the Slieve Mish Mountains and flows in a southerly direction downstream of the bridge. The watercourse is bounded predominantly by rural lands used for agriculture with mountainous lands to the north of the catchment.

Figure 2.2 illustrates the extent of the catchment upstream of Ballynamona Bridge. This image is taken from the OPW Flood Studies Update (FSU) Web Portal (<http://opw.hydronet.com/>). The methodology used in FSU to estimate extreme flows is recommended for catchments greater than 25 km²; therefore data available for the catchment at Dysert Bridge was used for information purposes only.

Catchment data available indicates that the stream is quite steep (S1085) and the permeability of the soil is slightly low (BFI_{soil}), and a small portion of the catchment close to the existing bridge benefits for Arterial Drainage management (ARTDRAIN2). These catchment characteristics are likely to increase the rate of flow within the channel in comparison with another catchment.

Figure 2.2 – Cloghleagh stream catchment upstream of Ballynamona Bridge (shaded area)

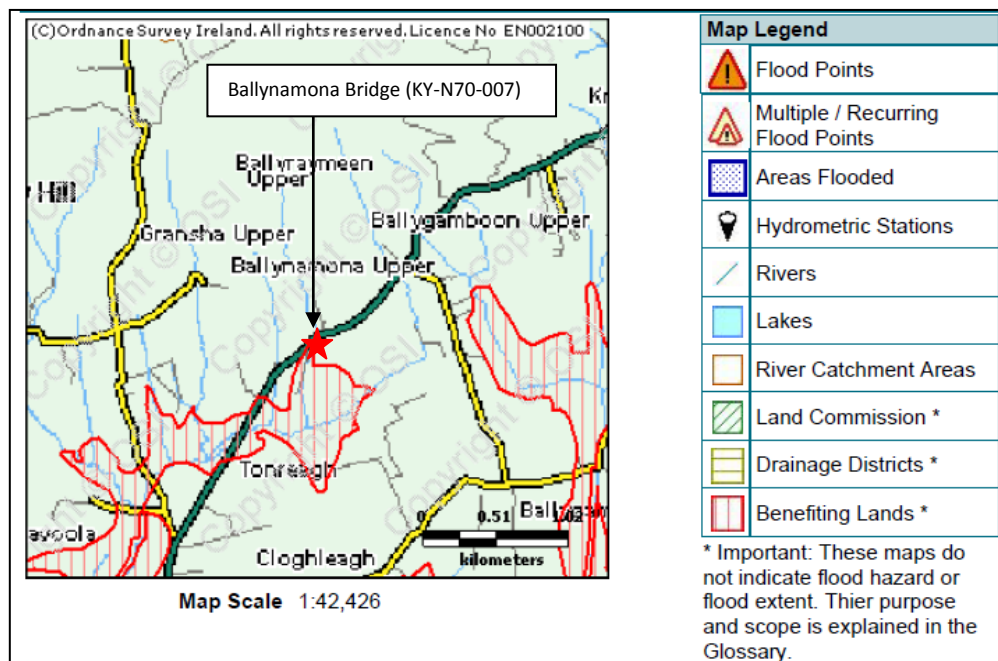


Ground elevations at the upstream end of the catchment range from approximately 200 m OD, while the road levels at Ballynamona Bridge range from approximately 28 m OD to 29 m OD.

BFI represents the influence of soils and geology on river flows. BFI_{soil} ranges from 0 (low permeability) to 1 (high permeability) with the catchment in question having a value of approximately 0.4, which is considered to be below average.

Further to the data available on the FSU web portal, information available on the OPW Flood hazard Mapping Website indicates that lands downstream of the existing bridge benefit from a drainage scheme. Figure 2.3 illustrates the areas benefitting from drainage schemes (highlighted in red).

Figure 2.3 – Lands benefiting from drainage schemes within the Cloghleagh Catchment



2.3 RIVER FLOW ESTIMATION

For the purposes of estimating potential flood levels at Ballynamona Bridge, flow rates during extreme events must be estimated. There are no OPW or EPA flow monitoring stations within the catchment of the Cloghleagh Stream, therefore the catchment is considered an 'ungauged catchment'. As the contributing area is less than 25 km², the catchment response to rainfall was estimated using the Institute of Hydrology, Report No. 124 Method.

2.3.1 Institute of Hydrology Report No. 124 Method

The Institute of Hydrology Report No. 124 (IH124) Flood Estimation for Small Catchments sets out the Catchment Characteristics Method for estimation of flood flows. The most appropriate method of calculating extreme river flows for a small catchment (>25km²) uses Equation 7.1 of the report. This method utilises three catchment characteristics to estimate run off from catchments; AREA, SAAR, and SOIL. **Table 2.1** includes the catchment characteristic values used to estimate Q_{bar} in the Ballynamona Catchment.

Table 2.1 – Catchment Characteristics for Ballynamona Catchment

Catchment Characteristics	Description	Ballynamona Catchment
AREA	Catchment Area (km ²)	1.23
SAAR	Standard Annual Average Rainfall (mm) From Fig II 3.1(I), Vol. 5 of FSR	1500
SOIL	Index of Rainfall Acceptance Potential From Fig. 1 4.18 (I) Vol.5 of FSR	0.49

The unfactored Mean Annual Flood (MAF) or Q_{bar} is calculated using the following equation:

$$Q_{bar} = 0.00108 (AREA^{0.89} SAAR^{1.17} SOIL^{1.27})$$

Q_{bar} for the catchment based on the described characteristics is estimated as **1.46 m³/s**. The factorial standard error (68%) associated with this 3-variable equation is 1.65. This factor has been applied to the estimated Q_{bar} to obtain a value of **2.40 m³/s**.

As discussed in Section 0, the catchment downstream of the bridge benefits from arterial drainage. This part of the catchment will not contribute to flow through the proposed bridge therefore; this was not allowed for in the flow estimation.

Using the estimated flow rate, flood flows for various return periods are calculated using growth curve multipliers recommended in the Flood Studies Report. Calculation details are included in **Appendix B. Table 2.2** sets out the estimated flows for each return period.

Table 2.2 – Flows calculated for various return periods

Return Period (Years)	Annual Exceedance Probability (AEP)	Estimated Flow (m ³ /s)
20	5%	3.53
50	2%	4.25
100	1%	4.71

2.4 CLIMATE CHANGE

The “OPW Assessment of Potential Future Scenarios, Flood Risk Management Draft Guidance”, 2009 makes recommendations on the expected impacts of climate change. This considers two scenarios Mid Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). Based on these scenarios the allowances described in **Table 2.3** are recommended for climate change.

Table 2.3 – Recommended allowances for Climate Change (Taken from OPW – Assessment of Potential Future Scenarios for Flood Risk Management)

	MRFS	HEFS
Extreme Rainfall Depths	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1000mm
Land Movement	-0.5mm/year*	-0.5mm/year*
Urbanisation	No general allowance – Review on case by case basis	No general allowance – Review on case by case basis
Forestation	-1/6Tp**	-1/3Tp** +10%SPR***
Notes: * Applicable to the southern part of the country (Dublin – Galway and south) ** Reduce the time to peak (Tp) by a third *** Add 10% to the standard percentage runoff (SPR) rate		

2.5 DESIGN FLOW

In accordance with the guidelines, a 100 year flood (1% AEP) is adopted for design and analysis of the proposed structure. Given the size of the catchment, the Institute of Hydrology Report No. 124 method of flow estimation is considered the most appropriate. Based on the above recommendations the 1 in 100 year flow rate simulated in HEC-RAS was 5.65 m³/s.

3 CROSSING DETAILS

3.1 EXISTING BRIDGE STRUCTURE

Ballynamona Bridge is a single span masonry arch with a max span of 3.07 m, an overall length of 3.07 m and an out-to-out width of 8.30 m. The existing soffit level of the bridge is 27.7 m OD Malin, approximately 2.18 m above bed level. Photos of the existing structure are included in **Appendix C**. **Figure 3.1** illustrates the existing upstream bridge cross section and the cross sectional flow area under the arch is 5.36 m².

Figure 3.1 – Cross section of existing bridge looking downstream

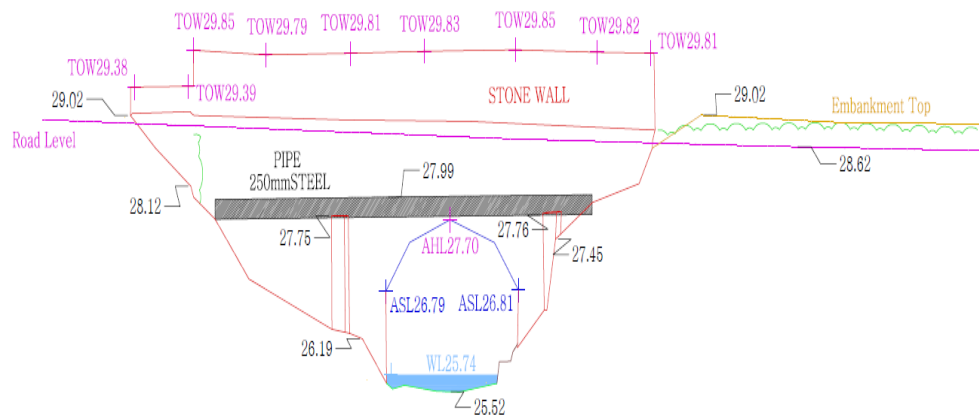


Figure 3.2 – View of existing bridge looking downstream



3.2 PROPOSED BRIDGE STRUCTURE

The proposed works involve widening the existing bridge on the downstream side of the existing structure. It is proposed to provide a reinforced concrete arch with a soffit level of 27.75 m OD, to match existing. Plan and section drawings of the proposed structure and works are included in **Appendix D**.

4 HYDRAULIC ANALYSIS AND RESULTS

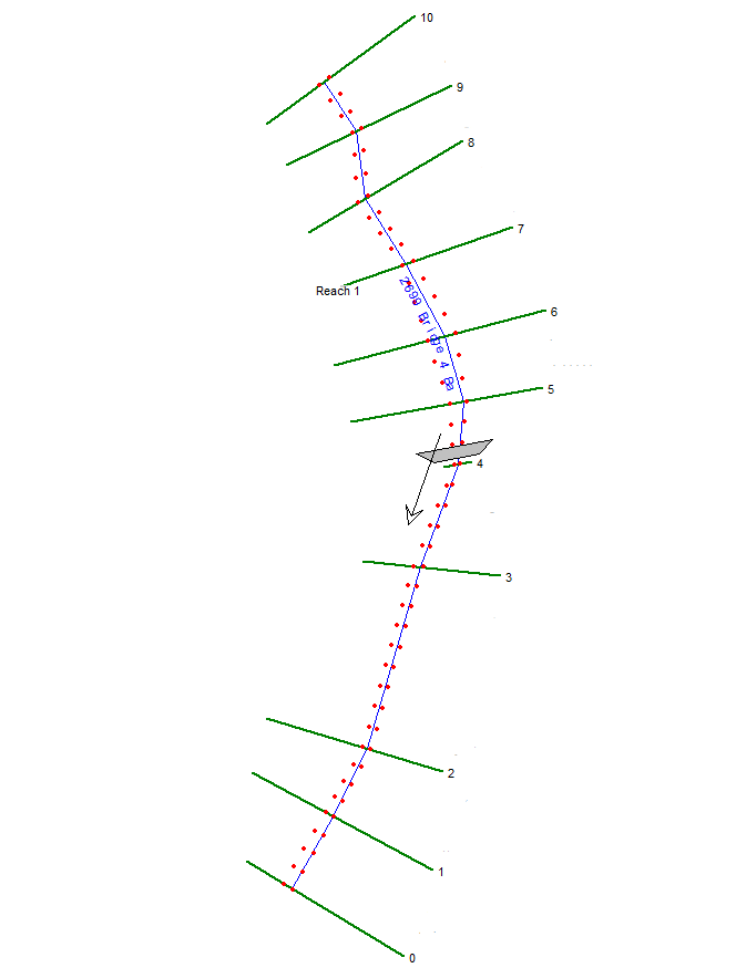
4.1 HEC-RAS MODEL

Hydraulic analysis of the water course was carried out using HEC-RAS (Version 4.1.0) software. This program calculates the water surface profiles for steady state, one dimensional flow in open channels.

The HEC-RAS model was generated using data recorded as part of a topographical survey undertaken Apex Surveys Ltd. in July 2016. The survey was carried out in order to establish river cross section, flood plain information, stream bed levels, and existing structure details. The hydraulic model was constructed from approximately 173 m upstream to 200 m downstream of the existing bridge. The total length of the channel modelled is 378 m.

Figure 4.1 illustrates the layout of the hydraulic model and cross section locations relative to the existing bridge. The model was run in steady state with a mixed flow (sub critical and/or supercritical) regime, using the 100 year return period peak flow estimated.

Figure 4.1 – HEC-RAS Model Layout



4.2 MANNING’S ROUGHNESS COEFFICIENT

HEC-RAS estimates energy losses due to friction using Manning’s equation. In order to construct the hydraulic model of the watercourse, the channel bed and banks were reviewed to assign appropriate Manning’s ‘n’ (channel roughness) values.

The Manning’s ‘n’ roughness values were adjusted based on the water levels recorded during the river cross section survey and on the type and density of the vegetation within the cross sections. The ‘n’ values were chosen based on guidance provided in “Open Channel Hydraulics”, (Chow, 1959). **Table 4.1** includes the roughness coefficients used for each element of the hydraulic model.

Table 4.1 – Manning’s Roughness Coefficients

Location	Value
Main Channel	0.035 – 0.075
Floodplain, Light Brush	0.035 – 0.045

4.3 SIMULATION RESULTS

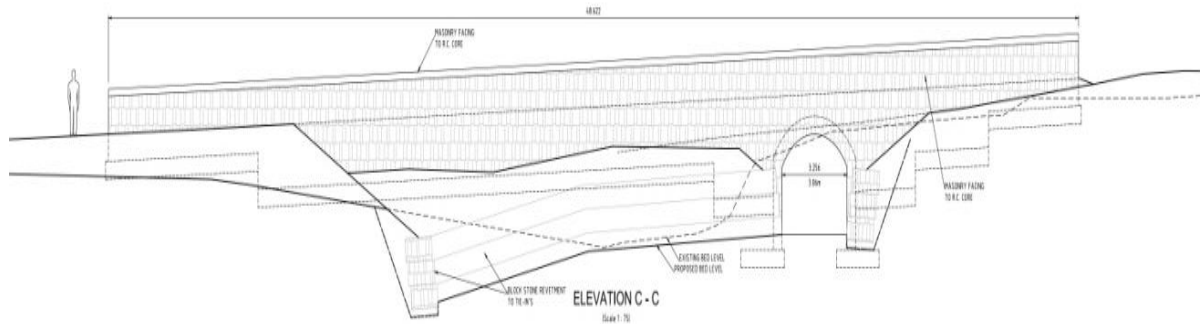
In accordance with the guidelines, a 100 year (1% AEP) flood flow rate has been adopted for design and analysis of the proposed structure. The 1 in 100 year flow rate of 5.65 m³/s was simulated within HEC-RAS to estimate the 1 in 100 year flood level at the existing Ballynamona Bridge.

A hydraulic model with the proposed structure was prepared to calculate the soffit level required to convey the 1 in 100 year flood event with a freeboard of 300 mm. It was found that a soffit level of 26.86 m OD would be required to satisfy these requirements, which is lower than the proposed soffit level of 27.75 m OD.

4.4 DESIGN DETAILS

The proposed bridge structure is based on the dimensions and gradient of the existing portion of the opening to be retained along with existing and proposed road geometry. The proposed bridge extension is a reinforced concrete extension of the existing masonry arch structure. Figure 4.2 illustrates the cross section of the proposed bridge looking upstream. Plan and section details of the proposed bridge are included in **Appendix D**.

Figure 4.2 – Proposed Bridge Cross Section – Looking upstream



4.5 MODEL RESULTS

Losses will occur as a result of friction in the channel up and downstream of the proposed structure and within the bridge crossing. The existing gravel river bed will remain through the existing and extended bridge. A roughness coefficient of 0.07 for the channel at the crossing has been adopted for analysis purposes. The HEC-RAS results are included in **Appendix E** for the existing and proposed bridge configurations.

Following assessment of the existing and proposed structures at Ballynamona, it was found that the 1 in 100 year flood level at the bridge crossing is approximately 26.56 m OD. Allowing the recommended freeboard of 300 mm, a new structure would require a soffit level of 26.86 m. The soffit level within the existing arch bridge is 27.75 m OD, 0.89 m above the minimum recommended level. The proposed structure will have a soffit level of 27.75 m OD to match existing, which is considered adequate to convey the 1 in 100 year flood flow while allowing the required freeboard to be maintained.

5 CONCLUSION

The preceding report and calculations show that the proposed alterations of the Ballynamona Bridge will not adversely affect flood elevations on the Ballynamona Upper River and the proposed alterations are satisfactory in reference to the requirements of Section 50 of the Arterial Drainage Act, 1945.

- The existing structure will remain in place with the proposed widening works on the downstream face of the existing bridge.
- The conveyance area of the existing bridge will not be reduced as a result of the proposed works.
- The soffit level of the proposed widening works will match the existing structure. This is considered sufficient to convey the 1 in 100 year flow rate while maintaining the required freeboard.
- As the proposed deck extensions will be constructed to match the existing soffit level, there will be no reduction to the existing levels of freeboard under the bridge.

APPENDIX A
Catchment Map



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PLAN LAYOUT
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D02	Oct.'16	DC	Draft Issue For Discussion	KR	
D01	Oct.'16	DC	Draft Issue For Discussion	KR	
No.	Date	Dr/Iss	Amendment / Issue	App	



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Checked	TC
Approved	KR
Date	Oct. 2016
Scale	Half @ A3
Shown	@ A1
Job No.	MCT0668

Project	Eirspan TO 269 Munster Bridges 2016
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Plan of Catchment Area
File Ref.	PL0404 KY-N70-007.dwg
Drg. No.	PL0404
Rev	D02

APPENDIX B

Design Flow Estimation

Design Flows for Dysert Bridge using IH 124 Method

Reference: Institute of Hydrology, Report No. 124 (IH 124), Equation 7.1 and Flood Studies Report (FSR)

IH 124 Equation 7.1: $Q_{BAR} = 0.00108 [AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}]$

Q_{BAR} = mean annual flood

Total Catchment Area , **A**

1.23 km²

Proportion of catchment with Class 1 Type Soil **S₁**
From the figures opposite

0.00

Proportion of catchment with Class 2 Type Soil **S₂**
From the figures opposite

0.00

Proportion of catchment with Class 3 Type Soil **S₃**
From the figures opposite

0.00

Proportion of catchment with Class 4 Type Soil **S₄**
From the figures opposite

0.15

Proportion of catchment with Class 5 Type Soil **S₅**
From the figures opposite

0.85

SOIL = $(0.15S_1 + 0.3S_2 + 0.4S_3 + 0.45S_4 + 0.5S_5) / (S_1 + S_2 + S_3 + S_4 + S_5)$

0.49

Annual Average Rainfall, **SAAR**
From FSU

1500.33 mm

Mean annual flood to rural conditons (from IH 124 Equation 7.1),

Qbar (rural)

1.46

m3/s

Factorial Standard Error for 3 variable eqn = 1.65 (68% Confidence)

1.65

Mean Annual Flood

Qbar (urban)

2.40

Note: The following growth factors obtained from Table 2.39 Vol.1 of Flood Studies Report

Return Period of 5 years factor by 1.20

Q(5) =

2.88

m3/s

Climate Change Factor = 1.2

Q(5) + CC =

3.46

m3/s

Return Period of 10 years factor by 1.37

Q(10) =

3.29

m3/s

Climate Change Factor = 1.2

Q(10) + CC =

3.95

m3/s

Return Period of 20 years factor by 1.47

Q(20) =

3.53

m3/s

Climate Change Factor = 1.2

Q(20) + CC =

4.24

m3/s

Return Period of 25 years factor by 1.60

Q(25) =

3.85

m3/s

Climate Change Factor = 1.2

Q(25) + CC =

4.61

m3/s

Return Period of 50 years factor by 1.77

Q(50) =

4.25

m3/s

Climate Change Factor = 1.2

Q(50) + CC =

5.10

m3/s

Return Period of 100 years factor by 1.96

Q(100) =

4.71

m3/s

Climate Change Factor = 1.2

Q(100) + CC =

5.65

m3/s

APPENDIX C

Photographs of Existing Structure



Existing Bridge – Looking downstream



Existing Bridge – Looking upstream



Existing Bridge – Road



Existing Bridge – Road



Existing River Channel - Looking downstream

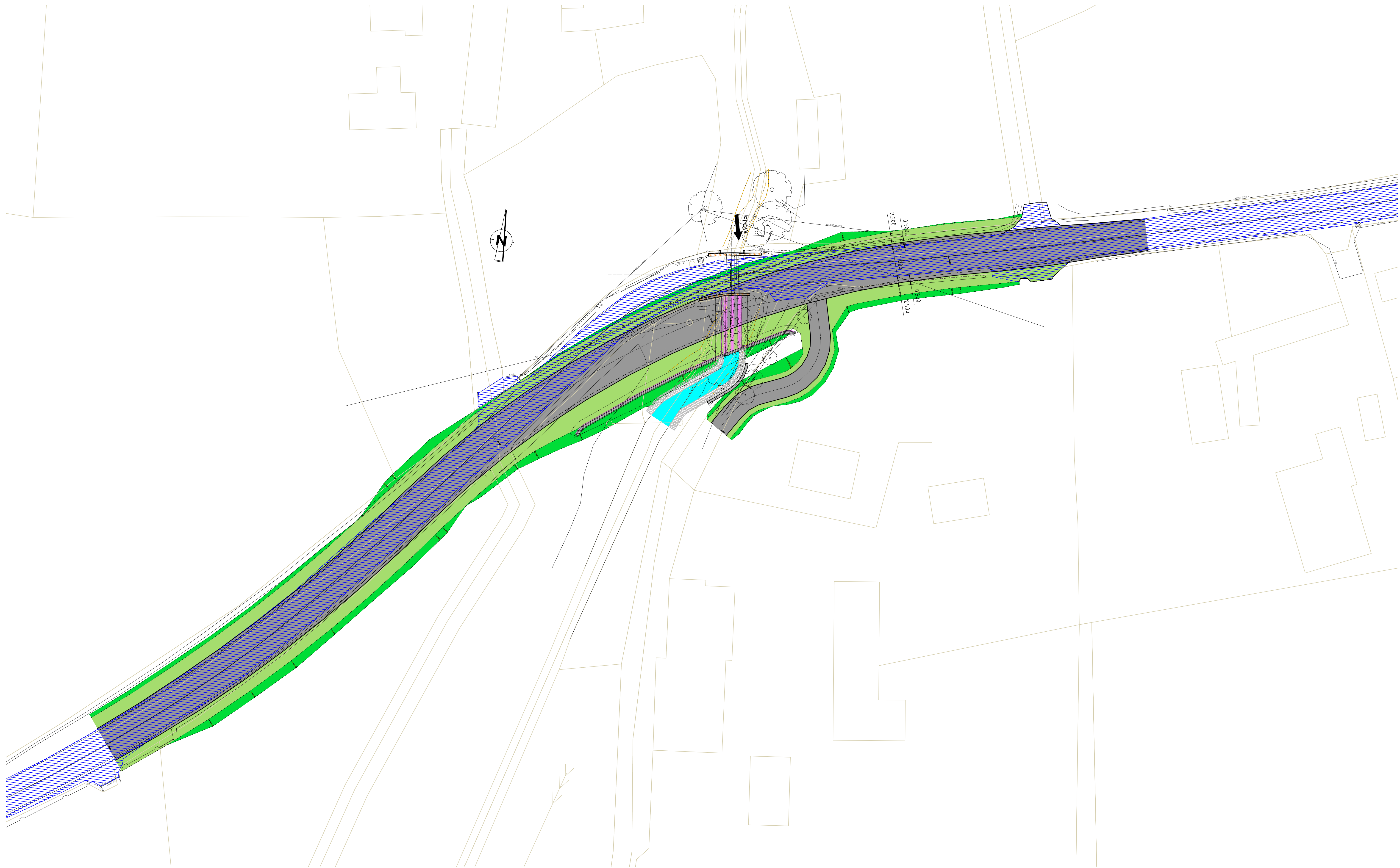


Existing River Channel - Looking upstream

APPENDIX D

Proposed Bridge Plan and Section

R:\MCT0668 - Eirspan TO269 Munster Bridges 2016\8.0 Drawings\PI\0401 KY-N70-007.dwg



PLAN LAYOUT - OVERALL SCHEME
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No.	Date	By	Amendment / Issue	App	
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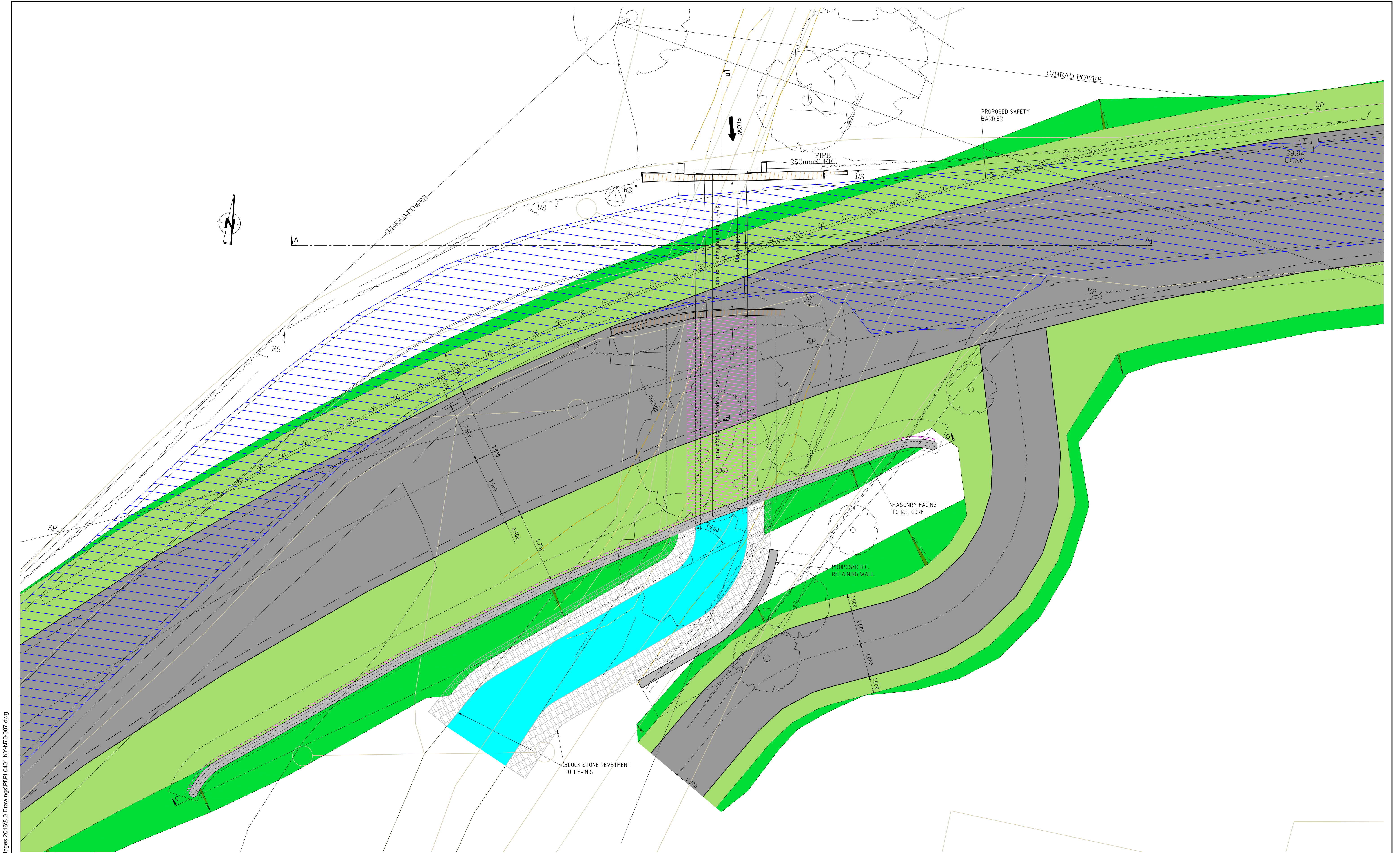


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Project	Eirspan TO 269 Munster Bridges 2016		
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Proposed Overall Layout		
Job No.	MCT0668	File Ref.	PL0401 KY-N70-007.dwg
Drg. No.	PL0401	Rev	P01



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Job No.	MCT0668

Project	Eirspan TO 269 Munster Bridges 2016
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Proposed Bridge (Sheet 1 of 2)
File Ref.	PL0401 KY-N70-007.dwg
Drg. No.	PL0402
Rev	P01

"Pre-submission Consultation for Proposed Part 8 Planning Application for Proposed Works at Ballynamona Upper Bridge KY-N70-007"

The proposed works at Ballynamona Upper Bridge include bridge widening and road realignment/widening over 240m to remove a local pinch-point on the existing N70 Tralee Castlemaine Road.

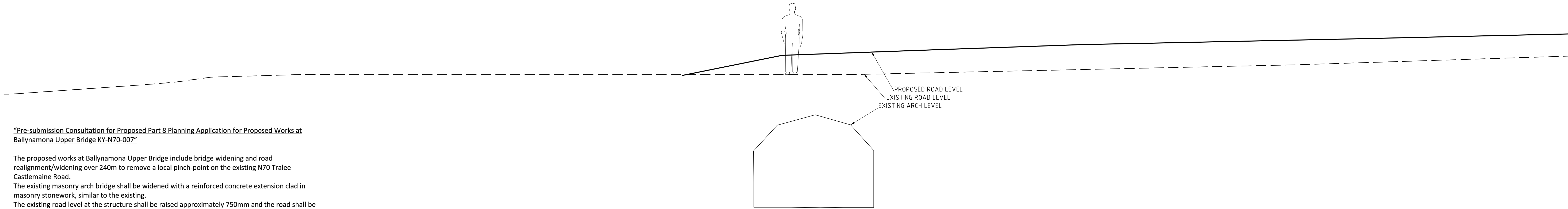
The existing masonry arch bridge shall be widened with a reinforced concrete extension clad in masonry stonework, similar to the existing.

The existing road level at the structure shall be raised approximately 750mm and the road shall be widened for approximately 120m either side of the existing bridge.

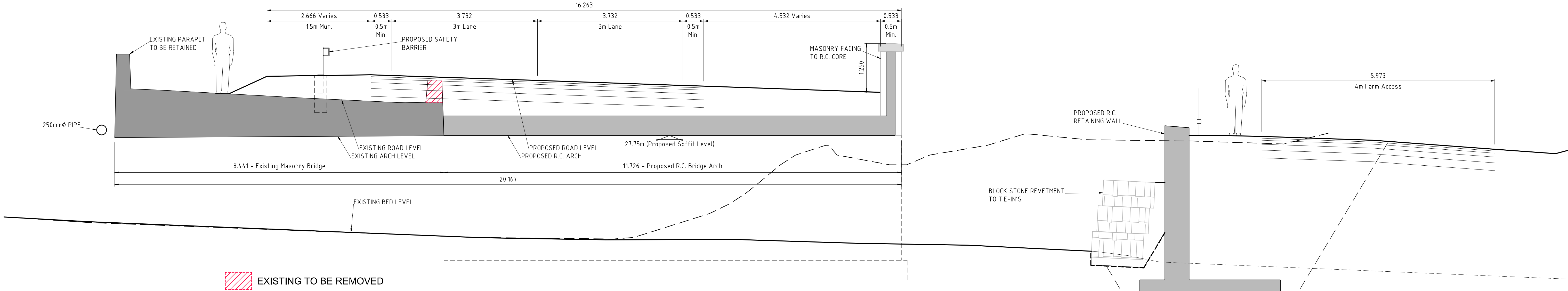
The width of the widened bridge has been largely governed by sightline requirement for the field access adjoining the bridge.

The works are subject to Section 50 Approval from OPW which will be submitted before the lodgement of the Part 8.

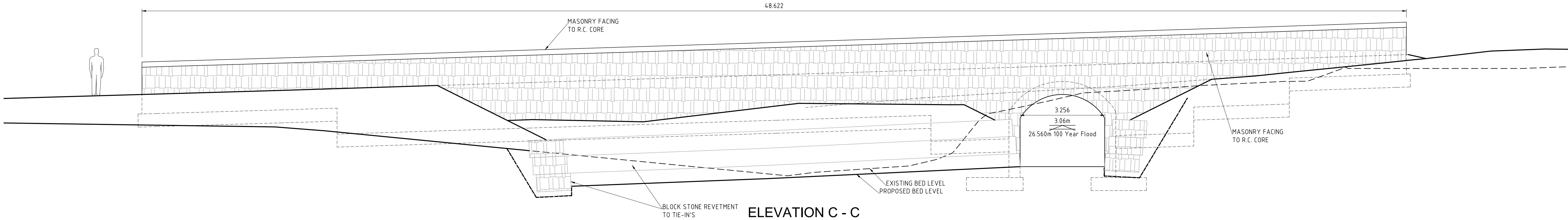
The AA Screening and the EIA Screening have been completed and shall be submitted to Eoin Kelleher (KCC) for review prior to lodgement of the Part 8.



SECTION A - A
(Scale 1:50)



SECTION B - B
(Scale 1:50)



ELEVATION C - C
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Project	Eirspan TO 269 Munster Bridges 2016
Title	ST4 Ballynamona Upper Bridge KY-N70-007 Proposed Bridge (Sheet 2 of 2)
File Ref.	PL0401 KY-N70-007.dwg
Drg. No.	PL0403
Rev	P01

APPENDIX E

Model Results

Reach	River Station	Profile	Return Period Event	Q Total	Min Channel El.	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width
Reach 1	10	Existing	100 Year	5.65	34.1	34.71	34.71	34.96	0.01612	2.21	2.58	5.29
Reach 1	10	Proposed	100 Year	5.65	34.1	34.71	34.71	34.96	0.016422	2.23	2.57	5.29
Reach 1	9	Existing	100 Year	5.65	32.9	33.55	33.55	33.77	0.014517	2.16	2.88	6.64
Reach 1	9	Proposed	100 Year	5.65	32.9	33.55	33.55	33.77	0.014517	2.16	2.88	6.64
Reach 1	8	Existing	100 Year	5.65	31.16	32.03	32.03	32.22	0.011895	1.97	3.21	9.09
Reach 1	8	Proposed	100 Year	5.65	31.16	32.03	32.03	32.22	0.011895	1.97	3.21	9.09
Reach 1	7	Existing	100 Year	5.65	29.52	30.25	30.25	30.5	0.019635	2.24	2.58	5.22
Reach 1	7	Proposed	100 Year	5.65	29.52	30.25	30.25	30.5	0.01992	2.25	2.56	5.21
Reach 1	6	Existing	100 Year	5.65	27.51	28.14	28.14	28.35	0.012642	1.99	2.83	7.13
Reach 1	6	Proposed	100 Year	5.65	27.51	28.14	28.14	28.35	0.012642	1.99	2.83	7.13
Reach 1	5	Existing	100 Year	5.65	26.16	27.09		27.24	0.040542	1.74	3.27	6.94
Reach 1	5	Proposed	100 Year	5.65	26.16	27.08		27.24	0.040876	1.74	3.26	6.93
Reach 1	Bridge											
Reach 1	4	Existing	100 Year	5.65	25.14	26.17		26.42	0.042361	2.23	2.54	3.15
Reach 1	3	Existing	100 Year	5.65	23.52	24.27		24.44	0.035159	1.82	3.15	6.77
Reach 1	3	Proposed	100 Year	5.65	23.52	24.27		24.44	0.034857	1.81	3.16	6.77
Reach 1	2	Existing	100 Year	5.65	20.18	21.09		21.24	0.022413	1.78	3.29	6.71
Reach 1	2	Proposed	100 Year	5.65	20.18	21.09		21.24	0.022298	1.78	3.3	6.71
Reach 1	1	Existing	100 Year	5.65	19.4	20.12	20.12	20.35	0.017916	2.21	2.72	5.79
Reach 1	1	Proposed	100 Year	5.65	19.4	20.12	20.12	20.35	0.017916	2.21	2.72	5.79
Reach 1	0	Existing	100 Year	5.65	18.48	19.13	19.13	19.39	0.012651	2.26	2.5	4.89
Reach 1	0	Proposed	100 Year	5.65	18.48	19.13	19.13	19.39	0.012651	2.26	2.5	4.89