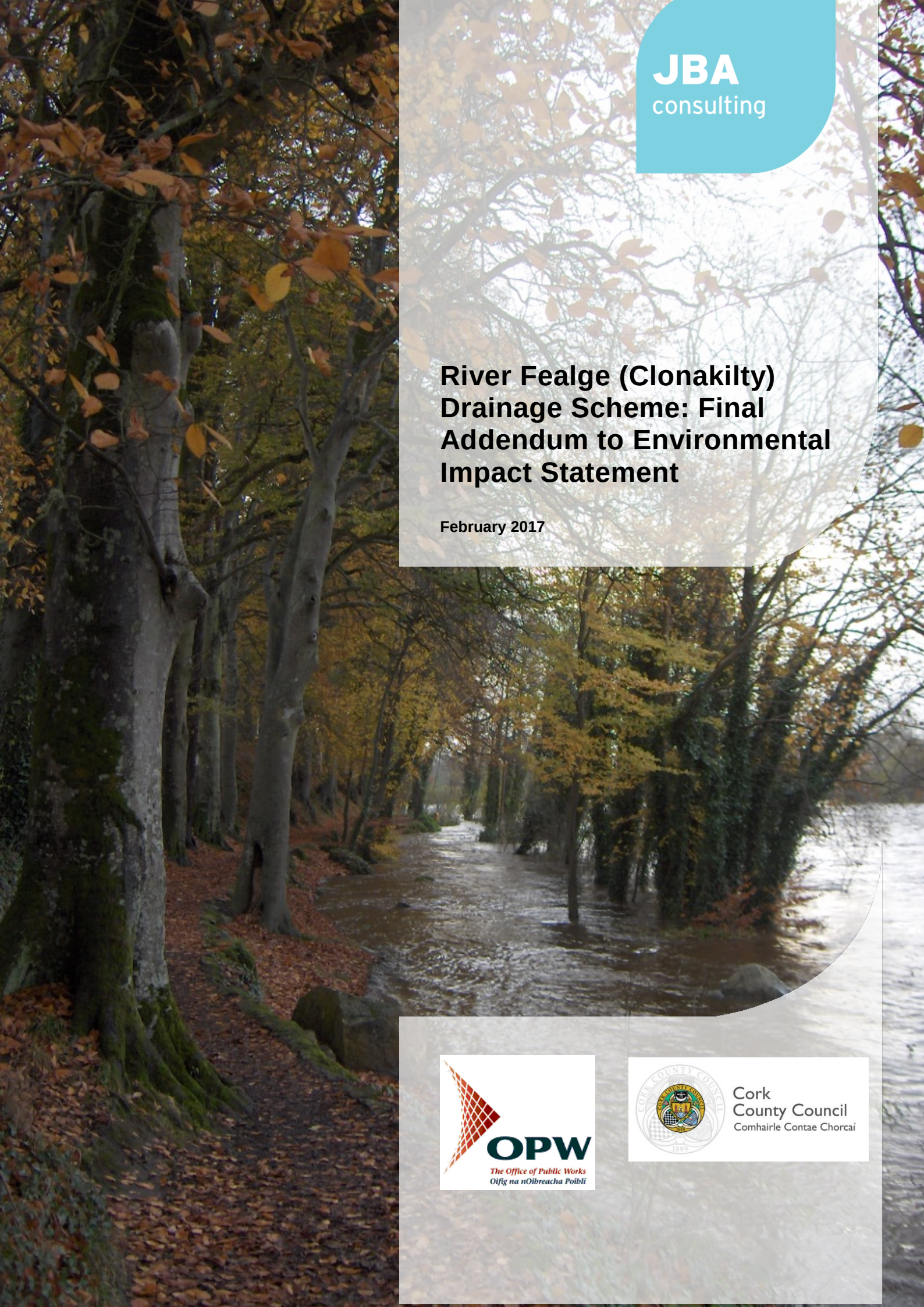

JBA consulting

River Fealge (Clonakilty) Drainage Scheme: Final Addendum to Environmental Impact Statement

February 2017

OPW
The Office of Public Works
Oifig na nOibreacha Poiblí

Cork County Council
Comhairle Contae Chorcaí

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Revision History

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2014s0971Ver2.0 27.02.2017		Lorraine Counihan, OPW

Contract

This report describes work commissioned by Lorraine Counihan, on behalf of OPW. Declan Egan, Niamh Sweeney and Niamh Burke of JBA Consulting carried out this work.

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Purpose

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1 Introduction

1.1 Background to the Scheme

The OPW, in partnership with Cork County Council and other local authorities in the South West, have commissioned the South-Western Catchment Flood Risk Assessment (SW CFRAM). In summary, the objectives of the CFRAM Study are to:

- Identify and map existing and potential flood hazards within the South West
- Assess and map the existing and potential flood hazards within the South West
- Identify systems and measures for the effective and sustainable management of flood risk in the Areas for Further Assessment (AFAs) and within the South West
- Prepare Flood Risk Management Plans (FRMPs) for the Study Area, prepare Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) for the plans.

Clonakilty forms one of the 26 AFAs in the SW CFRAM study. Clonakilty town experienced extreme flooding in June 2012 and this prompted the CFRAM work for the town to accelerate to assess the risk and to identify a viable flood relief scheme.

Mott MacDonald Ireland has been retained by the OPW to progress the engineering options and a preliminary design for the preferred option and the final detailed design. JBA Consulting has been retained by Office of Public Works to progress the River Fealge (Clonakilty) Drainage Scheme through Constraints Study, Preferred Options Selection and the Environmental Impact Assessment. In accordance with the 1945 Arterial Drainage Act and the 1995 amendment to the Act, the Environmental Impact Statement (EIS) formed part of the Public Exhibition that was held in Clonakilty in December 2015. The Public Exhibition of the preferred scheme took place from the 15th December 2014 to the 20th January 2015 and the public and affected landowners were notified in advance and invited to attend. The public had until the 20th February 2015 to make submissions on the scheme.

The EIS was prepared using the guidelines set down by the Environmental Protection Agency in their document 'Guidelines on the Information to be contained in Environmental Impact Statements'', 2015. This EIS is also cognisant of the requirements of Schedule 6 of the Planning and Development Regulations 2001-2015 (as amended).

1.2 History of the Scheme to date

Clonakilty has a long record of flooding from storm surges, heavy rainfall and extreme river flows over the past 60 years. Flooding in the town was recorded in 1961, 1963, December 1996, 2004, 2006, 2008, three times during 2009, 2010, and five times in 2012. In the clear majority of these cases flooding was attributed to rivers and streams.

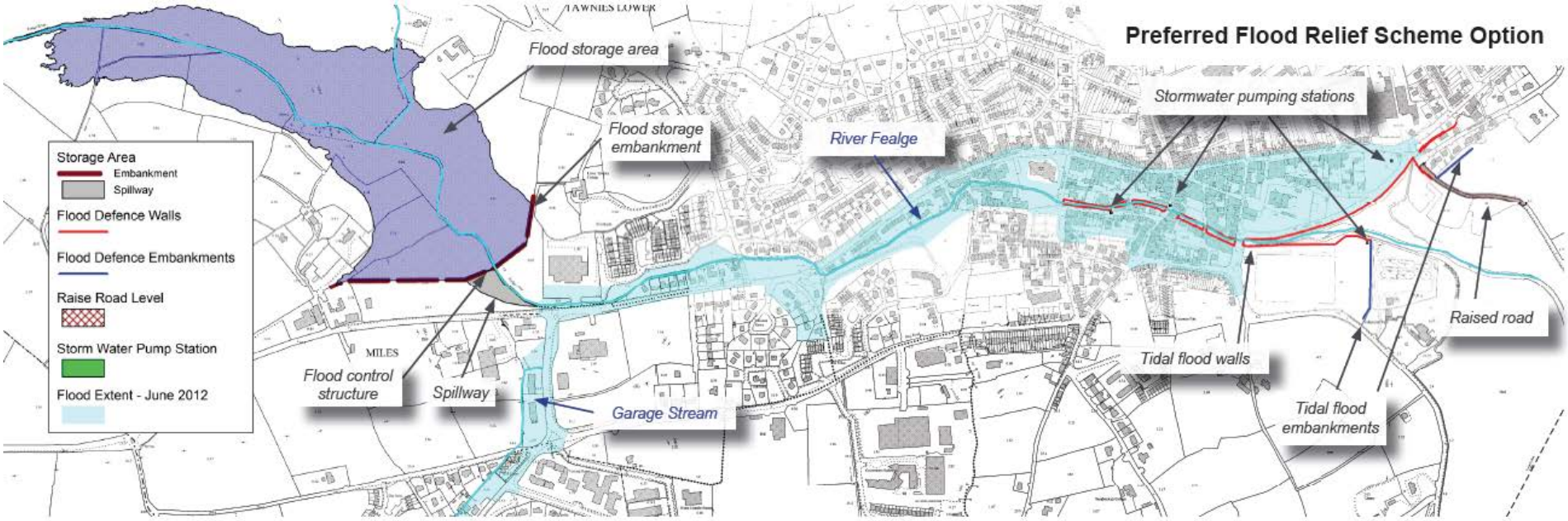
In the June 2012 event, extreme rainfall and river flows inundated the centre of Clonakilty causing significant damage to properties and businesses. It is estimated that 105 private residences were impacted along with 170 commercial premises. More than ten of these incurred direct damages of over €40,000. Total damage was estimated at between €6-€7 million. Costs arose due to structural damage, material damage, loss of stock, damage to machinery and indirectly through lost business. Summer flooding has the potential to be especially costly due to the town's dependence on tourism. The 2012 floods occurred immediately prior to the important tourist season.

As previously mentioned, Clonakilty was identified as an Area for Further Assessment (AFA) and the River Fealge as a High Priority Watercourse (HPW) as part of the South-Western Catchment Flood Risk Assessment and management Study (CFRAM).

In July 2013, the outcomes of the accelerated programme and a preferred Scheme option were presented to the public. In summary, the preferred option consisted of a flood water storage area and on-land flood defences to reduce coastal flood risk.

Six different options were assessed during the Study. A multi-criteria assessment (MCA) was conducted on the six options. The purpose of the MCA was to assess the social, economic, technical and environmental impacts of the six options. Based on this assessment a preferred option emerged as is illustrated in Figure 1-1.

Figure 1-1 Outline of the Preferred Option for the Clonakilty Scheme



The preferred Scheme was developed and designed by the consultant engineers (Mott McDonald Ireland) and this emerging Scheme was presented to the public at a second Public Information Day held in July 2014.

The preferred flood risk management option consisted of a combination of the following measures:

- Construction of new tidal defence walls
- Construction of tidal defence embankments
- Installation of several water level sensor and flow monitors to inform the operation of the storage area
- Construction of a storage area with embankment
- Replace sections of railings with solid parapets
- Strengthening and raise the parapets on Clarke Street Bridge
- Raise the Ring Road for a length of 200 m to a height of 1.7 m
- Construction of 5 no. surface water pumping stations.

JBA Consulting Ltd. prepared an environmental impact statement for the preferred Scheme. The EIS undertaken systematically assessed the impacts of the Preferred Scheme on the environment including water, air and climate, ecology, human beings, soils and geology, archaeology and cultural heritage and landscape and visuals. Several photomontages of the scheme were prepared and presented at the Public Exhibition and in the EIS.

A Natura Impact Statement was also prepared for the Scheme.

1.3 Purpose and Scope of this Document

The public and the affected landowners were given an opportunity to make submissions after the Public Exhibition held in December 2014. A number of submissions on the proposed Scheme were received by the design engineers and the environmental consultants. Following the Public Exhibition and the submissions received, the Detailed Design Stage of the Scheme was carried out. Several new/revised interferences have arisen from the Public Exhibition and these revisions are the subject of this report.

This report is an addendum to the original Environmental Impact Statement that was prepared for Public Exhibition in December 2014. This report will accompany the original EIS to the Minister for approval of the Scheme.

A revised Natural Impact Statement will also be submitted to the Minister.

The Addendum to the Environmental Impact Statement for the River Fealge (Clonakilty) Drainage Scheme was prepared by JBA Consulting, Grove Island, Limerick. The Natural Impact Statement was prepared by JBA Consulting.

This addendum to the EIS should be read in conjunction with the original EIS as the mitigation measures provided in both documents need to be considered for the Scheme.

2 Amendments to the Scheme

2.1 New/Revised Interferences

Details of the revised/new interferences are presented in the following tables (Table 2-1,Table 2-2,Table 2-3) and are shown in the Confirmation Drawings for the Scheme in Appendix A.

Table 2-1. New and Revised Interferences to the Scheme

Interference Number	Brief Description
B2	Changed distance from 6m to 12m. Replace railings with solid parapets 1.1m high (Drawing 005 in Appendix 1)
B6	Changed description of work. Installation of a short wall at Seymour Street Bridge. Raise parapets and seal bridge deck
D8	Included Clarke Street and increased distance from 130m to 200m. Re-directing the storm water sewer to a new Irish Water storm drain along Ashe Street and Clarke Street. (Drawing 004 in Appendix 1).
D9	Construct storm water drain along Long Quay (Drawing 004 in Appendix 1).
D13	New - drainage at Courtyard. Construct storm water drain at Harte's Courtyard (Drawing 004 in Appendix 1)
D14	New - underground pump station at Hartes Courtyard
D15	New - pipe existing land drain. Pipe existing surface water channel and connect through proposed headwall (Drawing 0011 in Appendix 1)
E3	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by up to 1.0 m (Drawing 0011 in Appendix 1)
E4	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by up to 1.0m (Drawing 0011 in Appendix 1)
E5	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by up to 1.0m (Drawing 0011 in Appendix 1)
E6	Raised height to 14.6m AOD. Raise embankments up to 6.1 m high (Drawing 008 in Appendix 1)
E7	Raised height from 14.0m to 14.6m.
E8	Raised height from 14.0m to 14.6m.
E10	Reduced distance from 200m to 95m. Revised layout and location of the embankment in the farmer's land beside the Ring Road. Possible short flood wall along the road to help reduce the size of the embankment. The embankment will be 95 m in length (Drawing 004 in Appendix 1) and up to 1.4m to 3.34 m AOD.
E11	New - embankment at Hennessy property. 1 m high embankment at the side of a nearby property, approx. 50 m long. (Drawing 10 in Appendix 1). This interference is linked to G12 and G18 (Drawing 10 in Appendix 1).
E12	New - embankment at Cullinane property. New embankment as residents experienced flooding from Ballyhalwick Stream. 700 mm high embankment approx. 75 m in length. (Drawing 011 in Appendix 1).
E13	New - embankment at Waterfront instead of proposed wall. Replacement of the proposed wall by an embankment. Height of embankment approx. 1 m with a setback distance of 3 m from the water's edge. Length of embankment 205m. (Drawing 004 in Appendix 1)
G10	Reduced distance from 810m to 650m (Drawing 007 in Appendix 1). Relocating the trash screen in the Garage Stream.
G11	Reduced distance from 810m to 650m (Drawing 007 in Appendix 1). Relocating the trash screen in the Garage Stream.

Table 2-2. New and Revised Interferences to the Scheme

Interference Number	Brief Description
G12	New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate. 60m in length. (Drawing 010 in Appendix 1)
G13	New - infill of gaps on river bank over a 30 m stretch. (Drawing 0011 in Appendix 1)
G14	New - infill of gaps on river bank over a 55m stretch of the river. (Drawing 0011 in Appendix 1)

G15	New - infill of gaps on river bank, 30m (Drawing 0011 in Appendix 1)
G16	New - infill of gaps on river bank, 20m (Drawing 0011 in Appendix 1)
G17	New - infill of gaps on river bank (Drawing 005 in Appendix 1)
G18	New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate over 60 m in length. (Drawing 010 in Appendix 1).
H1	Increased distance from 5m to 45m. Regrade channel for flow control structure over 45 m stretch of river (Drawing 008 in Appendix 1)
H2	Increased distance from 5m to 45m. Regrade channel for flow control structure over 45 m stretch of river (Drawing 008 in Appendix 1)
H67	Updated
L2	Registered owner updated.
L4	Reduced distance from 85m to 25m (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank
L6	Increased distance from 10m to 20m (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank
L7	Reduced distance from 25m to 2m. (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank
L8	Reduced distance from 26m to 20m. (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank
L9	Increased distance from 4m to 15m (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank
L11	Increased distance from 5m to 20m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank
L12	Increased distance from 5m to 45m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank
L14	Increased distance from 10m to 15m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank
L15	Reduced distance from 75m to 40m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank
L30	Revised location and registered owner. Distance reduced from 55m to 45m. (Swapped with L31). (Drawing 004 in Appendix 1). Excavate for foundations and construct reinforced concrete wall 1.3m high.
L31	Revised location and registered owner. Distance increased from 45m to 55m. (Swapped with L30). Excavate for foundations and construct reinforced concrete wall 1.3m high.
L35	Reduced distance from 255m to 50m. (Drawing 004). Excavate for foundations and construct reinforced concrete wall 1.3m high
L37	Excavate for foundations and construct reinforced concrete wall up to 1.8m high to 3.68m AOD. Length of wall 180m. Wall located along Deasy's Quay. (Drawing 004 in Appendix 1).

Table 2-3. New and Revised Interferences to the Scheme

Interference Number	Brief Description
L38	Updated description - u-shaped channel (Drawing 004 in Appendix 1). Excavate channel and install u-shaped channel with reinforced concrete walls 1.3m high for 35m.
L39	Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 65m
L41	Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 35m
L42	Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 20m
L43	New - repair / replace existing channel wall for 30 m stretch. (Drawing 006 in Appendix 1).
L44	New - repair / replace existing channel wall for 4m stretch. (Drawing 006 in Appendix 1).
L45	New - repair / replace existing channel wall. (Drawing 005 in Appendix 1).
L46	New - repair / replace existing channel wall for 20 m stretch. (Drawing 005 in Appendix 1).
L47	New - repair / replace existing channel wall for 20m stretch. (Drawing 005 in Appendix 1).
R2	New - permanent haul road to access trash screen, 80m in length (Drawing 007 in Appendix 1)
SI1	Changed description from sluice gate to penstock. Increased distance from 5m to 45m. (Drawing 008 in Appendix 1).
SI2	Changed description from sluice gate to penstock. Increased distance from 5m to 45m. (Drawing 008 in Appendix 1).

2.2 Description of the Works

A general description of the works for the Scheme is presented in Section 7 (Outline Construction Methodology) of the original EIS. The nature of the construction process, timescales and duration is difficult to provide at this stage because the contact is currently issued for tender. In these circumstances the EIS describes the worst-case scenario eg. maximum emissions, maximum lengths of embankments, walls etc.

3 Environmental Impact Assessment

3.1 Scope of this Assessment

The environmental impact assessment (EIA) of the revised/new amendments to the Scheme will be undertaken in accordance with the requirements of Directive 2014/52/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment. The EIA follows the guidance of the EPA's Guidance Note on the Preparation of Environmental Impact Assessments (2015).

This addendum should be read in conjunction with the original EIS.

3.1.1 Temporal Extent

The temporal extent of this EIA covers the study area as outlined in Figure 3-1.

3.1.2 Time Scale

The EIA covers the impacts of the Scheme during the construction, operation and demolition of the Scheme. Construction is scheduled to start in May 2017 and is expected to last 2 years. The Scheme will require on-going maintenance and a maintenance schedule will be formulated by the OPW/Cork County Council.

3.2 Guidelines used for the Preparation of the EIA

3.2.1 Planning and Development Acts 2001-2015 as amended

This EIA followed the requirements of the Planning and Development Regulations 2001-2015 as amended. The requirements of Schedule 6 (Information to be Contained in an EIS) of the Planning and Development Regulations was complied with.

3.2.2 EPA Guidance Document

In 2015 the Environmental Protection Agency (EPA) published its Revised Guidelines on the Information to be Contained in Environmental Impact Statements. The revised guidelines are an update of the original guidelines issued in 2003 and are in line with changes in legislation and the new 2014/52/EU EIA Directive.

3.3 Significance Test

The overall significance of the impact is dependent upon two factors - the size of the disturbance caused (magnitude) and the sensitivity of the receptor. The sensitivity of the receptor may be based on a legal designation of a site, for example a Special Area of Conservation or a Natural Heritage Area or Area of Architectural Conservation. It may also be based on the proximity to sensitive receptors such as schools, hospitals etc. The EIA has assign different ratings for positive and negative impacts. Within these two groups we have further defined the impacts as major, moderate and minor. This refined impact assessment will allow more specific mitigation measures to be suggested particularly during the construction of the flood defences.

The significance testing is based on the baseline information and technical judgement of the assessment team and experts.

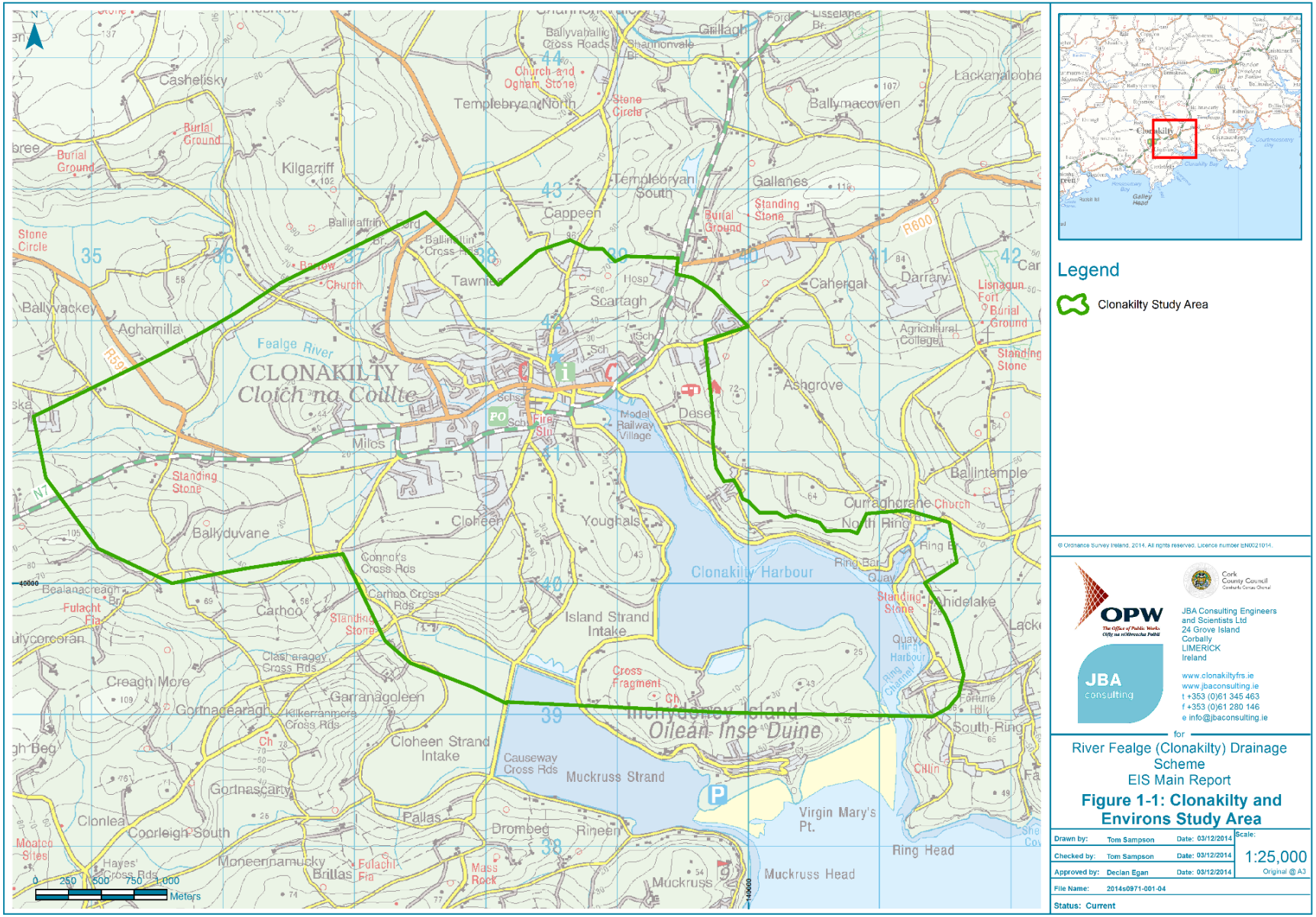
Impacts that may pose a significant major negative impact on a receptor, will or has the potential to have a permanent, irreversible impact on the baseline conditions. In other cases, the impact would or could have a negative impact on a designated European site, an area of archaeological importance, or a negative impact on humans close to the site.

Impacts that are assessed to have a moderate negative impact on a receptor will have a temporary, short term reversible impact on a receptor. This level of impact is most likely to arise during the construction of the flood defence(s).

Impacts that are assessed to have a minor negative impact on a receptor will have a short term negative impact on a local habitat or receptor. It is anticipated that this impact would be remedied by good construction practices and would only be of short duration ie. less than a day or two.

A neutral impact will arise where there is likely to be a change in the baseline conditions but where the level of change/impact is negligible.

Figure 3-1. Clonakilty Study Area



Impacts displaying a major positive impact will have a positive effect on the baseline conditions and will support the environmental and humans.

A moderate positive impact will have a moderate positive impact on the baseline conditions and will partially achieve the requirements and support the environment.

Impacts displaying a minor positive impact will help to protect the environment.

3.4 Residual Impact

In this EIS, residual effects include those positive and negative effects that may remain after proposed mitigation measures are implemented.

3.5 'Do Nothing' Scenario

The EIS has assessed the 'Do Nothing' impacts ie. what impacts will arise if nothing is undertaken.

3.6 Layout of the EIS

A revised Natura Impact Statement is also prepared for the addendums to the Scheme.

The individual sections of the EIS will address one aspect of the environment eg. air and climate, water etc. The sections are laid out as follows:

- Introduction to the aspect
- Baseline conditions
- Impacts of the proposed works on the existing environment
- Mitigation measures to reduce/remedy the significant impacts
- Residual impacts
- The 'Do Nothing' scenario.

In this EIS reference to the 'original EIS' refers to the EIS that was placed on display at the Public Exhibition in Clonakilty in December 2015. This report should be read in conjunction with the original EIS.

3.7 Project Team

The following personnel listed in Table 3-1 collaborated in the preparation of this Environmental Impact Statement.

Table 3-1. Project Team

Style	Keyboard shortcut
Project Management	JBA Consulting
Ecology	JBA Consulting ecologists
Hydromorphology	JBA hydromorphologist
Bat Surveys	Dr. Tina Aughney, Bat Eco Services
Fisheries Assessment	Ross Macklin, Triturus Environmental Services
Socio-Economic	JBA Consulting
Air & Climate	JBA Consulting
Noise	JBA Consulting
Soils & Geology	JBA Consulting, geologist
Archaeology & Cultural Heritage	Rubicon Heritage

4 Water and Hydrology

4.1 Introduction

The section of the environmental impact statement covers the topic of water. This section describes the existing aquatic environment within the Study Area and it describes the impacts of the proposed new/revised interferences to the Clonakilty Drainage Scheme on the aquatic environment. There are 3 types of aquatic habitats within the Study Area namely:

- Freshwater (River Fealge, Convent Stream, Ballyhalwick Stream and the Garage Stream)
- Estuarine/marine
- Groundwater

4.2 Surface Waters in the Existing Environment

4.2.1 The River Fealge

The status of the River Fealge is described in Section 8.3.1 in the original EIS. Surface water samples taken in the river in October 2014 show that, except for nitrates, water quality in the river is good.

The river holds stocks salmon, trout and eels.

4.2.2 Transitional Waters

Clonakilty Bay comprises transitional water within the study area. It is a Special Area of Conservation (SAC) under the Habitats Regulations and a Special Protection Area (SPA) under the Birds Directive. Clonakilty Harbour is a nutrient sensitive water designated within the Urban Wastewater Treatment (Amendment) Regulations 2010. The wastewater treatment plant that serves the town was upgraded following a € 7 M investment in 2015 along with the upgrade to the main pumping station at Long Quay. This upgrade will provide additional capacity for storm water storage that will significantly reduce the frequency of overflow to Clonakilty Bay at Croppy Park.

4.2.3 Coastal Waters

Clonakilty Bay forms the only coastal waters within the study area. A review of the EPA's 2012 report on The Quality of Bathing Water in Ireland found that Inchydoney is designated bathing water (Bathing Water ID IESWBWC100_0000_0100). The beach forms part of the Clonakilty Bay SAC (Site Code 00091). It is also a Blue Flag beach.

4.2.4 Groundwater

There are a few wells within the Study Area but these are not a potable water supply as the study area has poorly productive bedrock except for local zones. A review of the information on three wells within the study area located in the townlands of Clonakilty town, Miles and Tawines Lower show that groundwater vulnerability in the area ranges from moderate to high. Groundwater around the embankments and the sluice is moderate/high. Groundwater vulnerability at the eastern end of the town around Croppy Road and Deasy's Quay is moderate.

4.3 Impacts of the revised/new interferences on water, in the absence of mitigation measures, during construction

4.3.1 Introduction

Works proposed to be executed and properties proposed to be acquired or interfered with are indicated in the Confirmation Drawings in Appendix 1 and are listed in the tables given in Section 2 of the addendum to the EIS. The interferences have been prefixed as follows:

- B: Bridges
- D: Surface water drainage
- E: Embankments
- G: General Interference
- H: Channel Works

- L: Walls
- R: Road
- Sl: Sluices

4.3.2 Bridges (B2 and B6)

Interferences B2 and B6 are for the replacement of railings with concrete parapets to 1.1 m on the Credit Union and Seymour Street Bridge respectively. This work will be carried out at ground level although scaffoldings will probably be required in the river. There is a potential for wet concrete to fall into the river and this will have a moderate short-term negative impact on water quality in the River Fealge. The work will be carried out between May and September inclusive.

4.3.3 Surface Water Drainage (D8, D9, D13, D14 D15)

Interference D8 involves re-directing the storm water sewer to a new Irish Water storm drain along Ashe Street and Clarke Street. This work will be undertaken on land and will have no impact on water in the area.

Interference D9 involves the construction of a storm water drain along Long Quay. This work will be carried out on Long Quay and will not have an impact on water. Connection to the storm water drain at Croppy Road may encounter seepage from the estuary but this water will be pumped back into the estuary.

Interference D13 involves the construction of a storm water drain at Harte's Courtyard. This work will be undertaken on land and will not impact on water quality in the River Fealge.

Interference D14 involves the construction of a new underground pump station at Harte's Courtyard. Water may be encountered during excavations and will be pumped into the River Fealge. There is a potential for increased suspended solids and possibly oil/grease from the pumps. This will have a short term moderate negative impact on water quality in the River Fealge.

Interference D15 involves piping an existing surface water channel and connect through proposed headwall at the Ballyhalwick Stream. The construction of the headwalls at Ballyhalwick stream will cause a short term moderate negative impact on water quality in the stream.

4.3.4 Embankments (E3, E4, E5, E6, E7, E8, E10, E11, E12, E13)

This construction of the fluvial embankments will involve the removal of the top soil and excavating to subsoil over the footprint of the embankment on both sides of the river. The excavated material will be held on-site for possible re-use in the construction of the embankments. Soil will be imported to the site and depending on its permeability may need to be screened prior to use in the construction of the embankments. The excavation of the soil and the removal of the subsoil will increase the vulnerability of groundwater to pollutants. In the event of any spillages of diesel or rupturing of the hydraulic pipes on the excavators this would cause a significant medium-term negative impact on groundwater because of the immiscible nature of the material.

Silt laden runoff from the stockpiles will have the potential to discharge to the river and this will have a moderate negative short-term impact on water quality. The presence of suspended soils in the runoff has depending on their size and the velocity of flood in the river, the potential to settle out in the river bed. If the solids settle out in potential salmon spawning grounds (redds) downstream of the embankments, then this will be a significant medium-term negative impact on salmonids. Salmonids are particularly vulnerable to suspended solids runoff and the ova and the early juvenile stages are most sensitive. These stages are present during the mid-winter and early summer period.

The embankment at Cullinane property (E12) runs along the side of their property and for a large portion of the work (approx. 70 m of the embankment) it will be remote from the Ballyhalwick Stream. The impacts of this embankment on the water quality in the stream will be short-term minor impact.

Embankment E13 along the Waterfront replaces the original defence wall. The embankment is set back 3 m from the water's edge so the impacts of the construction of this embankment will be short term minor negative on water quality in the estuary.

4.3.5 General Interferences (G10, G11, G12, G13, G14, G15, G16, G17 G18)

The construction of a trash screen in the Garage Stream will require the placement of a coffer dam in the stream to facilitate the construction of a base and holding walls for the trash screen. The deposition of concrete, the placement of water pumps during construction will have a temporary negative impact on water quality in the stream. Immediately after construction, the water that flows over the newly constructed trash screen, will have a high level of suspended solids and possibly some oil/greases from the pumps. Depending on the size of the particles some will settle out close to the screen and remain until they are dispersed by a larger flow of water in the stream. The impact will be minimal/moderate on water quality and will be of short duration.

The infilling of gaps on the river bank of the Ballyhalwick Stream (G13, G14, G15 and G16) will be undertaken from the land side of the stream and will have no impact on water quality in the stream.

The removal of the ditch and replacement with fences (G12 and G18) will have no impact on water quality.

4.3.6 Channel Works (H1, H2)

This work involves the re-grading of the channel on the River Fealge immediately downstream of the flow control structure. A 45 m stretch of the river bed will be regraded. This operation will have significant negative impact on water quality in the River Fealge as the works will give rise to an increase in suspended solids in the river water. The impact will be temporary and the levels of suspended solids in the water will return to background levels soon after completion of the work. It is proposed to replace 300mm of the riverbed material onto the concreted section of riverbed. A short concrete plinth at the downstream end of the concrete section will be used to prevent the replaced fill from travelling downstream. The loss of aquatic habitat and riparian habitat at the site of the proposed re-grading will impact in the short term, on fish using this portion of the river and mammals that use the banks of the River Fealge as a foraging corridor. In the long term, it is anticipated that fish will return to this area of the river.

The pumping of concrete into the re-graded portion of the riverbed is a potential pollutant. The spillage of uncured concrete into a water body will cause a rise in the pH of the water (an increase in hydroxyl ions). This will cause a moderate short-term negative impact on water quality. This portion of the work will be carried out in the summer season when generally water levels are low. The impact of a spillage of concrete into the river when flows are low will be more significant and could result in fish kills downstream. A concrete spill would also increase the suspended solids levels in the river which would have a significant negative impact on fish and macroinvertebrates. An extended discussion on the impacts of the regraded sections of the river downstream of the flow control structure on ecology is provided for in Section 4. The re-grading of the channel will require the river to be diverted around the work area. This will involve excavation of a channel to facilitate the diversion of the river. This will have a short term moderate negative impact on the river water quality downstream of the works. The water will contain significant suspended solids loading and will be detrimental to fish and macro-invertebrates in the river.

4.3.7 Walls (L2, L4, L6, L7, L8, L9, L11, L12, L14, L15, L30, L31, L35, L37, L38, L39, L41, L42, L43, L44, L45, L46, L47)

Several the revised/new interferences relate to a reduction in the length of the wall, for example L4, L7, L8, L15, and L35. The impact of the construction of the walls at these locations was addressed in the original EIS.

A number of the interferences, for example L11, L12, L14 and L47 are required to ensure a continuous defence wall for the River Fealge and this will involve repairing or replacing the existing channel walls. If the walls are replaced new foundations will be required. A cofferdam will be placed around the existing wall, the wall will be dismantled and a mini excavator will be used to dig foundations for the wall. A cement/grouting mix will be pumped into the footings. Formwork will be placed around the footings, reinforced steel placed and concrete pumped into the formwork. The formwork will be removed and any blemishes made good. Several operations in this process have the potential to pollute the surrounding water. The pollutants range from oil on the excavator, to diesel and lubricants on the formwork. These pollutants would have a significant short-term negative impact on the water quality in the river. The release of suspended solids and silt into the river would have a moderate short-term negative impact on the fish in the river. This impact would be exasperated in summer when river flows are expected to be lower.

Other sections of the walls along the river are in fair condition and will require some work. The level of work that will be required is not known at this stage, but as a minimum some sections of the walls will need re-pointing or re-grouting. This will involve constructing a cofferdam and re-pointing from the river bed level. This operation has the potential to cause a moderate negative short-term impact on water quality in the river.

The raising of the Ring Road will require the construction of a reinforced concrete wall, 1.8 m in height for 180 m. The wall will be located along Deasy's Quay. Excavations will be required for the length of the wall. Water may be encountered during excavation which will require pumping. The pumped water will contain suspended solids and will be dispersed at high tide. This action will have a short term negative impact on the tidal waters.

Interferences L38, L39, L40, L41 and L42 involve the placement of a U-shaped channel in the Convent Stream. A cofferdam will be installed in the stream during construction work and the contained water upstream of the cofferdam will be pumped to the estuary. The initial flush of water after the installation of the U-shaped channel will have a high suspended solid loading and possibly some diesel and lubricants. This will have a short-term negative impact on the water quality in the stream and eventually in the estuary.

4.3.8 Roads (R2)

A permanent road will be constructed to provide access to the trash screen in the Garage Stream. The construction of the road particularly close to the river will impact on the water quality of the stream. The impact will not be significant and will be temporary during construction only. Suspended solids, and diesel are the main pollutants that may arise during the construction of the haul road. The temporary increased loading of suspended solids in the Garage Stream will also impact on the fish species that inhabit the stream. The impact will be temporary and it is expected that the populations of fish that it inhabits the stream will not be significantly impacted upon.

The combined impact of the trash screen and the road will increase the magnitude of the impact but it will be temporary and will not cause a significant impact on the water quality or fish life.

4.3.9 Sluices (Sl1, Sl2)

The impact of the sluices has been covered in the original EIS.

4.4 Impacts of the revised/new interferences on water, in the absence of mitigation measures, during operation

The impacts of the Scheme during operation has been discussed in the original EIS.

The new/revised interferences will, in general, not place any increased significant impacts on water quality. The storm water pumping station at Harte's Courtyard (D14) and drains along the quay (D9) will not significantly impact on water quality.

The trash screen (G10 and G11) in the Garage Stream will allow the flow of water through it and the only impact that may arise is a build-up of debris at the trash screen. The access road (R2) will provide permanent access to the screen for frequent removal of the debris.

The re-graded stretches of the riverbed (H1 and H2) downstream of the flow control structure will provide an area for settable materials in the stored flood waters to accumulate. This stock of settled material will be available for dispersion in the river during times of high flows. This will have an impact on the water quality downstream of the flow control structure. This source coupled with the high background levels of suspended materials in the river during times of high river flows will present a more significant impact on the water quality. However, the impact will be temporary and overall the significance of the impact on water quality will be minimal to moderate.

4.5 Mitigation Measures

Section 8.9 of the original EIS contains several mitigation measures to remedy/reduce the significant impacts on water quality and it is recommended that these are read and used by a contractor. In addition, the mitigation measures for the new/revise interferences include:

- The preparation of a site-specific Construction Environmental Management Plan

- All in-river works and any works liable to cause an increase in suspended solids in the River Fealge, The Ballyhalwick Stream, the Garage Stream or the Convent Stream should be limited to the period May to September inclusive
- All in-river works procedures to be agreed with IFI and NPWS in advance of any works taking place
- Best available technology must be employed by the contractor to limit the risk of all types of pollution to these waterbodies
- The contractor will ensure that no invasive species can enter a watercourse either river, estuary, marine or groundwater
- Material removed for the riverbed will be stockpiled at a suitable distance away from the River Fealge to avoid surface water run-off laden with suspended solids entering the watercourse
- Any excavated material from around the site of the flow control structure must be placed a suitable distance from the River Fealge to avoid surface water run-off laden with suspended solids entering the watercourse

4.6 Residual Impacts

The construction of the scheme will require in-river works along the length of the River Fealge and the estuary. There is a potential for increased silt and suspended solids in both the river and estuary during the construction work even when the mitigation measures are installed. The operation and maintenance of the Scheme will give rise to the generation of suspended solids in the waterbody but the levels and the duration of these increases in suspended solids levels will not significantly impact on water quality.

A water quality survey conducted on the River Fealge as part of the original EIS found slightly elevated levels of nitrate in the water. It was concluded that runoff from agricultural land and possibly effluent discharge from the wastewater treatment plant were the main sources of this pollutant. The upgrade of the Clonakilty Wastewater Treatment Plant will, in the long-term, reduce the background levels of nitrate in the water and consequently will reduce the levels and frequency of eutrophication in the estuary.

4.7 The 'Do Nothing' Scenario

In this scenario, it is assumed that no Flood Risk Management Scheme for Clonakilty would be constructed. Flooding would continue to impact on the town and with climate change, probably more frequently. Flood water levels would also rise. Naturally the flood waters would contain debris and suspended solids which would discharge to the river. If the flooding was tidal then treated effluent from the treatment plant would be driven up river. The water would contain nutrients which would be available for algae/protozoans to thrive. In the long term this may give rise to algae blooms in the estuary.

5 Flora and Fauna

5.1 Introduction

Chapter 9 of the River Fealge (Clonakilty) Drainage Scheme EIS Volume 2 outlines the existing environment of the working areas within and surrounding the drainage scheme. The habitats, flora and fauna are detailed in Section 9.3 of the EIS.

Amendments to the Scheme resulted in the inclusion of areas that had not been previously surveyed by the initial EIS. Hence, an ecological walkover survey was conducted relating to locations of all amendments to the Scheme. As a result of the walkover survey, additional surveying requirements were identified; namely bats and fisheries.

The amendments to the Scheme are outlined in Section 2 of this report.

5.2 Existing Environment

The following section contains additional information complied through desk-top reviews and additional surveys to provide supplementary baseline data on the existing environment.

5.2.1 Flora

The desk-based assessment identified the presence of one plant species that is listed under the Flora (Protection) Order 2015, within one of the 2km grid squares covering the study area (W34V); this is Pennyroyal *Mentha pulegium* (NBDC, 2017). The site is located at Deasy's Quay; the three pieces of land between the Ring Road and Clonakilty Harbour (Patrick Green, BSBI Recorder, pers.comm., December 2016). Pennyroyal is listed as an *Endangered* plant species in the Irish Red List for vascular plants and is categorised as being in continuing decline in terms of its area of occupancy and number of locations or subpopulations (Wyse et al., 2016). The exact location of Pennyroyal at Deasy's Quay is unknown at this stage.

5.2.2 Bats

The original EIS detailed the roost surveys, timed bat activity surveys and static surveys within the area of the Scheme. The amendments to the Scheme resulted in five additional areas being surveyed for potential bat roost sites, to supplement the baseline ecological data of the original EIS. These areas are;

- Ballyhalwick stream,
- Kilgarrif,
- Cloneen,
- Weston Lodge, and
- Convent Road.

The full bat survey report is detailed in Appendix 2.

Methodology

A winter assessment was conducted to determine the potential bat usage of the proposed amendment areas. The sections were surveyed by Dr. Tina Aughney of Bat Eco Services during the daytime on 10th and 11th December 2016 and assessed according to:

- Presence of mature trees
- Degree of treeline/hedgerow network in the landscape
- Location (rural / urban)
- Presence of building likely to provide roosting sites

Using these points, the bat potential of each area surveyed was assessed. Trees deemed potentially suitable as bat roosts were further assessed to determine their scale of value. Trees were assessed as to whether they had the potential to provide roosting site for bats according A, B or C value, with A-value being the most suitable for roosting bats and C-value trees tend to be ivy-clad trees.

Survey Results

Ballyhalwick Stream

Ballyhalwick stream is located west of Clonakilty and is approximately 2m wide. This stream flows under two local roads and through two sets of natural stone culverts. It is a rural area with one-off housing. The landscape is well connected with hedgerows and treelines. There is no street lighting.

The hedgerow along the Ballyhalwick stream provides a commuting route and foraging area for bats. In total, six Potential Bat Roost (PBRs) C-value trees were recorded along the Ballyhalwick stream. These trees were primarily deciduous and ivy-clad trees.

Kilgarrif

This stream is located north-west of Clonakilty, approximately 2m wide. This stream flows under one local road via a natural stone bridge. It is a rural area with one-off housing. The landscape is well connected with hedgerows and treelines. There is no street lighting.

The landscape provides potential commuting routes for bats and feeding areas for bats, however the trees along this section do not offer roosting potential for bats. The low cut hedgerow to the west of the stream offer little commuting and foraging value to bats.

Cloneen (Garage Stream)

The Garage Stream is located south-west of Clonakilty and is approximately 1m wide. This stream flows along a treeline/hedgerows at the boundary of cereal and grassland agricultural fields. It is a rural area with one-off housing. The landscape is well connected with hedgerows and treelines. There is no street lighting. There is evidence of drain cleaning and some scrub/hedgerow/tree removal along this stream.

The landscape provides potential commuting routes for bats and feeding areas for bats. Two PBR C-value trees were recorded along the Garage stream. These were a mature Ash tree and a second ivy-clad Ash tree. A culvert located on the Garage stream does not provide any roost potential for bats.

Weston Lodge (North of Emmet Square)

The Fealge River flows through the town of Clonakilty and through the area of Weston Lodge. The river is approximately 5m wide and much of the river bank is canalised. There are numerous bridges, a large array of buildings and a small number of trees. There is street lighting and general lighting associated with residential and commercial buildings. In particular, there are a large number of buildings (>100 years old, natural stone wall cladding, slate roofs) which are highly suitable as bat roosts.

Individual mature trees are located along the river bank. One tree has a PBR C-value due to spilt limbs and tree holes.

Convent Road and Croppy Road (N71)

The Fealge River flows through the town of Clonakilty. The width of the river varies greatly in this area as it flows into the estuary. There is street lighting and general lighting associated with residential and commercial buildings. This section of the river is primarily along the road (N71) and is characterized by high earthen banks and individual immature trees planted along road verges.

The trees in this area are characterized by lines of conifer trees, small sections of immature deciduous trees and individual trees. They provide little commuting and foraging habitat for bats and no trees offering bat roost potential were recorded.

5.2.3 Fisheries

The amendments to the Scheme that were not subject to the original fisheries assessment, detailed in Section 9.3 of the EIS, were surveyed by Triturus Environmental Services who undertook additional fisheries surveys of proposed additional working areas. The full report in given in Appendix 3.

This survey established baseline fisheries habitat and assist in the evaluation of the importance of the fisheries resource in the River Fealge catchment. The additional areas encompassed four riverine sites that had not been assessed as follows;

- Proposals for the installation of a U-Shaped channel on the Convent stream (adjacent to the N71 approaching Clonakilty from Cork city),
- The replacement of existing culverts (G8 & G9) and installation of a trash screen (G10 & G11) on the Garage Stream,
- An extension of the area to be regraded on the River Fealge (approximately 45m), and
- Bankside works at a number of locations on the Ballyhalwick stream.

Methodology

The field survey work was conducted during base flow levels on the River Fealge and tributaries and also on the Covent Stream (not part of the Fealge catchment) on the 3rd and 4th of January 2017. Fisheries habitat was assessed using the Life Cycle Unit method (Kennedy, 1984) to map river sites as nursery, spawning and holding water, by assigning quality scores to each type of habitat. This procedure was applied in assessing fisheries habitat at each of the flood relief zones in the main channel of the Convent Stream and in the Fealge River and tributaries where proposed works will be undertaken. In addition, a broad appraisal/ overview of the upstream and downstream habitat was undertaken to evaluate their importance for salmonid and lamprey spawning etc. Each watercourse was divided in sections depending on size (e.g. A, B, C & D) with larger lengths of channel having up to 4 sections. This helped compartmentalize summaries of the overall channel characteristics and helped better define potential impacts. It also facilitated a better overview of a greater longitudinal area of river rather than point sampling. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterize the rivers (i.e. channel profiles, substrata etc.). Fisheries habitat was mapped using Quantum GIS 2.16 and Bing Aerial Base Mapping.

Results

Ballyhalwick Stream

Figure 5-1shows the fisheries habitat of the Ballyhalwick stream for the habitat survey sections.

Section A

The upper reaches of the survey area the Ballyhalwick Stream (i.e. Section A) were approximately 3m wide with depths ranging between 0.2m to 0.6m. The Ballyhalwick Stream retained largely a natural profile with meanders and a well-defined thalweg (the line defining the deepest channel points along a channel's length) with localised channel modification (i.e. straightening or historical bank works). The channel comprised of 40% riffle, 40% glide and 20% pool habitat. The river substrata were composed of 30% cobbles, 65% gravels and <5% boulder, sand and silt with low to moderate levels of siltation. There was some evidence of bedded cobbles and gravels, indicating longer term siltation impacts to the channel. However, excellent quality spawning habitat was recorded locally in the upper reaches of section A on a meander (ITM 53412, 541220). This area of habitat was the most pristine of any encountered in sections A, B and C (the later two sections described below). Here a large pool habitat grading into deep glide had good quality clean well sorted gravel with adult salmonids present. This was considered the best quality spawning habitat within section A. Lamprey habitat was found further downstream on two meanders adjoining residential properties, where two 5m2 beds of soft organic rich silt had accumulated on the depositional concave areas of the meanders (ITM 535518, 541177 & ITM 535506, 541194).

Section B

Section B was located downstream of the R599 road crossing at Ballyduvane, extending to the boundary of Clonakilty GAA club. The stream was largely bordered by residential properties and became more canopied downstream. Immediately downstream of the bridge crossing of the R599, the stream loses energy and abundant gravels are present that are considered to be of value for spawning and also as a nursery habitat (i.e. moderate to good quality). The absence of pool habitat in this section of the river indicated it was of moderate to poor quality as a holding habitat.

Section C

Section C of the Ballyhalwick Stream was located in the grounds of Clonakilty GAA club at Ahamilla. The stream was approximately 3m wide and 0.3m deep with a bankful height of 1m. The stream had been realigned historically to facilitate the construction of the playing fields etc. Despite historical realignment the stream retained a good semi-natural instream profile with clean gravels and evident good numbers of brown trout. The river comprised 45% glide, 45% riffle and 10% pool. The substrata were dominated by 10% boulder, 60% cobble, 25% coarse and medium gravel with 5% by area sand and silt. The stream in section C, had good *Ranunculus sp.* cover (estimated at 30%) coupled with a good river profile, together provided a good quality nursery for salmonids. Only one area of lamprey habitat was located in section C adjoining a road box culvert crossing into the GAA club encompassing 4m2 of habitat (535839, 541312). Of note a second concrete plinth crossing further downstream between the playing fields had a steel grid trash screen that was considered impassable to salmonids (ITM 535923, 541287). At the lower reaches of section C, a good quality spawning area adjoined a deep pool habitat with abundant salmonids (ITM 535993, 541460). This was considered the best quality spawning habitat encountered in the lower survey reaches of the Ballyhalwick Stream. Overall the Ballyhalwick Stream in section C was considered of most importance as a nursery (i.e. good – scoring 2) but of lesser quality as a holding and spawning habitat overall (i.e. moderate – scoring 3 for both categories).

River Fealge

Figure 5-2 shows the fisheries habitat of the River Fealge for the habitat survey sections.

Section A

The uppermost survey area (i.e. section A) on the River Fealge was an example of a very good quality natural to semi-natural salmonid river. It was characterized by clean riverine gravels, beds of *Ranunculus sp.* and submerged *Berula erecta* vegetation (upto 30% cover), an open channel (localised shading only) with a well developed riparian zone on the south bank. The riparian corridor had species including Alder (*Alnus glutinosa*), Willow (*Salix cinerea sp*.), Hawthorn (*Craetagus monogyna*) and Bramble (*Rubus fruticosus*) present. The channel also had a very good river profile with 50% riffle, 45% glide and and 15% pool habitat. The channel had good depth ranges between 0.3m and 1.5m and was ranged between 5m and 8m in width. Abundant salmonids were visible in the clear river water indicating a healthy balanced population. The river also had very good quality un-bedded and clean substrata. They comprised of 20% cobble, 20% coarse gravel, 55% medium and fine gravels with the remaining 5% by surface area accounting for sand and silt. The sand and silt did not form extensive beds suitable for lamprey. In summary the spawning and nursery value of the stream was good to high (i.e. 1.5) with the holding value slightly lower (i.e. good – 2). Overall section A is considered a very good quality salmonid habitat. The habitat may also support European eel.

Section B

Section B of the River Fealge was overall of lower quality in terms of fisheries habitat the sections A and C located upstream and downstream respectively. The River Fealge at section B was heavily canopied with riparian vegetation (i.e. Alder, Willow. Hawthorn and Bramble) reducing the light quantities entering the river. The river also has evidence of historical bank stabilisation with cobble rip rap installed along sections. The substrata had a higher quantity of cobble than upstream or downstream likely as a result of local changes in the stream gradient that appeared slightly steeper increasing river energy locally. The substrata comprised 10% boulder and bedrock, 40% cobbles and 50% coarse, medium and fine gravels with no observed softer silt habitat. The presence of shade, boulder and cobble refugia indicates that section B may be of importance to European eel that favour such habitats. The river at section B was predominantly of glide (i.e. 70%) with riffle and pool accounting for 20% and 10% by surface area respectively. The water depths ranged between 0.3 and 0.7m with a channel width of 4-5m. These characteristics coupled with the aforementioned substrate types provided for a better nursery habitat than for spawning or holding habitat. As such the Life Cycle Unit Scores for spawning and holding habitat where moderate (i.e. score of 3) with the nursery habitat component being moderate to good (i.e. 2.5).

Section C

Section C was a semi-natural section of channel that had historical fisheries improvement works installed. These appeared to be functioning well, with large flagstone installations below a riffle and glide section of river creating excellent pool habitat for adult salmonids. This area provided the best

holding habitat for adult salmonids encountered during the catchment walkover surveys. The pool habitat was up to 2.5m deep with good quantities of clean mixed gravel and lower quantities of cobble. Substrata comprised 10% boulder, 40% cobble with 50% coarse and medium gravels and the remaining 10% of silt and sand. Indeed, the presence of good quantities of softer substrata adjoining gravels created the best lamprey habitat recorded during the survey also. This was located in the depositional areas on the pool margins and also adjoining the bridge abutment (i.e. bridge crossing entrance to Dunnes Stores; ITM 0537305, 0541289). The river profile overall comprised 30% riffle, 40% glide and 30% pool, indicating a mixed, well defined thalweg (i.e. river profile). Aquatic plants recorded included *Ranunculus sp.*, *Rorrippa nasturtium aquaticum*, *Callitriche sp*. and *Apium nodiflorum*. *Ranunculus sp*. cover was approximately 20%, a very important species for cover and food provision in salmonid rivers. Overall section C was considered and excellent quality fisheries habitat with scores for holding habitat as high (i.e. 1) with spawning and nursery as good to high (i.e. 1.5).

Section D

The lower River Fealge (i.e. tidal channel sections) was also surveyed. This area was exclusively of shallow riffle-glide habitat at low tide and was considered a good trout nursery (i.e. score of 4). Fast flowing open and large tidal sections of river channel in known salmonid rivers can have high densities of trout (e.g. River Bandon at Innishannon) because of high productivity and thus are important nursery areas. The lower River Fealge may also be of importance to sea trout migrating upstream, although it is very difficult to identify juvenile sea trout from brown trout. The lower River Fealge may also be of importance to European eel elvers that can be present at high abundances in the lower tidal reaches of river channels as has been observed in other surveys in West Cork (pers. obs.).

Garage Stream

Figure 5-3 shows the fisheries habitat of the Garage Stream for the habitat survey sections.

Section A

The upper reaches of the survey were undertaken at Carhoo, Clonakilty. The Garage Stream at this location was shallow averaging 0.1m deep and bordered by Bracken scrub and Alder woodland to the south with improved grassland to the north. Despite evidence of historical re-straightening, the channel bankfull height remained low (i.e. 0.5m) facilitating good light entry to the Garage Stream. The stream also had clear water and visually clean river gravels. The stream substrata comprised 25% cobble, 25% coarse gravel, and 45% medium to fine gravels with the remaining 5% by area composed of sand and silt. The instream habitat consisted of 50% riffle, 45% glide and 5% pool, the shallower water habitats being dominant. The best quality spawning area was immediately downstream of the existing culvert, where a deeper pool (circa 0.4m) adjoined good quality gravels. Further downstream throughout the wider reaches of section A, the gravels however, were partially bedded meaning their viability for spawning, coupled with shallow water was lower overall than the upstream area containing pool habitat. In summary the spawning and nursery value of section A were moderate to good for both (i.e. score of 2.5). Holding pool habitat was limited and as such was evaluated as moderate (i.e. score of 3).

Section B

Overall section B of the Garage Stream was a poorer quality habitat in terms of fisheries value. Much of the channel had been straightened historically. The deeper bankfull height 1-2m, narrow channel width (i.e. 1m) and the virtual absence of meanders exemplifies historical alteration of the stream in section B. Furthermore, the lower reaches of the habitat have been impacted by a long stand of Japanese Knotweed (circa. 100m) largely concentrated on the east bank bordering Well Court. The unconsolidated banks evidently are contributing to sedimentation of the river gravels that were heavily silted. This was evident from silt plumes underfoot, bedded gravels and Knotweed leaf deposition. Incidentally the siltation may have encouraged a small area of lamprey ammocoete habitat upstream of the road culvert at Well Court in a small pool. The habitat was approximately 2m2 and of lower quality (ITM 537212, 540996) given the depth of sediment was <8cm and situated on harder sub-structure of gravels making it borderline for lamprey. The substrate of the wider section B area comprised 10% boulder, 40% cobble, 30% coarse, medium and fine gravels and 20% silt. The channel was dominated by glide habitat (60% of channel area), with lower quantities of riffle (30%) and pool (10%). The heavy shading, because of deep embankment and lower quality gravels reduce the streams nursery value (i.e. moderate – 3) and the limited pool habitat and shallower water indicate lower quality holding habitat (i.e. also moderate – 3). Furthermore, the

heavily silted gravels indicate poorer spawning substrata. In addition, higher quantities of boulder and cobble make it less viable for spawning, especially for brown trout which are the most likely salmonid species using the habitat (i.e. spawning score of 3.5 – moderate to poor). Low densities of European eel may also occur in the habitat.

Section C

The lower reaches of the Garage Stream (e.g. adjacent to Clonakilty car hire) were marginally better in terms of fisheries habitats than upstream when considering all the habitat attributes. The channel was approximately 2m wide with 0.3 depth and appeared to have relatively low levels of siltation, west of the car hire and downstream of the culvert at Well Court. This section of the Garage Stream had some moderate to good spawning habitat (ITM 537241, 0541063) for brown trout with well sorted non-compacted gravels. This section also had approximately 8m2 of lamprey habitat (i.e. organic rich sand and silt bordered by finer gravels) adjoining a pool at ITM 537187, 541003. The invasive plant Japanese Knotweed was present (20m2) immediately downstream of the culvert at Well Court (ITM 537232, 541025), more extensive areas were present upstream of the culvert.

Overall the substrata of survey (section C) comprised approximately 30% cobble, 30% coarse gravel, 30% medium and fine gravels with the remaining 10% comprising sand and silt. Section C in terms of river profile comprised 15% pool, 30% riffle and 55% glide habitat with relatively open cover as a result of no riparian treeline or hedgerow habitat for the majority of the western bank. The eastern bank had Gorse (*Ulex europaeus*), Hawthorn, Sycamore (*Acer pseudoplatanus*) and bramble species on a small earthen embankment. Lesser Water Parsnip (*Berula erecta*), Creeping Buttercup (*Ranunculus repens*) and Lesser Celendine (*Ficaria verna*) bordered the stream.

The lower extent of section C (i.e. behind Clonakilty Service Station) declined in quality because of storm drain input and historical realignment of the river. This was evident from increased sedimentation of the gravels, with a deeper (circa 1-1.5m) straightened channel, in addition to increased shading. Despite the lower quality of the lower extents overall the stream scored well for spawning and nursery (i.e. moderate to good – 2.5 and good – 2 respectively), with a lower score for holding habitat given limited pools (i.e. moderate – 3).

Convent Stream

Figure 5-4 shows the fisheries habitat of the Convent Stream and lower River Fealge for the habitat survey sections.

Section A

The Convent Stream is located south east of the N71 Convent Road (Flaxbridge area of Clonakilty Town, opposite Supervalu). The Stream discharges to the Clonakilty estuary where Croppy Quay intersects the Ring Road. Only one section of the Covent Stream was surveyed (i.e. section A given the stream's short length. The stream was heavily modified being straightened and deepened historically. The stream was also heavily shaded bounded by two masonry stone retaining walls with evident Japanese Knotweed encroachment on the north bank. The stream water had evident pollution entering it, based on visual inspection and odour. The river profile was exclusively of shallow riffle and glide habitat (circa. 0.2m deep) with <5% pool habitat present. The substrata were dominated by cobble habitat (mostly bedded into the substrate) making up 75% by surface area. Lesser amounts 25% by surface area of coarse, medium, fine gravels, silt and sand covered the remaining interstitial space. The substrata suffered from siltation, evident cover on substrata and bedded nature indicating continual sedimentation of the channel despite a very swift flow rate. The channel is not considered of value to salmonids as a spawning (scoring poorly for i.e. 4) but may be a lower quality nursery containing a small residual population (i.e. moderate – 3). Overall the Convent Stream is considered a more optimal habitat for more tolerant water quality species i.e. European eel. Eel as a species are known to occur in shaded cobble strewn lower reaches of rivers such as the Convent Stream.

Clonakilty Bay

Clonakilty Bay is an important estuarine habitat for a range of estuarine species, most notably sea bass (*Dicentrarchus labrax*) and golden bream (*Sparus aurata*), the latter species being nationally uncommon (Quigley, 2015). Golden bream as a species were a rare vagrant until the 1970's in Irish waters but are present annually in the warmer months in Clonakilty Bay. The bay also contains three species of mullet, golden grey mullet (*Chelon aurata*), grey mullet (*Chelon labrosus*) and thin lipped mullet (*Chelon remada*), all of which are recreational angling target species as with bass and golden bream. The sandy banks of the bay support flounder (*Platichthys flesus*) and occasional brill

(*Scophthalmus rhombus*). Large shoals of sandeel (*Ammodytes tobianus*) utilise the middle and outer bay and the mouth of the estuary is an important area for spawning sandeel. Small numbers of sea trout also feed in the estuary. Other fish present include ballan wrasse (*Labrus bergylta*) and Pollack (*Pollachius pollachius*) in the rocky outcrops of the outer bay. Clonakilty Bay forms an important part of the angling asset of West Cork and nationally is a very important shore angling venue.

Figure 5-1. Fisheries habitat map of the Ballyhalwick Stream (illustrating lifecycle unit scores) for the habitat survey sections.

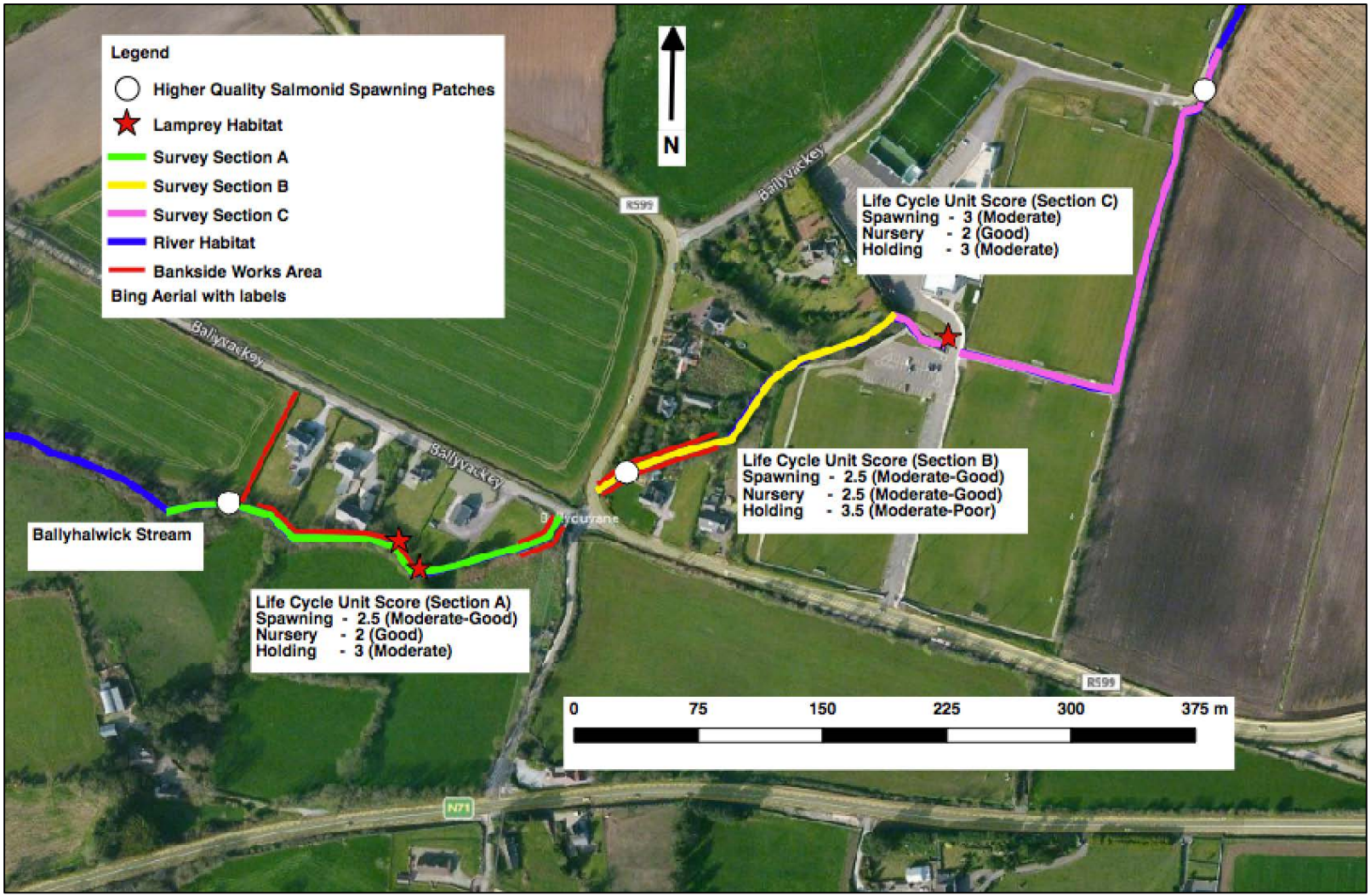


Figure 5-2 Fisheries habitat map of the River Fealge (illustrating lifecycle unit scores) for the habitat survey sections.

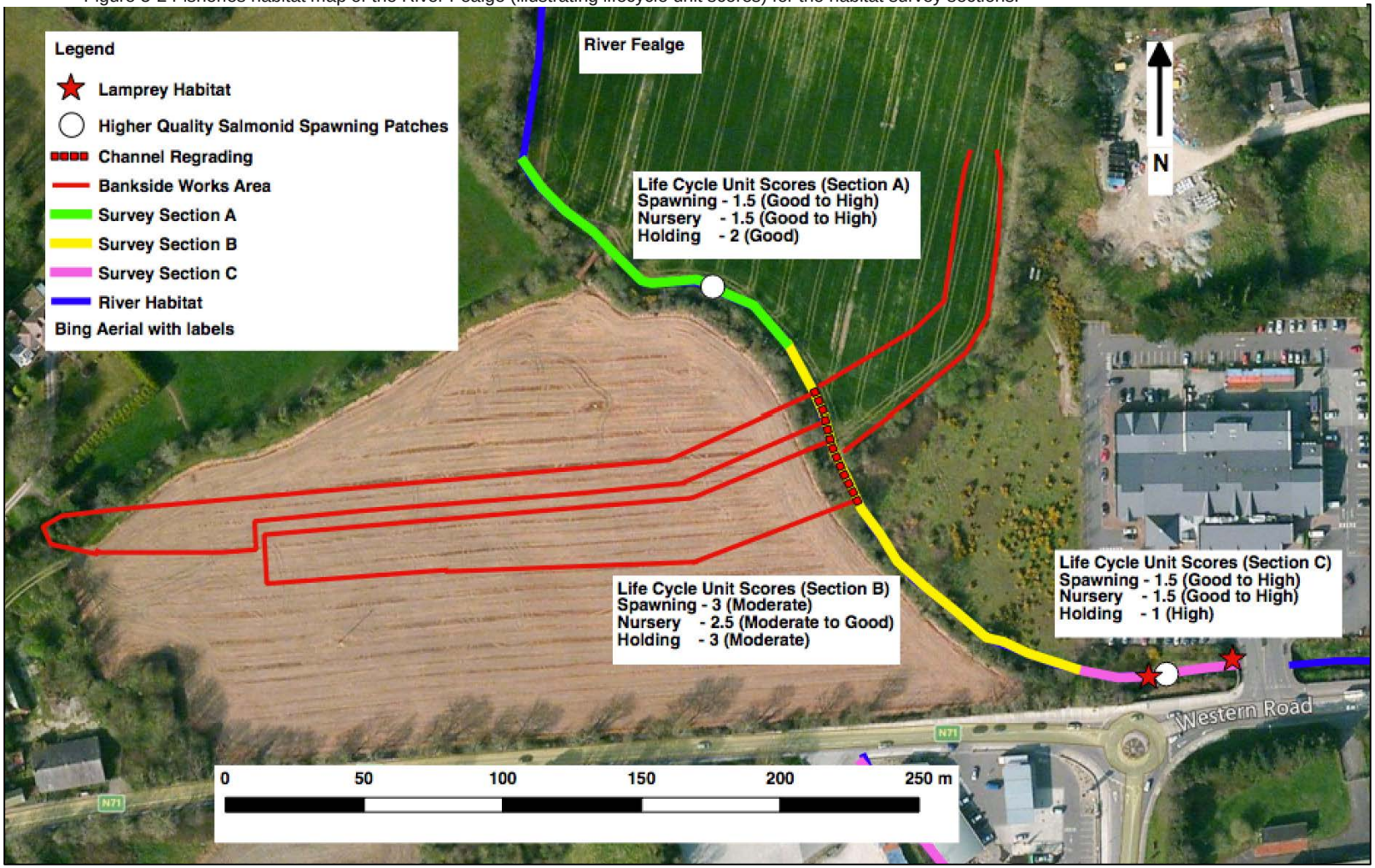


Figure 5-3. Fisheries habitat map of the Garage Stream (illustrating lifecycle unit scores) for the habitat survey sections.

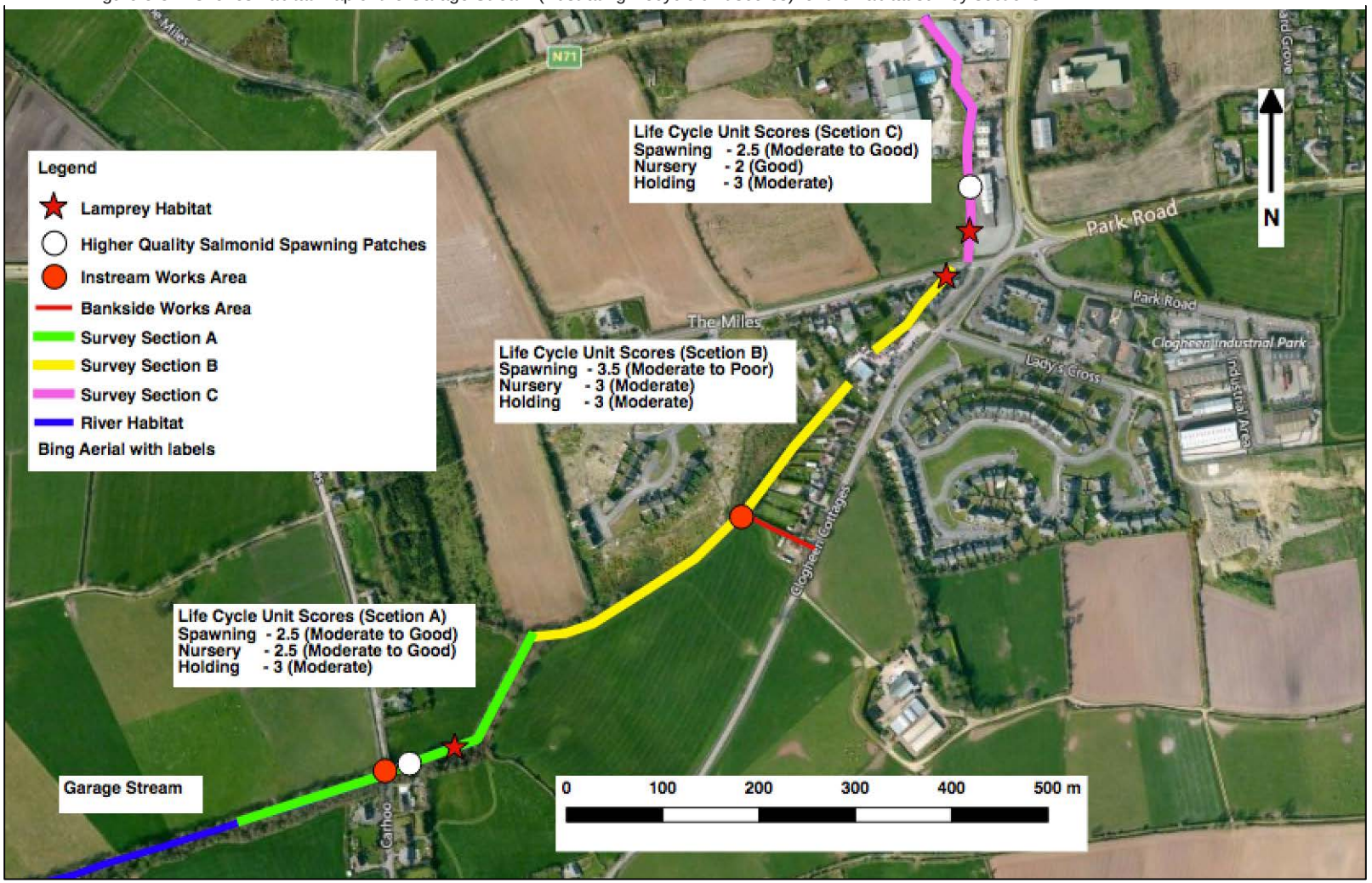
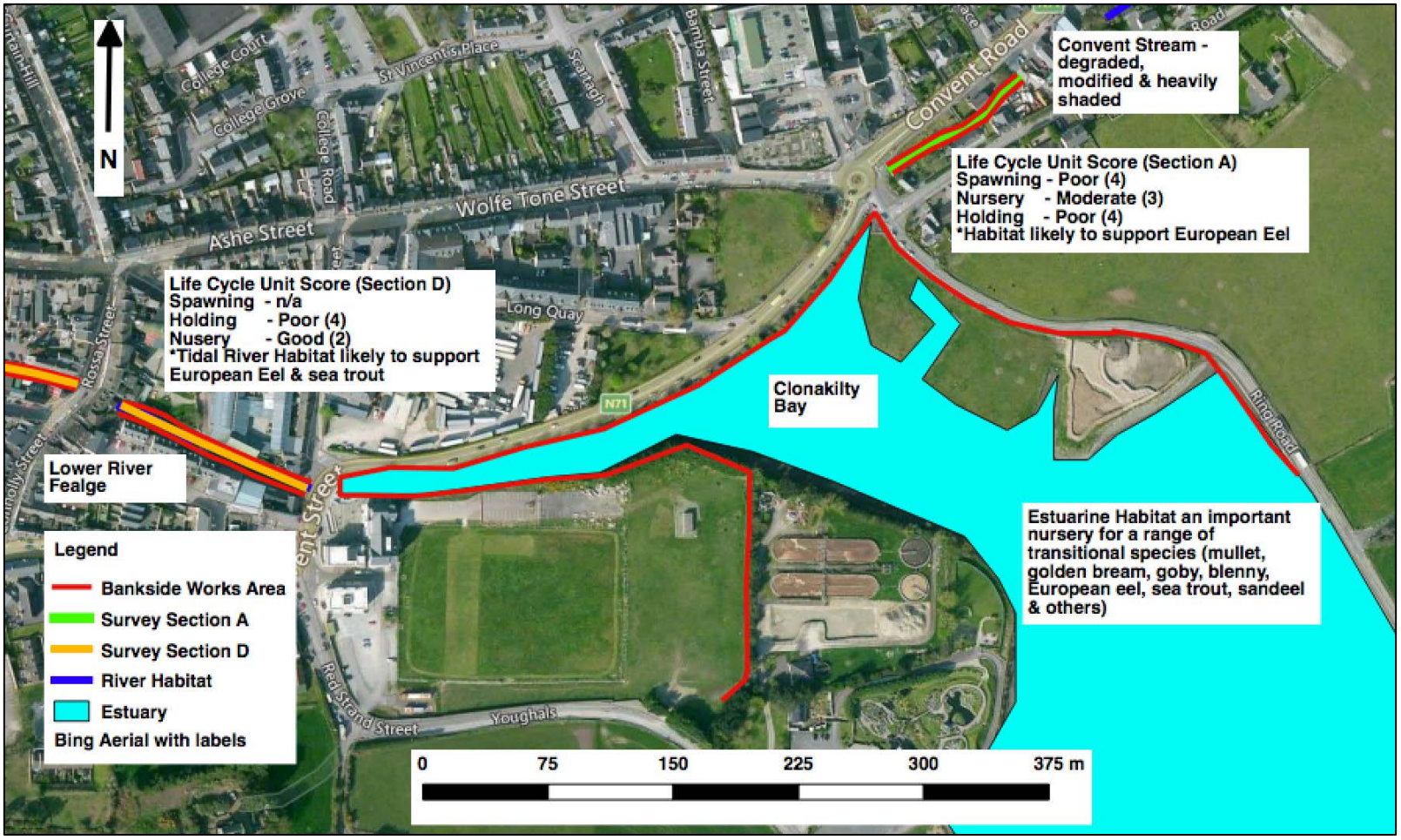


Figure 5-4.Fisheries habitat map of the Covent Stream and lower River Fealge (illustrating lifecycle unit scores) for the habitat survey section.



5.2.4 Invasive Species

An additional invasive species survey was conducted on May 20th and 21st 2016, during which Japanese Knotweed was recorded at locations along the Ring Road, Croppy Road adjacent to the estuary and the Waterfront development, and on the northern ditch of The Miles and Clogheen Cottages road junction. The fish surveys undertaken for this EIS identified Japanese Knotweed in the Convent Stream along the stone walls and a large stand of Japanese Knotweed in the Garage Stream on the east bank bordering Well Court. The reader is advised to review the invasive species section of the original EIS and the invasive species survey carried out on May, 2016.

5.3 Evaluation of Ecological Receptors

Section 9.3.10 of the original EIS evaluates the nature conservation importance of the study area of the Scheme for its habitats and species those habitats support following the assessment criteria set out in Section 9.2.5 of the EIS. The evaluation of those ecological receptors remains unchanged from the original assessment in the EIS. However, there is a requirement to assess the watercourses within the study area, due to the geographical expansion of the Scheme's measures and extent of instream works, the evaluation of fisheries habitat is outlined below. The conservation importance of Pennyroyal is also given.

5.3.1 Evaluation of Flora - Pennyroyal

As Pennyroyal is an *Endangered* Irish Red List plant species, it is considered to be of **National Importance**.

5.3.2 Evaluation of Fisheries Habitat

Ballyhalwick Stream

The Ballyhalwick Stream did not form part of the fisheries surveys conducted by INIS consultants (INIS, 2014). The Ballyhalwick stream was considered a semi-natural small stream with modified profile but retaining naturalness by virtue of good water flows and localised unaltered stretches of channel. Supports evident moderate densities of brown trout (visually observed within the channel) but may also support lamprey locally and European eel. The channel may also support low densities of Atlantic salmon but these are likely downstream of section B given the presence of an impassable trash screen (i.e. blocking migration of adult salmonids). Some lamprey habitat was identified but this was localised in the context of the wider river and characteristic of many of the spate rivers in west Cork. The Ballyhalwick Stream had moderate to good quality spawning and nursery habitat with lesser quality holding habitat, due to limited deeper pool habitat over the course of the river (). Due to smaller size, modified channel and lower overall importance regionally it is considered of **Local Importance**.

River Fealge

The River Fealge was surveyed by INIS consultants during 2014 between Ahamilla and Clonakilty town centre. Brown trout, European eel, three-spined stickleback, stone loach and Atlantic salmon were recorded during the survey. The most numerous species were brown trout (n=275), followed by European eel (n=39) across four survey sites. Very small numbers of Atlantic salmon were recorded (n=3) with only slightly higher numbers of stickleback (n=4) and stone loach (n=5) over the four electro-fishing sites. As would be expected, the cobble strewn lower reaches of the river had good numbers of European eel, a species that appears to be recovering in recent years (pers. obs.) in light of longer term, large declines over the past 50 years.

The River Fealge is considered a semi-natural watercourse with local channel modifications but retaining a good semi-natural profile upstream with the characteristic floating river vegetation community of a Cork sandstone river (i.e. *Ranunculus* dominated lower diversity community). The cover of *Ranunculus* likely increases in the summer and the high winter cover (approx. 30%) would indicate moderate levels of organic enrichment. Despite the high cover of *Ranunculus*, the river has retained good status Q4 water quality based on the most 2015 water quality data collected by the EPA.

The notable high density salmonid population present in what is considered a regionally a good sized river heightens it importance. The presence of Atlantic salmon (Annex II species) albeit at much lower densities than trout, improves further its overall fisheries value. The densities of salmon may be higher upstream as only four sites were electro-fished by INIS consultants during 2014 and

Atlantic salmon density is not always consistent across survey sites in lowland rivers. The Fealge River system is also known to contain lamprey (Annex II species) and European eel (ICUN red listed species) according to INIS (2014). While the former mentioned species (i.e. lamprey) was not recorded in the four electro-fishing sites, the later species (i.e. European eel) was recorded at moderate to high densities in the environs of Clonakilty Town centre. The absence of lamprey during the electro-fishing survey should not be used as a proxy for lamprey presence in the rest of the Fealge system as lamprey habitat is typically 'patchy' across the longitudinal length of rivers and distribution can often be clumped (pers. obs.). This was reflected during the current survey, where lamprey habitat was as identified 'patchy' in local pockets as illustrated in Figure 5-2 on the River Fealge (i.e. present locally in Area C). The Fealge had mixed quality spawning, nursery and holding pool habitat that changed over the surveyed areas. Overall the spawning and nursery habitat was good to high quality with some lesser quality habitat in section B. The holding habitat quality was also mixed but was best in section A and C. Section C, the lower reach of the survey area had deep pool and scour habitat meaning it scored high in the holding pool habitat category. The River Fealge is also listed as an area of local biodiversity importance on the Clonakilty Development Plan 2009-2015 (Clonakilty Town Council, 2009). Larger salmonid bearing watercourses with good status (Q4) water quality, such as the River Fealge can be considered of **County Importance**.

Garage Stream

The Garage Stream has been re-straightened and deepened extensively over its course, but still retains some localised semi-natural habitat. The swift flows in the lower river help maintain some moderate to good quality nursery and spawning habitat in sections A and C of the survey area (Figure 5-3). Despite this the river had typically poor holding habitat. Overall, the stream character was of a narrow and shallow stream with a heavily modified profile for over 50% of channel length with the lowest quality habitat being present in section B and the lower end of section C (the upper reaches of section C being of good quality). The stream supported small numbers of brown trout (visible during survey) but may also support lamprey and European eel locally. Due to its smaller size, more extensive modified channel length, shallow depth and lower overall importance regionally, it is considered of **Local Importance**.

Convent Stream

The convent stream was considered the poorest quality fisheries habitat of all of the survey areas. The stream had a short catchment length and largely contained between retaining walls in a deep shaded channel profile. The stream was shallow and evidently suffering from pollution due to the odour of the channel and presence of abundant Waterlouse (*Asellus aquaticus*) and Tubificid worms (i.e. invertebrate indicators of poor water quality). Overall the stream was considered of low value but may have some lower potential as a brown trout nursery. The Covent Stream however, is most likely to support European eel, a more pollution tolerant species that favours shaded cobble strewn rivers close to estuaries (i.e. Clonakilty Bay). While the stream is likely of some fisheries value, its short length, modified instream habitat and heavily shaded nature indicates it of **Local Importance**.

5.4 Impacts of the Interferences

5.4.1 New/Revised Interferences

Details of the revised/new interferences are presented in Table 5-1 and are shown in the Confirmation Drawings for the Scheme in Appendix 1. Table 5-1 identifies whether the revised/new interferences pose a potential significant impact to ecological receptors. If an interference is a new inclusion to the scheme or the footprint of a revised interference has been altered, it is deemed that it may have a potential significant impact, as it was not considered in the original EIS. The interferences that are deemed to have a potential significant impact are described in Section of this report.

Table 5-1. New and revised interferences for the Scheme

Interference Number	Brief Description	Potential Significant Impact
B2	Changed distance from 6m to 12m. Replace railings with solid parapets 1.1m high (Drawing 005 in Appendix 1)	No Note 1
B6	Changed description of work. Installation of a short wall at Seymour Street Bridge. Raise parapets and seal bridge deck	No Note 1
D8	Included Clarke Street and increased distance from 130m to 200m. Re-directing the storm water sewer to a new Irish Water storm drain along Ashe Street and Clarke Street. (Drawing 004 in Appendix 1).	No Note 1
D9	Construct storm water drain along Long Quay (Drawing 004 in Appendix 1).	No Note 1
D13	New - drainage at Courtyard. Construct storm water drain at Harte's Courtyard (Drawing 004 in Appendix 1)	No Note 1
D14	New - underground pump station at Hartes Courtyard	No Note 1
D15	New - pipe existing land drain. Pipe existing surface water channel and connect through proposed headwall (Drawing 0011 in Appendix 1)	Yes
E3	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by up to 1.0 m (Drawing 0011 in Appendix 1)	No Note 1
E4	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by up to 1.0m (Drawing 0011 in Appendix 1)	No Note 1
E5	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by up to 1.0m (Drawing 0011 in Appendix 1)	No Note 1
E6	Raised height to 14.6m AOD. Raise embankments up to 6.1 m high (Drawing 008 in Appendix 1)	No Note 1
E7	Raised height from 14.0m to 14.6m.	No Note 1
E8	Raised height from 14.0m to 14.6m.	No Note 1
E10	Reduced distance from 200m to 95m. Revised layout and location of the embankment in the farmer's land beside the Ring Road. Possible short flood wall along the road to help reduce the size of the embankment. The embankment will be 95 m in length (Drawing 004 in Appendix 1) and up to 1.4m to 3.34 m AOD.	Yes
E11	New - embankment at Hennessy property. 1 m high embankment at the side of a nearby property, approx. 50 m long. (Drawing 10 in Appendix 1). This interference is linked to G12 and G18 (Drawing 10 in Appendix 1).	Yes
E12	New - embankment at Cullinane property. New embankment as residents experienced flooding from Ballyhalwick Stream. 700 mm high embankment approx. 75 m in length. (Drawing 011 in Appendix 1).	Yes
E13	New - embankment at Waterfront instead of proposed wall. Replacement of the proposed wall by an embankment. Height of embankment approx. 1 m with a setback distance	Yes

Interference Number	Brief Description	Potential Significant Impact
	of 3 m from the water's edge. Length of embankment 205m. (Drawing 004 in Appendix 1)	
G10	Reduced distance from 810m to 650m (Drawing 007 in Appendix 1). Relocating the trash screen in the Garage Stream.	Yes
G11	Reduced distance from 810m to 650m (Drawing 007 in Appendix 1). Relocating the trash screen in the Garage Stream.	Yes
G12	New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate. 60m in length. (Drawing 010 in Appendix 1)	Yes
G13	New - infill of gaps on river bank over a 30 m stretch. (Drawing 0011 in Appendix 1)	Yes
G14	New - infill of gaps on river bank over a 55m stretch of the river. (Drawing 0011 in Appendix 1)	Yes
G15	New - infill of gaps on river bank, 30m (Drawing 0011 in Appendix 1)	Yes
G16	New - infill of gaps on river bank, 20m (Drawing 0011 in Appendix 1)	Yes
G17	New - infill of gaps on river bank (Drawing 0005 in Appendix 1)	Yes
G18	New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate over 60 m in length. (Drawing 010 in Appendix 1).	Yes
H1	Increased distance from 5m to 45m. Regrade channel for flow control structure over 45 m stretch of river (Drawing 008 in Appendix 1)	Yes
H2	Increased distance from 5m to 45m. Regrade channel for flow control structure over 45 m stretch of river (Drawing 008 in Appendix 1)	Yes
L2	Registered owner updated.	NA
L4	Reduced distance from 85m to 25m (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L6	Increased distance from 10m to 20m (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank	Yes
L7	Reduced distance from 25m to 2m. (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L8	Reduced distance from 26m to 20m. (Drawing 006 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L9	Increased distance from 4m to 15m (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L11	Increased distance from 5m to 20m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L12	Increased distance from 5m to 45m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L14	Increased distance from 10m to 15m. (Drawing 005 in	No Note 1

Interference Number	Brief Description	Potential Significant Impact
	Appendix 1). Repair / replace existing channel wall / bank	
L15	Reduced distance from 75m to 40m. (Drawing 005 in Appendix 1). Repair / replace existing channel wall / bank	No Note 1
L30	Revised location and registered owner. Distance reduced from 55m to 45m. (Swapped with L31). (Drawing 004 in Appendix 1). Excavate for foundations and construct reinforced concrete wall 1.3m high.	No Note 1
L31	Revised location and registered owner. Distance increased from 45m to 55m. (Swapped with L30). Excavate for foundations and construct reinforced concrete wall 1.3m high.	No Note 1
L35	Reduced distance from 255m to 50m. (Drawing 004). Excavate for foundations and construct reinforced concrete wall 1.3m high	No Note 1
L37	Excavate for foundations and construct reinforced concrete wall up to 1.8m high to 3.68m AOD. Length of wall 180m. Wall located along Deasy's Quay. (Drawing 004 in Appendix 1).	Yes
L38	Updated description - u-shaped channel (Drawing 004 in Appendix 1). Excavate channel and install u-shaped channel with reinforced concrete walls 1.3m high for 35m.	Yes
L39	Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 65m	Yes
L41	Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 35m	Yes
L42	Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 20m	Yes
L43	New - repair / replace existing channel wall for 30 m stretch. (Drawing 006 in Appendix 1).	Yes
L44	New - repair / replace existing channel wall for 4m stretch. (Drawing 006 in Appendix 1).	Yes
L45	New - repair / replace existing channel wall. (Drawing 005 in Appendix 1).	Yes
L46	New - repair / replace existing channel wall for 20 m stretch. (Drawing 005 in Appendix 1).	Yes
L47	New - repair / replace existing channel wall for 20m stretch. (Drawing 005 in Appendix 1).	Yes
R2	New - permanent haul road to access trash screen, 80m in length (Drawing 007 in Appendix 1)	Yes
SI1	Changed description from sluice gate to penstock. Increased distance from 5m to 45m. (Drawing 008 in Appendix 1).	Yes
SI2	Changed description from sluice gate to penstock. Increased distance from 5m to 45m. (Drawing 008 in	Yes

Interference Number	Brief Description	Potential Significant Impact
	Appendix 1).	

Note 1: No potential significant impact provided the mitigation measures outlined in the original EIS and NIS are adhered to.

D15 New - pipe existing land drain. Pipe existing surface water channel and connect through proposed headwall (Drawing 0011 in Appendix 1)

This interference may pose negative impacts to the surface water quality of the Ballyhalwick Stream during construction. The works may require tree removal, however these trees do not have bat roost potential, as identified in the in the bat survey report (Appendix 2). These trees may offer bird nesting habitat. No instream works are required for the piping of this land drain. If tree removal is required, this will reduce the available bird nesting habitat within the study area.

E10 Reduced distance from 200m to 95m. Revised layout and location of the embankment in the farmer's land beside the Ring Road. Possible short flood wall along the road to help reduce the size of the embankment. The embankment will be 95 m in length (Drawing 004 in Appendix 1) and up to 1.4m to 3.34 m AOD

This interference may pose negative impacts to the surface water quality of Clonakilty Harbour during construction. No tree or bush removal will be required for the construction of the embankment as it will be located in an agricultural field. Operational impacts are not anticipated.

E11 New - embankment at Hennessy property. 1 m high embankment at the side of a nearby property, approx. 50 m long. (Drawing 10 in Appendix 1). This interference is linked to G12 and G18 (Drawing 10 in Appendix 1)

This interference may pose negative impacts to the surface water quality of the River Fealge during construction. The construction of this embankment will not result in any tree or bush removal, will be located in an agricultural field and will boarder an existing farmyard. Operational impacts are not anticipated.

E12 New - embankment at Cullinane property. New embankment as residents experienced flooding from Ballyhalwick Stream. 700 mm high embankment approx. 75 m in length. (Drawing 011 in Appendix 1)

This interference may pose negative impacts to the surface water quality of the Ballyhalwick Stream during construction. The works may require tree removal, however these trees do not have bat roost potential, as identified in the in the bat survey report (Appendix 2). These trees may offer bird nesting habitat. No instream works are required for the construction of this embankment. If tree removal is required, this will reduce the available bird nesting habitat within the study area.

E13 New - embankment at Waterfront instead of proposed wall. Replacement of the proposed wall by an embankment. Height of embankment approx. 1 m with a setback distance of 3 m from the water's edge. Length of embankment 205m. (Drawing 004 in Appendix 1)

This interference may pose negative impacts to the surface water quality of Clonakilty Harbour during construction. The works may require the removal of conifers and deciduous trees for the construction of the embankment. These trees do not offer bat roost potential and have little commuting or foraging value for bats, however they may provide nest habitat for riparian birds. The construction works may pose disturbance impacts to waterbirds of Clonakilty Harbour during construction. If tree removal is required, this will reduce the available bird nesting habitat within the study area.

G10 & G11 Reduced distance from 810m to 650m (Drawing 007 in Appendix 1). Relocating the trash screen in the Garage Stream

This interference will pose negative impacts to the surface water quality of the Garage Stream during construction. Tree removal may be required at this location, where an ivy-clad Ash tree was identified as being of PBR C-value. The surrounding vegetation also offers bird nesting potential. If tree removal is required, this will reduce the available bird nesting and bat roosting habitat within the study area. The design of the trash screens may pose a barrier to fish passage during operation.

G12 & G18 New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate. 60m in length. (Drawing 010 in Appendix 1)

This interference will involve the removal of a low hedgerow and immature Ash trees. The trees do not offer any bat roost potential. The hedge and trees may offer bird nest habitat. The works may also pose negative impact to the surface water quality of the Fealge River. The tree and hedge removal will reduce the available bird nesting habitat within the study area.

G13, G14, G15 & G16 New - infill of gaps on river bank, 20m (Drawing 0011 in Appendix 1)

This interference will pose negative impacts to the surface water quality of the Ballyhalwick Stream during construction. A continuous treeline exists between G13 - G16, from which tree and vegetation removal may be required to access the Ballyhalwick Stream to carry out these works. The bat survey identified four trees of PBR C-value along the treeline and that the hedgerow provides potential commuting and feeding areas for bats. This treeline and hedgerow also offers bird nesting potential. Instream works are not anticipated as part of these works. If tree removal is required, this will reduce the available bird nesting and bat roosting habitat within the study area.

G17 New - infill of gaps on river bank (Drawing 0005 in Appendix 1)

This interference will pose negative impacts to the surface water quality of the Fealge River during the works. Instream works are not anticipated. Tree removal may be required to access this area and conduct works. The additional bat survey identified that one tree adjacent to Weston Lodge/Bridge Street bridge is of PBR C-value. The EIS identified 4 trees adjacent to the south riverbank as medium and high potential for roosting bats. The treeline also offers bird nesting potential. If tree removal is required, this will reduce the available bird nesting and bat roosting habitat within the study area.

H1 & H2 Increased distance from 5m to 45m. Regrade channel for flow control structure over 45 m stretch of river (Drawing 008 in Appendix 1) and

Sl1 & Sl2 Changed description from sluice gate to penstock. Increased distance from 5m to 45m. (Drawing 008 in Appendix 1)

Interferences H1 & H2 and Sl1 & Sl2 are both associated works for the same section of channel downstream of the flood storage area and therefore are considered together. The works pose negative impacts to the River Fealge, through potential contaminated runoff and pollution incidents during construction. These works may require tree and vegetation removal to access the working area. The treeline and hedgerows within the working area offer potential bird nesting habitat. The original bat survey categorised the trees within the working area as having no or low bat roost potential.

If tree removal is required, this will reduce the available bird nesting habitat within the study area. As these works, will involve instream works and regrading of the channel, there will be a negative impact to the channel substrate and profile and therefore impact on fisheries. During the operational phase of the flood storage area and associated sluice gates, migration of fish will be temporarily restricted.

L37 Excavate for foundations and construct reinforced concrete wall up to 1.8m high to 3.68m AOD. Length of wall 180m. Wall located along Deasy's Quay. (Drawing 004 in Appendix 1)

This interference may pose negative impacts to the surface water quality of Clonakilty Harbour during construction. The construction works will pose disturbance impacts to waterbirds of Clonakilty Harbour during construction. No vegetation clearance is anticipated for this interference. The plant species Pennyroyal is located at Deasy's Quay on the seaward side of the proposed reinforced concrete wall. Pennyroyal may be disturbed during construction, which could potentially result in the loss of the plant at this location. Operational impacts from this interference are not anticipated.

L38 - L42 Updated description - u-shaped channel. (Drawing 004 in Appendix 1). Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high for 20m

The works pose negative impacts to the surface water quality of the Convent Stream, through potential contaminated runoff and pollution incidents, during construction. These works may require

tree or bush removal to access the working area, however the original bat survey only recorded trees of no or low bat roost potential. These trees/bushes may offer potential bird nesting habitat. If tree/bush removal is required, this will result in a loss of bird nesting habitat. As these works will involve instream works and regrading of the channel, there will be a negative impact to the channel substrate and profile and therefore impact upon fisheries.

L43 - L47 New - repair / replace existing channel wall (Drawing 005 and 006 in Appendix 1)

This interference may pose negative impacts to the surface water quality of the Fealge River during construction. The EIS identified a tree of Medium bat roost potential (Section 9.3.6, Figure 9-15, tree number 59) located downstream of L44. If tree removal is required for the works at L44, the removal of this tree will reduce the available bat roosting habitat within the study area. Certain sections of channel wall, in proximity to the proposed works, offer bat roosting potential, e.g. Tobin's Bridge and the wall at the rear of the Brewery Wall. Works in proximity to bat roosting sites within channel walls may result in the disturbance and displacement of bat species.

R2 New - permanent haul road to access trash screen, 80m in length (Drawing 007 in Appendix 1)

This interference may pose negative impacts to the surface water quality of the Garage Stream during construction. Tree removal may be required at this location, where an ivy-clad Ash tree was identified as being of PBR C-value. The surrounding vegetation also offers bird nesting potential. If tree or bush removal is required, this will reduce the available bird nesting and bat roosting habitat within the study area.

5.5 Impact Assessment of the Proposed Interferences

Section 9.4 of the original EIS addressed the potential impacts of the proposed Drainage Scheme, both in terms of short-term impacts during construction and the long-term operational impacts on ecological receptors. As many of the new/revised interferences are of a local nature, therefore many of the impact evaluations remain unchanged.

5.5.1 Short-term Construction Impacts

Designated Conservation Sites

The Drainage Scheme, including the interferences, pose potentially significant adverse impact on the Clonakilty Bay SAC and SPA. Therefore, the project is subject to an Appropriate Assessment under Article 6(3) of the Habitats Directive. A Natura Impact Statement has been prepared on the final selected option of the Scheme.

Habitats and Flora

An additional impact identified in terms of the flood defence wall to be constructed along the Ring Road (Interference L37) is the potential disturbance to Pennyroyal, a plant species protected under the Flora (Protection) Order 2015. The area of Deasy's Quay could be disturbed during construction through the movement of machinery and storage of construction materials, which could result in the damage and potential loss of Pennyroyal and its supporting habitat. This would be a direct impact and is considered to be a **major negative impact**.

Birds

The new/revised interferences will not alter the assessment of impacts on birds during construction. Thus the impact of the works during construction will be a **minor negative impact**.

Otter

The new/revised interferences will not alter the assessment of impacts on otter during construction. Thus the impact of the works during construction will be a **moderate negative impact**.

Badger

The new/revised interferences will not alter the assessment of impacts on badger during construction. Thus the impact of the works during construction will be a **neutral impact**.

Bats

During the construction phase, tree and hedgerow removal will take place at localised sites that were identified as having potential for commuting routes and feeding areas for bats. These areas are along the Ballyhalwick stream, Garage stream, at Kilgarrif adjacent to the River Fealge and adjacent to Weston Lodge (north of Emmet Square) in Clonakilty town. As outlined in Section 9.4.1 of the original EIS, the additional removal of trees with bat roosting potential and hedgerows along these sections will result in a **moderate negative impact** on bats.

Fisheries

The construction phase impacts on fisheries are likely to result from significant instream and bankside works. These include the proposed regrading of the instream channel profile locally on the River Fealge and Convent Stream, the installation of trash screens and sluice system, and the construction of flood embankments and flood walls at multiple sites within the Scheme. The instream works may directly impact the fisheries habitat locally through the removal of hard substrata (valuable for spawning) and nursery habitat. Indirect impacts include the settlement of suspended solids on river gravels downstream of works areas on the riparian verges (i.e. flood walls and embankments). Further associated impacts include pollution by chemicals such as concrete and hydrocarbons used during construction, in addition to vibration during piling or other works.

As part of instream works the construction of a new channel in the dry would be favourable. However, based on engineering constraints etc. works may be required in the existing channel in the dry via overpumping in conjunction with aquadam/ sandbag placement in the channel. This would create a temporary, impediment to fish passage along the river. However, the impact of an impediment to fish passage would be reduced as instream works are only permitted outside of the salmonid spawning period. Direct mortality of fish buried in gravels and weed beds can occur during the placement of sand bags and aqua dam structures to facilitate water diversions and within the pumping equipment etc. However, such direct impacts are considered to be restricted to the works area of the river and should not affect the salmonid populations upstream or downstream, i.e. outside of the impact zone. This is considered as in-channel works are likely to be relatively localised and confined to the immediate vicinity of instream structures (e.g. sluice location, or instream trash screen, culvert areas etc.) at the zone of intersection of embankments, headwalls and flood walls at the river verge.

Consequently, the construction impact is considered to be a direct impact and to be **medium term minor negative** for the Covent Stream, Garage Stream, Ballyhalwick Stream and the River Fealge as a result of instream and bankside works (refer to Table 5-2).

Likely indirect construction related impacts are considered to be **medium term minor negative** for the for the Covent Stream, Garage Stream, Ballyhalwick Stream and the River Fealge as a result of instream and bankside works. These include silt mobilisation, cement and hydrocarbon pollution incidents which could impact upon water quality and turbidity levels. These pollutants can settle out in spawning / nursery area gravel, cobble and *Ranunculus* habitat and impact juvenile fish.

Table 5-2. Potential construction phase impacts

Watercourse Name	Location relative to survey area	Works Proposals	Risks
Ballyhalwick	Section A & B	Bankside regrading works Piping of small adjoin surface water channel and connecting to Ballyhalwick via headwall. Excavation & construction of concrete flood wall Construction of embankment downstream of existing culvert crossing	Escapement of solids in surface water drainage. Escapement of concrete & other pollutants from construction areas. Indirect impacts to instream river gravels (moderate to good quality spawning) from bankside construction works.
Fealge	Section B	Installation of flood water storage embankment & spillway Installation of sluice gate system	Escapement of solids in surface water drainage. Escapement of concrete &

Watercourse Name	Location relative to survey area	Works Proposals	Risks
		instream	other pollutants from construction areas. Direct impact to substrate & channel profile from instream channel regrading. Associated impacts to existing salmonid and European eel population locally. Indirect impacts to instream river gravels (good quality spawning downstream) from bankside construction works.
Garage	Section A & B	Installation of new road culverts (G8 & G9) Installation of new instream trash screen & bankside access road	Escapement of solids in surface water drainage. Escapement of concrete & other pollutants from construction areas. Direct impact to substrate & channel profile from instream culvert excavation & replacement (also from trash screen installation downstream). Associated impacts to existing salmonid and European eel population locally. Indirect impacts to instream river gravels (pockets of better quality spawning habitat downstream) from bankside construction works.
Convent	Section A	Construct new concrete walls. Excavate & reinstate new U-shaped channel	Escapement of solids in surface water drainage. Escapement of concrete & other pollutants from construction areas. Direct impact to substrate & European eel habitat. Possible impacts to low density stock of salmonids if present (no e-fishing survey conducted as yet).
Clonakilty Bay	Inner Clonakilty Bay	- Excavate & build Embankment - Excavate Foundations & construct concrete wall	- Escapement of solids in surface water drainage. - Escapement of concrete & other pollutants from construction areas. - Indirect impacts to juvenile fish that use inner bay as a nursery.

Non-native Invasive Species

Construction activities in areas where non-native invasive species, in particular Japanese knotweed, are present have the potential to spread these species to un-infested areas. The additional invasive species survey identified Japanese knotweed along the Ring Road and Croppy Road (N71), where reinforced concrete walls are proposed. If appropriate working methods and biosecurity measures are not implemented, this could have a **moderate negative impact**.

5.5.2 Long-term Operational Impacts

Designated Conservation Sites

The EIS outlines the operational impacts of the Drainage Scheme. As the new and revised interferences are local in nature, the impact of the Scheme during operation remains unaltered, resulting in a **neutral impact**.

Habitats and Flora

The operation of the Scheme and reinforced concrete wall proposed along the Ring Road will not encroach into the Deasy's Quay. The proposed wall will not affect the inundation of Deasy's Quay and therefore will not affect the habitat of Pennyroyal at Deasy's Quay, resulting in a **neutral impact**.

Birds

The new/revised interferences will not alter the assessment of impacts on birds during operation. Thus the impact of the Scheme during operation will be a **neutral impact**.

Otter

The new/revised interferences will not alter the assessment of impacts on otter during operation. Thus the impact of the Scheme during operation will be a **neutral impact**.

Badger

The new/revised interferences will not alter the assessment of impacts on badger during operation. Thus the impact of the Scheme during operation will be a **neutral impact**.

Bats

The new/revised interferences will not alter the assessment of impacts on bats during operation. Thus the impact of the Scheme during operation will be a **neutral impact**.

Fisheries

The operational phase of the Scheme relates to the everyday operation of the design once infrastructure is in situ. Potential operational phase impacts are summarised in Table 5-3.

During the operation of the proposed flood storage area, the installation of sluice gates that form part of the flood storage facility of the River Fealge (section B; Figure 5-2) are likely to cause a temporary impediment to fish movements during migratory periods coinciding with high water levels, when the facility will be operational. The operation is considered to be infrequent (i.e. once every 1 to 2 years), meaning restrictions to fish passage are only during high velocity spates.

The proposed sluice gates will be of an undershot design, maintaining a minimum 200mm high submerged orifice space to allow for some unrestricted movement of water. The water velocities experienced through the resulting orifice during some flood events may be impassable to all species including powerful swimming adult salmonids.

Despite the restriction of fish passage, it will be temporary, relatively infrequent and unavoidable, if occurring during the spawning season, there is a risk that spawning areas will not be accessible and therefore recruitment may be compromised in the worst case scenario.

The smooth surface of the concrete surface of the sluice structure may provide for difficult passage of elvers and lamprey, species with slower swimming speeds than salmonids.

To allow successful operation of the sluice gates, a sill or similar structure, will be required within the channel in which the gates can lock to prevent water movement downstream in a flood event. This will result in the permanent habitat loss of a small area of in-channel habitat due to the replacement of natural channel substrate with concrete, stone and other construction materials. This may result in a very localised loss of channel habitat exploitable by fish.

The operation of the flood storage facility will likely result in a **permanent minor negative impact** to lamprey, salmonids and European eel in the River Fealge.

There is proposed regrading of the Convent Stream also to create a U-Shaped channel to convey flood waters more efficiently. The regrading of the channel will result in the permanent loss of fisheries habitat and result in a **permanent minor negative impact** to fish species, likely dominated by European eel.

There is also the risk of scour of the river bed at the outfall of the flood storage area where an increase in peak velocity will be experienced during the release of stored volume; this may potentially directly displace fish spawning habitat as the gravel survey identified that the section of channel where the embankment will be located is of good spawning potential. However, the area of impact will be extremely localised around the new structure and therefore an impact of low magnitude is therefore anticipated, resulting in a **permanent minor negative impact**.

Furthermore, the operation of the flood storage area and sluice gates will interrupt the flow of the river during flood events by holding water back. Within the confines of the storage facility, an increase in fine sediment deposition is likely to temporarily compromise the moderate spawning habitat quality currently present in this area (section B map 3.2) giving rise to a **permanent minor negative impact** on salmonid species, in terms of local spawning habitat and invertebrate foodstuff.

Localised deposition may however create habitat for burrowing lamprey ammocoetes locally, creating a **permanent minor positive impact** for lamprey species.

The redistribution of sediments downstream of the storage facility (due to a reduction in peak flows arising from the storage facility, but increased velocities due to increased confinement within the channel) and potential for net reduction in the extent of spawning gravels due to coarse sediment deposition within the storage area is likely to result in a **permanent minor negative impact** to all fish species occurring in the River Fealge.

Where culverts are to be replaced in the Garage Stream, physical barriers to upstream fish migration could be created. Elevated velocities associated with a lack of bed heterogeneity, along with engineered head differences associated with incorrect placement are possible. Such effects have the potential to give rise to a **long term minor negative impact**.

Trash screens are also to be included on the Garage Stream, meaning bar spacing has the potential to restrict the upstream migration of larger fish species, particularly adult salmonids. This would constitute a **permanent minor negative impact**.

Table 5-3: Potential operational phase impacts

Watercourse Name	Location relative to survey area	Works Proposals	Risks
Ballyhalwick	Section A & B	Piping of small adjoin surface water channel and connecting to Ballyhalwick via headwall. New flood walls & embankments	New source of solids escapement from new channel (i.e. storm water drain) Potential hydro-morphological changes, i.e. changes to channel profile after flooding and resultant changes in the patterns of erosion and deposition
Fealge	Section B	Installation of flood water storage embankment & spillway Installation of sluice gate system instream	Potential hydro-morphological changes, i.e. changes to channel profile as a result of regrading and instream sluice system. Resultant changes in the patterns of erosion and deposition. Impediment to fish caused by sluice gates during the operation of flood storage area

Watercourse Name	Location relative to survey area	Works Proposals	Risks
Garage	Section A & B	New road culverts (G8 & G9) Installation of new instream trash screen & bankside access road	Changes in water velocities, depths and fish passage as a result of culvert installations/ trash screen. Potential hydro-morphological changes, i.e. changes to channel profile as a result of new instream structures (i.e. culverts & trash screen). Resultant changes in the patterns of erosion and deposition.
Convent	Section A	New flood walls New U-shaped channel	Potential hydro-morphological changes, i.e. changes to channel profile as a result of regrading of U-shaped channel. Resultant changes in the patterns of erosion and deposition.
Clonakilty Bay	Inner Clonakilty Bay	New flood walls and embankments	Potential local changes to the patterns of sediment transport and deposition during high water levels.

Non-native Invasive Species

No operational impacts are identified in relation to non-native invasive species.

5.6 Mitigation Measures

This section describes additional mitigation measures to supplement the mitigation measures outlined in Section 9.5 of the original EIS, to avoid or reduce impacts on valued ecological receptors and protected species that will be incorporated into the proposed River Fealge (Clonakilty) Drainage Scheme.

5.6.1 Designated Conservation Sites

Please refer to Section 9.5.1 of the original EIS for mitigation measures for designated conservation sites. No supplementary mitigation measures are detailed in this report.

5.6.2 Habitats and Flora

The following mitigation measures are supplementary to those outlined in Section 9.5.2 of the original EIS;

- During site set up and prior to works near the Ring Road (Old Timoleague Road), in particular interferences L37, R1 and E10, it is recommended that the distribution of Pennyroyal at Deasy's Quay is marked/delineated to restrict access. The survey should be completed before any work at the quay commences. Signage shall be erected to identify that access to this area is prohibited.
- No machinery access or storage of materials will be allowed on Deasy's Quay, in the areas marked/delineated to restrict access.

5.6.3 Birds

Please refer to Section 9.5.3 of the original EIS for mitigation measures for birds. No supplementary mitigation measures are detailed in this report.

5.6.4 Otter

Please refer to Section 9.5.4 of the original EIS for mitigation measures for otter. No supplementary mitigation measures are detailed in this report.

5.6.5 Badger

Please refer to Section 9.5.5 of the original EIS for mitigation measures for badger. No supplementary mitigation measures are detailed in this report.

5.6.6 Bats

The following mitigation measures are supplementary to those outlined in Section 9.5.6 of the original EIS;

Tree Removal:

- Treelines and shrubs should remain in-situ and remain protected from potential management work. Minimal removal should take place in order to maintain commuting and foraging routes for bats.
- Trees identified as PBR C-value trees should be retained where possible. These are identified in the bat survey report detailed in Appendix 2;
- 6 PBR C-value trees on the Ballyhalwick stream;
- 2 PBR C-value trees on the Garage Stream;
- 1 BPR C-value tree at Weston Lodge;
- If it is necessary to remove these trees, they should be felled on a mild day during the months of September, October and February only and during mild weather conditions. C-value trees should be left to lie for 24hours after felling to allow the bats to escape.
- If PBR C-value trees are removed, alternative roosting sites must be installed;
- For every four C-value trees felled - one bat box is required,
- For every five mature trees felled - one bat box is required.
- Bat boxes should be of 'Schwegler' woodcrete bat box design and either be sited on an adjacent mature tree to that which was felled, or a bat box scheme can be erected in Waldschaff Park, Clonakilty.
- A number of bat boxes should be erected on one tree at an array of different aspects. The siting of bat boxes should be undertaken by a suitably qualified ecologist.
- Bat boxes should be monitored at least once within 12 months of their erection to monitor their use. Those that remain unused within two years of the date of erection should be re-located. Monitoring and inspection of bat boxes should be carried out by a bat licensed ecologist.

Structures:

- All equipment and construction materials should not be stored adjacent to bridges and culverts.
- The culvert located at interference G8 and G9 should have 'Schwegler' Bat Tubes inserted into the new culvert to provide roosting areas for bats.
- As stated in the original EIS, *'there will be no pointing or infilling of the existing walls in the town above 1.5m OD, unless the presence of bat roosts has been discounted via a pre-works bat roost survey*'. If works to the channel walls of the River Fealge will result in the loss of crevices suitable for roosting bats, a number of crevices suitable for roosting bats should be retained. These should be marked by a licensed bat ecologist and blocked appropriately in order to prevent filling in during the works. If it is not possible to retain these crevices, 'Schwegler' Bat Tubes should be inserted into the walls to replace crevices suitable for roosting bats.

5.6.7 Fisheries

The following mitigation measures are listed to supplement those in Section 9.5.7 of the original EIS in order to mitigate the construction and operational impacts of the Scheme on fisheries.

- In the EIS, it is stated that an '*annual fish population survey for at least three years to capture changes in length-frequency distribution*' should be carried out as part of a monitoring programme. It is recommended that multiple pass catch-depletion is employed to get accurate density readings and six replicate sites are fished. The electro-fishing sites should also overlap but not be limited to those of INIS report (2014).

Culvert Installation

The installation of culverts should follow best practice from both Inland Fisheries Ireland (i.e. IFI, 2016) and the National Roads Authority (i.e. NRA, 2008). A method statement which includes details on best practice methodologies relating to environmental control measures, must be prepared and agreed upon by Inland Fisheries Ireland in advance of works commencement. Recommendations of particular note include the following;

- Where required, all embedded culverts should be over-sized so that they can be set a minimum of 500mm below bed-level (unless stated otherwise by IFI) and set to follow the natural gradient of the bed so as to maintain natural river habitat characteristics. Ideally, the gradient should not exceed 3% and never exceed 5%.
- Where box and or pipe culverts are installed, IFI require that the approach and departure channels for such installed culverts are back-filled to a depth of up to 500mm with clean round gravel, in such size range as required where IFI determine that the material in the newly formed channel is unsuitable in terms of fish habitat.
- Any installed/modified culvert should not be less than 900mm in diameter to allow for the passage of fish. Where closed (i.e. box, pipe) culverts are required, culverts should be of similar width to that of the natural low-flow channel. It should be noted that pipe culverts are generally not acceptable except at sites demonstrating little or no significant fisheries value or potential.
- Any culverts should accommodate the speed of the slowest swimming species (i.e. European eel and lamprey) and water velocities should not exceed 1.2m/s (culverts <24m in length) or 0.9m/s (culverts >24m in length).
- Baffles should be provided within the culvert structure to locally reduce flow velocity thus aiding fish swimming/passage upstream without undue stress.
- In all cases, the culvert should be laid at a level and grade which allows the upstream invert to remain drowned (by back-watering) under low-flow conditions, to a depth suitable for the easy passage of the largest species frequenting the stream (e.g. 100mm for Brown trout, 150mm for Atlantic salmon)
- The design and layout of all culverts to be agreed in advance with the IFI prior to construction.

Ecological Clerk of Works

An Ecological Clerk of Works (ECoW) should be present during the installation of the new instream structures (i.e. sluice gates, trash screens & culverts) and during the installation of embankments and headwalls at prior agreed periods during the construction phase. This will help ensure that the environmental controls as detailed in the method statements are adhered to, and the appropriate mitigation is implemented effectively in order to maintain water quality targets in the River Fealge, tributaries, Convent Stream and Clonakilty Bay. Broadly these include low suspended solids and turbidity with no leakage of concrete or hydrocarbons in accordance with a well thought out method statement. The ECoW should also guide construction staff during high risk construction activities and make every effort to prevent water pollution and damage to sensitive fisheries habitat (as identified in Section 0 of this report). The works should be undertaken in strict accordance with method statements agreed with Inland Fisheries Ireland in advance of commencement of works. The ECoW should have at least 5 years' experience in riverine infrastructural works and should have a high level knowledge of fisheries. This knowledge base and onsite construction experience is required given the sensitivity of the River Fealge and Clonakilty Bay in particular.

Fish Salvage at Culvert Installation Sites

Areas likely to support juvenile lamprey have only been identified in the Ballyhalwick Stream adjacent to bankside re-grading proposals but not adjacent to instream works. However, salmonids and European eel do occur adjacent to instream works areas and these species should be salvaged in advance of instream works. It is recommended that salmonids and eel are removed by means of electro-fishing and translocated upstream of the works area by under DCMNR licence in advance of all culvert installation works. This will ensure local populations of fish are not significantly impacted. The fish salvation operation will be agreed as part of the schedule of works within the construction method statement to be agreed with Inland Fisheries Ireland.

The contractor is required to conduct an electro-fishing survey and fish salvage in the working area on the Convent Stream. An electro-fishing survey and fish salvage should be conducted prior to any in-river works at the site of the flow control structure on the River Fealge. The electro-fishing surveys are to be conducted under licence from IFI between July to September inclusive.

5.6.8 Non-native Invasive Species

In order to mitigate the possible spread of non-native invasive species, the following mitigation measures, in addition to those detailed in Section 9.5.8 of the original EIS, will be incorporated in to a site specific Invasive Species Management Plan:

- All works shall be conducted in accordance with the most up to date and relevant guideline on the control and management of invasive species
- An overall site specific Invasive Species Management Plan will be developed by the contractor to address any areas that may affect the proposed scheme prior to the commencement of works. The contractor shall carry out a pre-works invasive species survey to identify stands of invasive species. This will be required well in advance of the works in order to address both treatment and/or removal of Japanese Knotweed, in particular. The Invasive Species Management Plan should also cover the disposal of material contaminated with invasive species.
- All contractors and staff shall adhere to Biosecurity Protocols for invasive species.

5.6.9 Pollution Prevention Measures

A detailed and site specific Construction and Environmental Management Plan (CEMP) for the construction phase of the works will be provided to the competent authority by the contractor prior to works commencing. This shall be completed in consultation with a suitably qualified ecologist. The CEMP will incorporate the main constraints outlined in Section 9.5.9 of the original EIS.

5.7 Residual Impacts

Section 9.6 of the original EIS summarises the conclusions of Sections 9.4 '*Impacts of the Proposed Scheme*' and 9.5 '*Mitigation Measures*' and identifies what the residual impact of the proposed River Fealge (Clonakilty) Drainage Scheme will be on ecological receptors. The reader is directed to the table in the EIS, as due to the localised nature of many of the interferences, many of the impacts of the scheme, and hence residual impacts, remain unaltered. The categories that the new/revised interferences posed potential impacts to were namely; Habitats and Flora, Bats and Fisheries. The residual impact of the Scheme on these ecological receptors are outlined below.

5.7.1 Habitats and Flora

The impact posed to Pennyroyal is during construction of the Scheme. The impacts are direct disturbance and loss to the species and its supporting habitat. The mitigation outlined in this report for the avoidance of the areas of Deasy's Quay that may hold Pennyroyal during construction of the Scheme, will result in a neutral residual impact.

5.7.2 Bats

As outlined in Section 9.6 of the EIS, the mitigation measures outlined in the EIS for bats, which are supplemented by the mitigation measures detailed in this report for the additional working areas, will reduce the construction impacts from a moderate negative impact on bats to a residual impact of minor negative.

5.7.3 Fisheries

Once mitigation has been implemented in full in accordance with the contractor's method statement that will be agreed with IFI in advance of commencement of works, residual impacts are considered minor negative for the River Fealge, Ballyhalwick Stream, Garage Stream, Clonakilty Bay and the Covent Stream.

Despite physically not being a good quality salmonid stream, long term minor negative impacts are considered for the Covent Stream given there is significant channel regrading proposed. In addition, the channel length is naturally short relative to the proposed working area and the full fisheries status remains unknown without electro-fishing meaning the impact magnitude should be as stated. It must be noted however, follow up electro-fishing annually for 3 years after the installation of the flood relief infrastructure may identify no changes in the density and length-frequency (year class distributions) of salmonids, lamprey and European eel at upstream and downstream control stations at various sites in the catchment of the proposed works. Should this be the case, impact significance may be reduced to a neutral impact.

6 Hydromorphology

6.1 Introduction

Hydromorphology can be described as the hydraulic interaction between channel form and channel flows to define physical habitat. This also demonstrates the important link between hydromorphological forms and processes, and ecological condition and habitat. A hydromorphological response to a physical modification within a watercourse needs to be understood to determine not only the impacts on hydromorphological condition but also the impacts to habitats at a local scale.

6.2 Baseline Assessment

The hydromorphological assessment of the river systems is given in Section 10.3 of the original EIS.

A further assessment was carried out on the stretch of water downstream of the flow control structure. The assessment of the Ballyhalwick Stream found that depths ranged from 0.2 to 0.6 m and that the river strata is composed of 30% cobbles, 65% gravels and < 5% boulder. Sand and silt is also present with low to moderate levels of siltation.

In the River Fealge at the location of the flow control structure has a river strata comprising 10% boulder and bedrock, 40% cobble, 50% coarse, medium and fine gravels and no observed softer silt habitat.

The substrate of the wider section of the Garage stream comprise 10% boulder, 40%cobble, 30% coarse, medium and fine gravels and 20% silt.

The strata in the Convent Stream is heavily modified with the substrata dominated by cobble habitat and lesser amounts (25%) of coarse, medium, fine gravels, silt and sand.

6.3 Impacts of the new/revised interferences, without mitigation on hydromorphology during construction

The hydromorphological processes and response to the proposed flood relief scheme is important to understand due to the direct impact that it could have on altering flood capacity and changing flood risk levels. It is also important in terms of maintaining or improving biotic health through the creation and development of ecological habitats impacting on water body hydro-geomorphological status which is a fundamental component of the European Water Framework Directive (WFD).

The baseline assessment a desktop study was undertaken to determine whether the proposed flood scheme could have an impact upon any of the criteria set out in the WFD for hydromorphological condition and status.

The sluice structure and stream bed construction over the 45m reach will have hydromorphological effects which will act in the following ways:

- The flood retention at the sluice during periods of high flow will result in a jet of water at the base of sluice with velocities which have not previously been experienced at this location. This would under normal bed conditions create a scour hole in the vicinity of the jet but which will be curbed by the concrete base proposed. Any gravel replaced into this area will also be removed as a result of high velocities during these high flow conditions.
- The creation of a concrete base within the 45m section will decrease the instream flow diversity which would have been present in the natural river reach. This decreases the overall habitat quality which would have contained areas of higher and lower flow which in turn would support more diverse habitat niches.
- It has been proposed that a 300m stopper be placed at the toe of the 45m section which will act to retain gravel and other bed material which will be replaced onto the artificial concrete surface. This stopper will also act to retain sediment during times of lower flow and some deposition of silts behind the stopper can be expected during lower flow periods.
- Re-working of gravels will occur over the length of the 45m reach due to a lack of stability and ability to form a outer 'armour' layer as would occur in a gravel bed stream. This reach of stream will no longer hold potential for spawning habitat but may offer some nursery habitat or refuge areas if gravel sizes were in the coarser gravel to cobble size range.

- Downstream of the stopper board the effects on downstream flows apart from some localised turbulence just downstream of the stopper, should be minimal.

The replacement of the substrate in the Convent Stream with concrete U-Shaped section will remove the substrate over the length of the U-shaped concrete sections.

6.4 Mitigation Measures

The following mitigation measures will reduce/remedy the impacts of the scheme on the hydromorphology of the affected rivers and streams:

- No in-stream activities outside the open season of May – September to take place.
- Concrete plinth structure to be designed with a roughened surface, to provide some texture which will help with flow diversity (small scale), gravel retention in the area and with passage of fish – (benthic species in particular).
-
- Replacement of spawning habitat by creation of spawning habitat in areas upstream – equivalent to the area lost to the sluice and concreted bed structure.
- Ensure passage for elvers/ lamprey and small fish is facilitated at the downstream stopper. A bristle pass mounted to the side wall of the channel would fulfil this requirement for small eel and & lamprey.
- Ensure passage for elvers/ lamprey and small fish is facilitated at the trash screen. A bristle pass mounted to the side wall of the channel would fulfil this requirement for small eel and & lamprey.
- Consultation with IFI on all the above measures is required, to ensure the most beneficial habitat effects for the aquatic environment.

7 Soils and Geology

7.1 Introduction

This chapter outlines the existing soils and geology environment within the study area and the immediate surrounding area in relation to the potential impacts of the new/revise interferences for the Clonakilty Drainage Scheme.

7.2 Baseline Soils & Geology in the Area

7.2.1 Bedrock Geology

Clonakilty town centre is underlain by Kinsale formation which covers most of the northern part of the study area. To the north and to the south of the Kinsale formation is bands of Old Head Sandstone Formation. The downstream reach and mouth of the Fealge River is over Old Head Sandstone Formation. The Old Head Sandstone Formation is flatter-bedded sandstone and minor mudstone. The carboniferous Kinsale Formation is a grey mudstone with subordinate sandstone.

Clonakilty Harbour is over a band of Castlehaven Formation with a band of Toe Head Formation. The Castlehaven Formation is formed of purple mudstone and siltstone. The Toe Head Formation is cross-bedded sandstone and minor mudstone

There are no bedrock boreholes or karst features in the study area.

7.2.2 Superficial Deposits (soils)

There are no records of landslides in the study area.

The predominant soil type around Clonakilty is Sandstone and shales till (Devonian/Carboniferous) with some bedrock outcrops. To the south of Clonakilty, either side of the harbour soils are Sandstone till (Devonian), again with some bedrock outcrops. A band of estuarine sediments (silts/clays) separates Inchydoney Island and Clonakilty. The town of Clonakilty is classified as Made Ground.

The northern part of the study area is entirely covered with Sandstone and shales till.

7.2.3 Economic geology

There are no active quarries in the study area. The historic slate mines at Modrana are listed as area of geological interest in the draft Cork County Council Development Plan (2015-2022). Simon's Cove in Clonakilty Bay is also listed as an area of geological interest for the marine rock platform, subglacial erosion and deposition.

There are no subsidence zones in the study area.

7.2.4 Geological Heritage

There are no geological heritage sites within the study area or immediate surroundings. Clonakilty Harbour and Clonakilty Bay is a proposed Natural Heritage Site.

7.3 Impacts of the new/revised interferences on Soils & Geology during Construction

Interferences G10 and G11 (placement of supporting walls and a base for the trash screen in the Garage Stream), the construction of the haul road (R2) and the re-grading of the 45m stretch of riverbed downstream of the flow control structure (H1 and H2) will have a permanent impact on soils and geology in those areas. Interferences G10, G11 and H1 and H2 will require the removal of riverbed material and will make groundwater in these areas more vulnerable to pollution.

Other amendments to the interferences for example increasing the heights of some of the embankments, the construction of an embankment along the Waterfront (E13) will require the importation of soil from other parts of the site or externally. This will have an indirect impact on soils and geology.

The foundations for the new defence walls to be constructed as part of this scheme will require excavation to bedrock. The exposed bedrock, for the duration of the excavating of the footing, will be vulnerable to pollution from the works and the use of machinery in the area. This will result in a short -term negative impact on groundwater.

7.4 Impacts of the new/revised interferences during Operation, with Mitigation on Soils & Geology during Operation

During the operational phase, periodic maintenance will be required on the walls and the flow control structure. It is expected that a full maintenance programme will be required every 5-7 years. It is not expected that the operation of the scheme will have any significant negative impacts on soil and geology.

7.5 Mitigation Measures

During the stripping of the topsoil and the excavation of the subsoil it is recommended that the denuded area is kept to a minimum. All the excavated material should be segregated on-site into topsoil and subsoil and opportunities for re-use should be sought. Material from area where invasive species are growing or being treated is not to be re-used on site. The Contractor will need to dispose of this material in accordance with the relevant guidelines and legislation. Records of disposal shall be retained by the Contractor. Other material that is not suitable for re-use, the soil should be taken off site and disposed of at a suitability licenced facility by a licenced waste haulier company. Records of the material taken off site should be maintained in the site offices.

The stockpiles of topsoil and subsoil should be located a sufficient distance away from any watercourses. A Surface Water Management Plan should be prepared for the site that will outline how surface water runoff will be managed on site particularly in the areas around the contractor's compound and the stockpiles of material at the fluvial storage embankments. At a minimum, the Plan should address:

- Profiling the stockpiles to avoid ponding of rain water
- Surface water runoff from denuded areas should be directed to a settlement pond
- All stockpiles should be remote (>40 m) from the river or estuary
- An Emergency Procedure should be prepared for events like the spillage of diesel or hydraulic oil. All contractors and sub-contractors should be made aware of this procedure.
- Adsorbents and pig bags should be available at the site offices.

If suspect material is excavated which may indicate that the material is contaminated, then a sample of the soil should be sent to an analytical laboratory for analysis. A full waste acceptance criteria (WAC) assessment should be carried out on the material to determine if it is inert, non-hazardous or hazardous. It should be disposed of accordingly depending on its classification. It is recommended that all laboratory analysis and disposal records for the material are maintained in the site offices.

Only clean material should be imported to site for the construction of the embankments. The soil must be free from any invasive species or seeds of invasive species. Full records must be maintained by the contractor to verify same.

The movement of soil around the site, particularly in areas where Japanese Knotweed or other invasive species is known to occur or was present should be avoided. The disposal of Japanese Knotweed or other invasive species must follow the requirements of the Invasive Species Management Plan for the site. Aftercare of the burial site must be agreed with the OPW and Cork County Council and must form part of the overall maintenance contract for the Scheme.

Short-term negative impacts have been identified during the soil stripping for the construction of the embankments and the excavation of foundations for the defence walls. The presence of diesel/hydraulic oil could result in a spill of this material or a leaking of a vessel/drum into the bedrock. Strict Operating Procedures (as part of the Construction Environmental Management Plan), for the handling of this material should be prepared and individuals working in the area should be made aware of the procedures.

The potential of spillages of hazardous materials to surface water should be avoided by:

- Full containment of all hazardous material on site. Oils and hydraulic oils should be contained in bunded areas with a capacity of 110% the volume of the largest drum
- Spill kits, pig bags, adsorbents should be kept in the site office. All personnel on site should be familiar with their location. Used spill kits, or adsorbents must be replaced. Following an incident, the adsorbent should be correctly labelled as hazardous and taken off site to a suitably licenced facility for disposal. The transportation of the waste adsorbent should be carried out by a licence waste haulier. All disposal records should be maintained in the site office. An investigation should be undertaken and corrective actions put in place.

7.6 Residual Impacts

The new/revised interferences will result in a permanent loss of riverbed material in the Garage Stream and downstream of the flow control structure in the River Fealge. The removal of this material will have a knock-on impact on the hydrology of the stream/river, the habitats in these waterbodies and the species that it can support.

7.7 'Do Nothing' Scenario

In this scenario soils would erode at a natural rate due to natural forces such as weather and flooding.

8 Socio-economic Impact Assessment

8.1 Introduction

This section of the EIA expands on the information provided in the original EIS. There are interactions between socio-economic and other impacts that are addressed by other chapters of the EIS dealing with visual impacts, noise, traffic, ecology and cultural heritage.

8.2 Baseline Information

The reader is referred to section 12.2.4 (The Context of the Flood Relief Scheme) in the original EIS for a discussion on socio-economics in Clonakilty and the surrounding area.

Clonakilty is an attractive market town with a population of 4,721 as of the 2011 Census. In contrast to some other similar country towns, the legally defined core of Clonakilty has maintained an increasing population numbering exactly 4,000 compared with 3,745 in 2006.

The Clonakilty Development Plan 2009-2015 identifies the role that the town plays as key settlement within County Cork, a major retail centre and an integrated employment centre within the N71 corridor linking Schull, Castletownbere, Bantry and Cork. It aims to adopt measures that will attract economic development and employment, but to balance these with the protection of the town's attributes as a place to live and visit.

Clonakilty is an important destination for tourism. Visitors are attracted by the combination of a vibrant and attractive town centre, the built and cultural heritage, the nearby coastal scenery and beaches, along with the wider attributes of West Cork. The town contains a good number of lively cafes, pubs and craft shops along with more convention main street premises. The Model Railway Village is a specific attraction sited beside the bay. There is also a series of cultural and music festivals throughout the year. Visitor accommodation in the town is supplied by hotels and guest houses providing for over 4,400 beds.

The laudable proposals for Clonakilty's future growth are placed at risk by the threat of flooding. In recent years, significant flooding has occurred in the town on a number of occasions. In June 2012, much of the commercial heart of the town, along with areas along the River Fealge, found itself suddenly under water following a period of intense rainfall. The regularity of flooding has the potential to seriously set back aspirations to maintain a residential population and commercial activity in the town centre as set out in the Development Plan. According to the Clonakilty Chamber of Commerce, 105 private residences were impacted by the 2012 event along with 170 commercial premises, more than ten of which sustained direct losses of over €40,000. The total damage was estimated at between €6 and €7 million including material damage and loss of business. Tourism is very important to the economy of Clonakilty and the 2012 floods occurred just before the main tourist season. A more enduring legacy of the flooding is that many businesses and residents are now unable to avail of insurance cover and so would be dependent on their own resources in the event of another significant flood event.

Some of the properties worst affected by the 2012 floods were occupied by elderly people and other more vulnerable subsets of the population.

8.3 Impacts of the new/revised interferences during construction, without mitigation measures

The new/revised interferences will impact on the social and economic operations in Clonakilty. The disruption to traffic, pedestrian walkways, access to shops, cafes, restaurants etc. will have a moderate temporary negative impact on the town and its populations for the duration of the construction. The timing and duration of the disruption will very much be dependent upon the extent of the work that need to be carried out. Residents, pedestrians and commercial stores along Ashe Street and Clarkes will be disrupted during the laying of the storm water sewer (D8). Similarly, Long Quay will experience disruption. Premises and residents around Harte's Courtyard will experience similar temporary disruption during the installation of the storm water pump (D14), and the installation of the storm water drains (D13).

The residents in Weston Lodge will experience disruption during the construction of a flood defence wall (G17) beside their home. The impact will be temporary in nature. However, the construction of

the defence wall requires the removal of some trees and hedgerow in the garden and this will have a long term negative impact on the privacy at this residence.

The construction of the haul road at the trash screen on the Garage Stream will cause disruption to the nearby residents.

The installation of the U-shaped concrete channel in the Convent Stream will have a temporary negative impact on the people that live in the houses located beside the stream.

The proposed development will provide employment for approximately 18 months. There is the possibility that a proportion of workers could be sourced locally. An indirect impact will also arise from the need for impermeable material for the embankment which, due to the volume and traffic implications, will be best sourced locally if possible.

8.4 Impacts of the new/revised interferences during operation, without mitigation measures

On completion, the flood defences will have a profound positive impact by removing or greatly reducing the risk of flooding and the impacts this has in terms of severance, disruption to daily life, health and direct threats to life, business and property.

Positive impacts will be most significant for the 500 people, residing in the town centre and most especially those living in rental or owner-occupied accommodation in the central area which is at highest risk. There is a positive impact for more vulnerable population subsets such as elderly people or people with disabilities, for example people living on Casement Street or in basement flats. On previous occasions, these individuals will have had to have moved out during period of flooding or will have had to cope with a period of living in an unsatisfactory environment following a flood event. There has involved problems of material damage and damp with consequent financial and health implications.

The benefits to business will be greatest for those shops, hotels and other businesses located on Western Road, Kent Street, Connolly Street, Rossa Street, Clarke Street, Astna Street, College Road and Ashe Street/Wolftone Street. The protection should permit businesses without insurance to re-avail of cover.

The protection afforded to Clonakilty will have a major positive impact on the town's environment and economy and its ability to attract future residential and commercial development. This applies particularly to the new and infill development that would be considered under the consolidation sought for the town centre by the Town Plan. Any western expansion of the town would only be prevented in the area and immediate vicinity of the proposed flood storage area.

8.5 Mitigation Measures

The following mitigation measures are proposed to address the socio-economic impact of the new/revised interferences:

- During construction, distribute deliveries of materials to avoid peak hour traffic
- Ensure continued access to residential properties, equine businesses and farms
- Negotiate timing of any particularly noisy operations with local residents and equine businesses.
- Ensure continued access to businesses and other properties
- Minimise periods when pedestrian or cyclists diversions may be required.
- Noting that works is to be undertaken in summer, undertake these outside of one month peak summer holiday period where possible
- Keep use of stone cutting or other noisy machinery to a minimum.
- Construct walls or façade of attractive high quality materials
- Noting that works is to be undertaken in winter around the estuary, minimise any need for lane closures of N71 and particularly during run-up to Christmas.
- Ensure continued access to Old Timoleague Road and avoid use of signalling or road blockages at times of school runs for Kilgarriff National School.

8.6 Residual Impacts

Once operational, the combined effect or measures included in the flood relief scheme, including the new/revise interferences, should greatly reduce the risk of flooding. It is almost impossible for any scheme design to eliminate the risk from extreme events, but the scheme as proposed should permit the continued prosperity of Clonakilty as a place to live, work and visit. The measures will lift the flood-related anxiety of people living in the centre of town and improve access to insurance for residents and businesses. The raising of riverside walls and the construction of embankments are somewhat intrusive but overall the Scheme will have a positive impact on the town. However, in other respects, there is an opportunity to enhance the character of this heritage town using quality materials and by attracting appropriate renovation and occupancy of heritage buildings through the reassurance of reduced flood risk.

8.7 'Do Nothing' Scenario

In the event of no Scheme in the town, flooding would continue to occur. The impacts of climate change will increase the intensity of flooding in the future and Clonakilty will continue to flood and the disruption to the economy and quality of life of its citizens would continue to deteriorate.

9 Air Quality & Climate

9.1 Introduction

Air quality and climate is described in Section 14 (Air and Climate) in the original EIS. The new/revised interferences will not significantly impact on air quality or climate in the area.

Readers are however, directed to the section in the original EIS to familiarise themselves with the background air quality in Clonakilty and the recommended mitigation measures, particularly during construction.

9.2 Baseline Air Quality in Clonakilty

The baseline air quality in Clonakilty is described in Section 14.2.3 of the Original EIS.

9.3 Impacts of the new/revised interferences, without mitigation, on air quality

Construction activities including for example material handling, earth moving and excavating are likely to generate some dust emissions. All the new/revised interferences have the potential to generate dust. The potential impact from dust also depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. Most any dust produced will be deposited close to the potential source and as such any impacts from dust deposition will typically be close to the source or within 500m of it. Excavation works will be short and will only be required at some locations for preparation of foundations. Stockpiling of earth for embankments has potential to result in dust deposition but this can be reduced if mitigation measures are put in place.

The excavations around Harte's Courtyard (D13 and D14) and the excavation of the trenches for the storm water drains along Ashe Street (D8) and the Long Quay (D9) will generate dust emissions.

The construction of embankments (E3, E4, E5, E6, E7, E10, E11, E12, E13) will generate dust during the haulage and stockpiling of the material and during the construction of the embankments. The levels of dust generated will be dependent upon the operations and weather conditions. Dust generation will be temporary and the impact will be minimal to moderate.

The construction of the haul road (R2) to the trash screen on the Garage River will also generate dust. The impacts of dust deposition on the residents in the Cloheen Cottages will be minimal because of the distance between the source and the receptors. Dust will fall on the Garage Stream during the construction of the road but the levels are anticipated to be low and it will have a minimal impact on water quality in the stream.

The repair/replacement of walls within the town (L2, L4, L6, L7, L8, L9, L11, L12, L14, L15, L30, L31, L35) will involve the excavation of foundations and the construction/repair of the existing walls in the town. These operations will generate dust and the receptors will be dependent upon the stages and the location of the work. The construction activities are likely to generate dust that will mainly be confirmed to particle sizes of greater than 10 microns. The construction vehicles, generators etc. will give rise to petrol and diesel exhaust emissions, although this is of minor significance. Construction traffic to and from the sites will generate dust emissions but it is unlikely if the traffic emissions will exceed the TA Luft limit value of 350 mg/m2/d for dust deposition.

The stockpiles of material generated from the excavation of the river bed in the Convent Stream (L38, L39, L41, L42) will be a potential source of dust emissions particularly during periods of extended dry weather. The houses located close to the Garage Stream will be the receptors for these emissions. However, the impact of the dust emissions on air quality will be temporary and of minimal impact.

The stockpiles of material generated from the excavation of the river bed in the River Fealge (Sl1 and Sl2) will be a potential source of dust emissions particularly during periods of extended dry weather. The houses located close to the works will be the nearest receptors for these emissions. However, the impact of the dust emissions on air quality will be temporary and of minimal impact.

9.4 Mitigation Measures

To ensure that no dust nuisance occurs, a Dust Minimisation Plan will be formulated for the construction phase of the project. The plan must include, but not be limited to, the following measures:

- Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface.
- Any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site roads and on hard surfaced roads site management dictates that speed shall be restricted to 20 km per hour.
- All vehicles exiting the proposed embankment sites at the eastern and western ends of the town should make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary.
- Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods
- Complaints from the public regarding dust shall be dealt with immediately by the contractor
- Dust monitoring shall be carried out by the Contractor or their agents at nearby receptors closed to the working area. Dust monitoring shall be carried out using Bergerhoff Gauges and according to Method VDI 2119: Measurement of Dust Fall using Bergerhoff Gauges. Results shall be reported to the Competent Authority monthly.

9.5 Residual Impacts

The main environmental nuisance associated with construction activities is dust. However, if the construction contractor adheres to good working practices and dust mitigation measures outlined the levels of dust generated will be minimal and are unlikely to cause an environmental nuisance.

9.6 'Do Nothing' Scenario

If the drainage Scheme was not implemented air quality in Clonakilty was remain unchanged.

10 Archaeology and Cultural Heritage

10.1 Introduction

Given the archaeological potential of Clonakilty town and the surrounding areas, several detailed archaeological assessments were conducted as part of the original EIS. Consultation with the Department of Art, Heritage and the Gaeltacht at the time of the original EIS recommended additional surveys such as:

- A survey of the Historic Port area and the Old Timoleague Road
- Survey of the fulacht fia in the flood storage area
- Underwater archaeology surveys in the Fealge River and estuary

10.2 Baseline Archaeological Assessment

The reader is referred to Section 15.6 (Baseline/Receiving Environment) of the original EIS and the series of previous archaeological studies undertaken that define and refine the baseline archaeological, architectural and cultural heritage environment. These include the original EIS, the test trenching report in the flood storage area, architectural and cultural heritage survey, condition survey and underwater archaeological impact assessment all undertaken in 2015.

These previous studies have demonstrated that a total of 113 individual cultural heritage sites are located within the study area for this assessment. No National Monuments of sites with Preservation Orders are located within the study area but there are 12 Recorded Monuments (RMPs), 65 Protected Structures and 56 NIAH sites. The River Fealge itself and its estuary are an area of archaeological potential (CH#113) for the purposes of this assessment. The urban core of Clonakilty has been designated an Architectural Conservation Area (ACA) and a Zone of Archaeological Potential (ZAP).

JBA Consulting retained the services of Rubicon Heritage to assess the impact of the new/revised interferences on the archaeology of the area. Their report is provided in Appendix 4 and summarised herewith.

10.3 Impacts of the new/revised interferences on archaeology, without mitigation

The design changes in the Scheme will result in changes to the construction phase impacts. Reduction in the scale of impacts will occur largely because of a commensurate reduction in the scope of required groundworks at specific locations. New impact and increases in the scale of the impacts will occur as a result of new groundworks or an increase in the scope of required groundworks.

The archaeological assessment found that some of the new/revised interferences will have no or no new impact on the archaeological features. However, several interferences will have an impact on some archaeological features.

The assessment found that the repair and replacement of the channel wall at L15 will remove the historic fabric of the c.1807 Brewery.

There is a potential impact on CH#102 (a fulacht fia) because of excavations for the storm drains and storm water pump at Harte's Courtyard (D8, D9, D13 and D14).

The new embankment at Cullinane's property (E12) could uncover previous unknown archaeological features.

The new embankment at the Waterfront (E13), which replaces the proposed wall, will lessen the impact on historic river walls (CH#10). However additional impacts may arise due to uncovering previously unknown archaeological features.

The infilling of gaps on the river bank (G13, G14, G15, and G16) have the potential to impact on CH#113 AAP (Area of Archaeological Potential) of the River Fealge.

The construction of the reinforced concrete wall (L37) on the south side of the Ring Road may requires the presence of an archaeologist to preserve any record of the affected sections of Deasy's shipyard site (CH#115).

The work on the existing channel walls (L22, L30 and L32) may impact on a number of buildings including the masonry building with a water door on the south bank (L22), the masonry building with a water door on the west of the Seymour Pedestrian Bridge (L30) and the 19th century masonry building east of Seymour pedestrian bridge.

The re-grading of the riverbed downstream of the flow control structure (H1, H2) has a potential impact on CH#113 AAP of the River Fealge.

Any construction works close to or adjacent to any RMP (eg. CH#009 and CH#011) should be fenced off for the duration of the works and must not be used for the temporary storage of waste soil, site access and/or haulage routes.

10.4 Mitigation measures

Full details on mitigation measures to reduce/remedy impacts on archaeological features within the areas of work and given in the Rubicon Heritage report in Appendix 4.

It is recommended that the Rubicon Heritage report is read but in summary the recommendations include:

- Full archaeological excavation of the RMP fulacht fia site CH#010 should be undertaken in advance of any works
- Any RMP site adjacent to the works (eg. CH#009 and CH#011) should be fenced off from the works for the duration of the works
- A full archaeological excavation of the foundation corridor for the wall (L37) on the Ring Road should be carried out in advance to construction to ensure the preservation by record of the affected sections of Deasy's shipyard site (CH#105). Work needs to be carried out by a suitably qualified archaeologist
- A full archaeological record of the wall at the Brewery (CH#002) if it is to be replaced
- Archaeological monitoring of all groundworks (including enabling and temporary works) associated with the Scheme should be carried out during the construction phase
- A fully licenced archaeologist should be retained by the contractor to supervise any dredging works in the River Fealge
- Where possible every effort should be made to preserve in situ. Where works are going to take place close to an archaeological site, the area should be fenced off
- Repair work to the masonry walls or revetments should be undertaken by experienced masons under the supervision of the conservation architect, conservation engineer or other suitably qualified personnel
- If existing river walls or revetments are to be directly impacted, then a detailed written and photographic record of the affected section of walling or revetment should also be compiled along with a historic buildings survey (to NIAH standards) prior to its removal. Notable area where recording should be undertaken include (but not limited to):
  - L22: Masonry building with water door on the south bank
  - L30: masonry building with a water door west of the Seymour Street pedestrian bridge
  - L32: 19th century masonry building east of the Seymour Street pedestrian bridge
- A condition survey has been undertaken of the five RMP sites within the Fluvial Storage Area. The recommendations of that report should be applied
- The results of any archaeological monitoring and/or excavation will be submitted in a report to the Local Authority, the Heritage and Planning Division, Department of Arts, Heritage Rural, Regional and Gaeltacht Affairs and the National Museum of Ireland.

10.5 The 'Do Nothing' Scenario

If the proposed Scheme is not constructed then the archaeological, architectural and cultural heritage features of Clonality town and surrounding area would remain. However, over time these features would be subject to natural erosion from the elements and would require continual upkeep.

11 Landscape and Visual

11.1 Introduction

This chapter is the Landscape and Visual Assessment (LVIA) for the proposed flood alleviation scheme at Clonakilty. It sets out the potential impacts of the scheme relating to the landscape and visual amenity and outlines the recommended mitigation.

11.2 Baseline landscape

The reader is directed to Section 16.8 (Landscape: Baseline and Assessment of Effects) of the original EIS for a detailed description of the landscape and protected views within Clonakilty and the Study Area.

11.3 Impacts of the new/revised interferences, without mitigation, on the Landscape and visuals of the area

11.3.1 Bridges (B2, B5)

The replacement of the railings on the pedestrian bridge beside the Credit Union (B2) and the Seymour Street Bridge (B6) with solid parapets 1.1m high will result in the presence of new or modified elements, but they will not significantly alter the character of the area. In general, views of the river will still be possible. The visual impacts of the parapets are regarded as moderate negative impact.

11.3.2 Drainage (D8, D9, D13, D14, D15)

Drainage works at Harte's Courtyard and at Long Quay will cause a minor temporary negative impact on visuals experienced by residents and passer-by's. There will be no long term negative impact on landscape or visuals arising from the storm water drain installation works at these locations.

11.3.3 Embankments (E3, E4, E5, E6, E7, E8, E10, E11, E12, E13)

Several of the embankments at the residents along Ballyhalwick Stream (E3, E4, E5, E6) will be subject to an increased height. This will have a minor long term negative impact on the residents around these embankments.

Revised interference E10 has a revised location for the embankment on the land beside the Ring Road. The embankment will be in a low point of the field and it will not restrict the views of the estuary for the dwellings located along the Old Timoleague Road. The visual impact of the re-located embankment is neutral.

The new embankment at the Hennesey property (E11) will tie into a post and rail fencing along the road. The embankment will be 1 m in height and will, when constructed, restrict the views of the Ballyhalwick Stream for the residents. The loss of the views of the steam will be permanent consequently the impact will be a permanent minimal negative impact.

A low embankment (0.7 m) will be constructed at the Cullinane property (E12). The embankment will have a neutral impact on the visuals and landscape in this area.

An embankment at Waterfront (E13) replaces the originally proposed reinforced concrete wall at this location. The height of this embankment will be approx. 1 m high and will be set back about 3 m from the river's edge. A section of hedgerow and trees will be removed to facilitate the construction of the embankment. The loss of tree cover and presence of a new earth embankment will result in bare earth immediately post-construction. However, it is relatively localised and within the character area as a whole and within a part that displays a more fragmented urban fringe quality. The magnitude of change is medium and the effect moderate (at most), adverse.

Interferences E6, E7, and E8 (raising the flood storage embankment at Miles) will involve the raising the embankment by approximately 0.6 m above the heights shown on the Exhibition drawings. The spillway will run an east-west orientation. The flow control structure will result in a notable but localised (c.40m) change in the morphology of the Fealge river where it passes through the control structure. When retaining flows, there will be an increase in standing water upstream, which will

temporarily alter the nature of the water body. The change is low and the effect is slight, permanent, adverse. Other effects downstream are expected to be negligible.

11.3.4 General Interferences (G10, G11, G12, G13, G14, G15, G16, G17)

The trash screen on the Garage Stream (G10, G11) will have a temporary negative visual impact during construction on the Cloheen Cottage dwellings to the north east.

During operation, the trash screen will introduce an artificial concrete structure into a semi-rural/urban environment. The trash screen will be screened from view from the nearest residence by a mature hedgerow containing several trees that runs along the southern boundary of their property. The visual impact of the screen on the nearest neighbours is concluded to be minimal.

Interference G12, requires the removal of the existing ditch/hedging and replacing with timber post and fence and a gate. This will have a minimal negative visual impact for the people living in this area.

Interferences G13, G14, G15 and G16 (infilling of gaps on the river bank) will have no visual impacts on the houses living close to the Ballyhalwick Stream.

Interference G17 involves the construction of a river wall from Michael Collins Bridge to the end of Weston Lodge. This will involve the removal of trees and bushes in the gardens of Weston lodge. This will have a long-term significant negative visual impact on the resident of this house, as the current view of vegetation will be replaced by a 1 m high concrete wall.

11.3.5 Walls (L2, L4, L6, L7, L8, L9, L11, L12, L14, L15, L30, L31, L35, L37, L38, L39, L41, L42, L43, L44, L45, L46, L47)

Several of the new/revised interferences require an increase in the length of wall to be repaired. Pedestrians and residents will experience a temporary visual impact from construction plant and equipment during the construction/repair of these river walls.

Interference L37, the 180m long wall of up to 1.8m along Deasy's Quay will have a long term negative visual impact on the views of the estuary for people living in the houses backing onto the Old Timoleague Road. Deasy's Quay is not visible for travellers driving on the Ring Road. The visual impact during the construction of the wall will be temporary. This area has a more fringe character, representing the transition from the more constricted built form of the town centre to the open and rural countryside to the east of Clonakilty. It has a fragmented appearance, dominated by the busy road, roundabout and with adjacent areas of development interspersed with areas of public open space, relic farmland and foreshore.

However, it is informed by open views across the harbour, complemented by further glimpses towards both the town centre and the surrounding rural countryside. In combination, these provide a reference for the historic setting of the town, including the crossing point of the River Fealge and the economic importance of the harbour.

Views of these elements are notable for travellers heading W along the inland N76 from Bandon and Cork; it is effectively the first 'sea view' along this key route. This and the Ring Road to the E side of the harbour are both Scenic Routes within the Cork County Plan. In addition, the views also represent a 'gateway' to the town, reinforced by smaller-scale managed greenspace such as that to the east side of the N76 approaching the roundabout.

Interferences L38, L39, L41 and L42 (replacement of the exiting channel in the Convent Stream with a U-shaped concrete channel and the construction of a 1.3 m high concrete wall) will have a significant long-term negative impact on the residences living in the houses that are beside the stream.

The replacement/repair of the existing channel walls beside the Catholic Church (L47), at the Malthouse (L45 and L46) will have a temporary visual impact during the repair/construction of the channel walls. The repairs/construction of the walls will have a permanent minimal negative visual impact on the residents and pedestrians in the areas.

11.4 Mitigation Measures

The original EIS prepared a detailed assessment for the residential receptors. Details on the mitigation measures to reduce/remedy visual impacts for groups of receptors is presented in Section

16.9.2 of the EIS. The proposed mitigation measures will cover the new/revised interferences. Screen planting and seeding of embankments will help to mitigate the visual impacts.

Appropriate finishes to walls, matching the existing walls where possible will help to mitigate the visual impacts of the new/repaired channel walls in the town.

Sensitive cladding and design of the defence wall along Deasy's Quay will help to reduce the visual impact for the receptors and on the landscape in this area. Consideration in the use of appropriate design that reflect the vernacular and local materials such as is used on the walls along the Ring Road.

Sensitive cladding and design of the defence wall along the Weston Lodge will help to reduce the visual impact for the receptors and on the landscape in this area. Minimising the removal of trees in this area prior to construction will help to naturally reduce the impacts of the defence wall on the sensitive receptors. When complete, planting of native shrubs on the landside of the defence wall will help to soften the visual impact and over time the residual impact will be reduced.

Sensitive cladding and design of the defence wall along the Convent Stream will help to reduce the visual impact for the receptors and on the landscape in this area. Avoid loss of trees where possible.

Tree or vegetation removal particularly between the Convent Road and the Old Timoleague Road, should be kept to a minimum where possible.

Any finishes and design to new flood alleviation structures should - as far as possible-reflect the aspirations of the cultural and historical aspirations of the architecturally significant part of the town.

11.5 Residual Impacts

The residual impacts for the smaller embankments will be negligible when seeded.

The residual impacts of the new/refurbished channel walls in the town will be slight to neutral and permanent.

The residual impacts of the defence wall along Deasy's Quay will be slight to neutral and permanent.

11.6 The 'Do Nothing' Scenario

In this scenario, the landscapes in the town and surrounding areas would be subject to on-going maintenance by the Council or landowners. If left unattended the landscapes particularly hedgerows would eventually become colonised by mature trees. This would naturally change the functions of the hedgerows and through time different species would inhabit these areas.

In the 'do nothing' scenario the channel walls would continue to erode and with a predicted increase in the intensity of flooding due to climate change, the walls would become less effective for their intended purpose.

An increase in the intensity of flooding would also naturally flood more land and make it subject to erosion.

12 Traffic

12.1 Introduction

The traffic section of the original EIS was completed by NRB Consulting Engineers Limited and much of the assessment of the new/revised interferences is based on the data used in the EIS.

No additional traffic counts were carried out for this assessment.

12.2 Baseline Traffic in Clonakilty

Clonakilty has an attractive and compact town centre, which is defined by a system of narrow, mostly one-way, streets, with on-street parking available. The N71 National Secondary Road runs through the town, in a broadly north-west direction. The N71 is a National Secondary Road, the primary link between Cork City and Bandon with Clonakilty, and onwards to Skibbereen and West Cork.

The town is also linked to the surrounding hinterland via the Regional Road R588 (Fernhill Road) which runs northbound from the town, the Regional Road R599 which runs North-West, and the Regional Road R600 linking to the east to Timoleague. Each of these Regional Roads links with the N71 National Road on the approach to, or within, the Town Centre.

The N71 through the town is a very narrow single carriageway road with a very restrictive horizontal alignment (several bends where large vehicles can only pass with care at very slow speeds).

The NRA Traffic Counter information (N71 Between Clonakilty and Jones Bridge, Clonakilty, Co. Cork) indicates that the N71 carried an Annual Average Daily Traffic Flow (AADT) of 8,566 Passenger Car Units (PCUs, or "car-equivalents) with 3.1% Heavy Goods Vehicles (HGV) content in 2013 (HGVs being considered as trucks with more than 2 axles for the purposes of this assessment).

A classified traffic survey carried out as part of the original EIS in October 2014 indicated that the N71 to the western perimeter of the town, at the preferred location for the creation of the storage area, carries an AADT of 6930 PCUs with 1.7% HGV content.

12.3 Impact of the New/Revised Interferences on traffic during construction, without mitigation measures

Like the EIS, it is assumed that all in-river works will be carried out between May and September inclusive. This will provide a worst-case assessment of the impacts upon roads during the construction of the scheme.

12.3.1 Bridges (B2, B6)

The construction of the parapets on these two bridges will cause local traffic disruptions. It is expected that the nearby carpark to the Credit Union pedestrian bridge will be sued by contractors as a set down area for plant and equipment. An area of the car park will be cordoned off for this purpose. The impact on traffic will be a temporary significant impact on traffic movements particularly during the tourist season.

12.3.2 Drainage (D8, D9, D13, D14, D15)

The installation of the storm water drainage and the underground storm water pump in the Harte's Courtyard (D13 and D14) car park will cause a temporary moderate negative impact on traffic in this area during the excavation and laying of the drain.

The excavation of the storm water drain along Ashe Street and Clarke's Street (D8) will cause temporary moderate negative impact on traffic movement and flow along these streets. The traffic disruption will extend for the duration of the works at this location.

The excavation of the storm water drain along Long Quay (D9) will cause temporary moderate negative impacts on traffic movement and flow along the street. The traffic disruption will extend for the duration of the works at this location.

12.3.3 Embankments (E3, E4, E5, E6, E7, E8, E10, E11, E12, E13)

Several of the embankments at the residents along Ballyhalwick Stream (E3, E4, E5, E6) will be subject to an increased height. This will have a minor temporary negative impact on traffic along the road at these residents.

Revised interference E10 has a revised location for the embankment on the land beside the Ring Road. The construction of the embankment and the haulage of material will have a temporary minor negative impact on people using this road.

A low embankment (0.7 m) will be constructed at the Cullinane property (E12). The construction of the embankment and the haulage of material will have a temporary minor negative impact on people using this road.

An embankment at Waterfront (E13) replaces the originally proposed reinforced concrete wall at this location. The height of this embankment will be approx. 1 m high and will be set back about 3 m from the river's edge. Construction traffic will probably approach the site from the Inchydoney Road. Parking of the plant and machinery will probably be on the hard-standing areas just north of the football field. Traffic on the Inchydoney Road will be temporarily impacted upon by construction traffic and haulage trucks.

12.3.4 General Interferences (G10, G11, G12, G13, G14, G15, G16, G17)

Plant and equipment for the construction of the trash screen on the Garage Stream (G10, G11) and the construction of the access road to the screen (R2) will probably access the site via the Cloheen Road via the N71. The increased traffic movements will have a temporary negative impact on traffic movements in the area during construction. Residents in the Cloheen Cottages will experience the biggest impact.

Interference G17 involves the construction of a river wall from Michael Collins Bridge to the end of Weston Lodge. This operation will involve an increase in HGV movements along Kent Street. The increased traffic movements will occur during the felling of the trees in the garden of this premises. Excavation of foundations for the reinforced concrete wall will require an excavator and several concrete trucks to form the wall. This impact will be temporary moderate impact on traffic movements in Kent Street and in the town.

12.3.5 11.3.5 Walls (L2, L4, L6, L7, L8, L9, L11, L12, L14, L15, L30, L31, L35, L37, L38, L39, L41, L42, L43, L44, L45, L46, L47)

Several of the new/revised interferences require an increase in the length of wall to be repaired. This will not add any significant volumes of traffic and hence the impact to traffic movements will be temporary and minor.

Interference L37, the 180m long wall of up to 1.8m along Deasy's Quay will have a temporary moderate impact on traffic flows on the Ring Road. The duration of the impact will be dependent upon the length of construction.

Interferences L38, L39, L41 and L42 (replacement of the exiting channel in the Convent Stream with a U-shaped concrete channel and the construction of a 1.3 m high concrete wall) will have a moderate temporary negative impact on traffic entering the town from the Cork side.

The replacement/repair of the existing channel walls beside the Catholic Church (L47), at the Malthouse (L45 and L46) will have a temporary increase in traffic along Bridge Street and Old Brewery Lane. The impact will be temporary moderate and negative.

12.4 Mitigation Measures

Several mitigation measures were given in the original EIS. A temporary traffic management plan will be required for the town during the construction of the Scheme. The contractor will liaise with the Garda to initiate the management plan. It is envisioned that traffic restrictions/one way traffic/traffic control measures will be implemented in different streets and parts of the town depending on the location of construction.

The mitigation measures that are included in Section 9.4 (Mitigation measures for Air) are applicable here.

12.5 Residual Impacts

Commuters will experience traffic delays in the town even when a traffic management plan is implemented. The disruption in traffic flows will impact on tourists visiting Clonakilty and surrounding areas.

12.6 The 'Do Nothing' Scenario

If the Scheme was not constructed in Clonakilty, the intensity of flood events would have a greater impact on roads within the town and surrounding areas. Roads located along the coast eg. Croppy Road, and the Ring Road would be subject to increased flooding and in time the surface and bases of these roads would become eroded.

13 Noise

13.1 Introduction

An ambient noise survey was carried out as part of the original EIS. The reader is referred to Section 17 of the original EIS. No new noise surveys have been undertaken as part of this EIS, because it is considered that the noise environment in the town has not changed significantly since the 2014 surveys.

Although the construction phase of the proposed scheme has the greatest potential for impact it must be recognised that these works will be temporary in duration. It is anticipated that construction works will take approximately 18 months to complete. However, works will not be on-going in any one area for the duration of the construction phase. Given the fact that the scheme primarily comprises of constructing flood defences near coastal and areas close to the town centre, construction works will progress along the scheme which will in effect be a linear development. Therefore, construction works associated with the proposed flood defence scheme will be temporary and transient in nature.

13.2 Baseline noise conditions in the town

The main sources of noise in the town is local and distant traffic. Traffic movements on the Cork Road, the local by-pass and the Timoleague Road were main noise sources.

13.3 Impacts of the new/revised interferences on noise, without mitigation

During the various phases of construction of the proposed drainage scheme, the main potential noise sources that would be evident at the site would be: -

- Site Preparation, noise will be generated by plant and machinery used to place fill material to form flood defence embankments at the site, construct concrete flood defence walls etc. For example, the haulage of soil for the construction of the embankments at the Waterfront (E13) will mean that the residents of the Waterfront apartment complex will experience an increase in ambient noise levels during the construction of the embankment. The noise sources will predominantly be haulage traffic and excavators used to place the soil.
- Haulage of fill construction materials to the site, by heavy goods vehicles and distribution of the material to the different sections of the drainage scheme site by excavators and earth mover trucks.
- Internal/external haulage and delivery of construction materials by trucks.
- Traffic associated with employees working at the site during the construction phase of the proposed drainage scheme.

The local road (The Ring Road) along the sea wall will be elevated over a 200 m stretch and there is potential for increased noise levels. Existing noise levels in this area are influenced by regular traffic movements from several local roads, which converge at the Cork Road Roundabout. The average noise levels were recorded at 62-63dB(A). Where the activity will take place at distances close to 60m from the embankment there is likely for Moderate-Significant impact with noise levels in the region of 75-80dB(A) for a number of weeks, thereafter with levels expected to be reduced to 70-75dB(A) at the nearest properties. It is expected the resultant traffic noise generated for the construction of the embankment (E10) will not give rise to significant impact, considering the existing traffic dominated local noise environment. The construction of the flood defence wall (L37) along Deasy's Quay will result in an increase in ambient noise levels in the area. The ambient noise levels of 62 dBA will increase over the construction period and when construction activities are close to the houses the residents will experience a Moderate-Significant Impact with noise levels reaching 70-75 dBA. The increase in noise levels will be temporary in nature

The repair/replacement of the channel walls in the town (L4, L6, L7, L8, L9, L11, L12, L14, L15, L35) will result in an increase in ambient noise levels in these areas. The resultant noise level at the noise sensitive location will be dependent upon:

- The types of works undertaken
- The proximity of these works to the residents.

The current noise levels in the town are dominated by traffic noise and noise was recorded in the range 56-63 dBA for the 2014 noise survey. Where in-river works take place, there will be a requirement for pumping of water with the resultant noise levels predicted to be 66dB(A) at 10m from the pump. The likely construction of small scale cofferdams may require excavators work in the area for short-term periods early in this phase. Once this initial excavation has been completed it is expected that the wall construction will proceed with only minimal local noise impact. At 40m from source the sound level from excavations will reach 78dB(A) so there is potential for moderate impact where these works take place. The area around the Credit Union and Library will likely be impacted by short-term increases in noise levels. The impact is also predicted to be moderate.

The work that will be undertaken at Harte's Courtyard (D13, D14) will result in an increase in ambient noise levels throughout the excavation for the storm water pump and the laying of the storm water drain. At 40m the sound levels will reach 78db(A) and this will cause a moderate impact on the residents in the apartments.

Interference G17 involves the construction of a river wall from Michael Collins Bridge to the end of Weston Lodge. This operation will involve an increase in HGV movements along Kent Street and the excavation for foundations and concrete pumps to create the wall. It is anticipated that noise levels in the range 70-75 db(A) could arise from these operations. These noise levels would have a moderate impact on the residents of Weston Lodge and pedestrians in the area of the church.

13.4 Mitigation Measures

Reference will be made to BS 5228-1: 2009: Code of Practice for Noise and Vibration Control on Construction and Open Sites: Noise, which offers detailed guidance on the control of noise & vibration from demolition and construction activities. It is proposed that various practices will be adopted during construction, including:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted
- provision of a 2.4m high hoarding around concrete wall and embankment works areas;
- establishing channels of communication between the contractor/developer, Local Authority and residents
- appointing a site representative responsible for matters relating to noise and vibration
- monitoring typical levels of noise and vibration during critical periods and at sensitive locations
- Furthermore, it is envisaged that a variety of practicable noise control measures will be employed

These may include:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- erection of enclosures as necessary around noisy processes and items such as generators, heavy mechanical plant or high duty compressors;
- placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary;

It is recommended that vibration from construction activities be limited to the NRA guideline values. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%.

A programme of noise monitoring will be initiated by the Contractor or their agents throughout the project.

Noise complaints will be addressed as soon as possible and noise monitoring will be carried out at the dwelling of the complainant.

13.5 Residual Impacts

There will be no significant residual noise and vibration impacts associated with the construction or operation stage of the proposed flood defence scheme.

13.6 The 'Do Nothing' Scenario

If the flood relief scheme was not constructed, the noise environment in Clonakilty would continue to be dominated by traffic noise. Typical diurnal and seasonal variation in noise levels would apply.

14 Interaction of the Foregoing

14.1 Introduction

This addendum to the original EIS, has systematically addressed the impacts of the new/revised interferences on water, ecology, soils & geology, air & climate, landscape and visuals, archaeology and cultural heritage, humans, noise and traffic and socio-economic aspects. This section of the EIS will assess the potential interactive effects of the project. It will demonstrate that an impact on one environmental receptor eg. water may have an impact on another environmental receptor like ecology.

Although the EIA Directive requires an impact assessment of a project on a range of environmental receptors, it also requires an assessment of the interaction of the impacts on receptors.

JBA's EIA specialists and specialist consultants has prepared a table (Table 4-1) illustrating the interaction and cumulative impacts which could occur as a result of the new/revised interferences.

Table 14-1: Interaction of Impacts

Cumulative Impacts	Human Beings	Noise	Ecology	Landscape & Visual	Archaeology	Soil, Geology Hyrdogeology	Water Quality & Fisheries
Human Beings		X	X	X	X	X	X
Noise	X						
Ecology	X	X		X		X	X
Landscape & Visual	X	X				X	
Archaeology	X						
Soil, Geology Hyrdogeology	X		X	X	X		X
Water Quality & Fisheries	X		X			X	

14.2 Interactions

The assessment has demonstrated that the following interactions are likely to occur.

14.2.1 Water Quality and Ecology

In this context, the term 'ecology' is meaning to include fisheries in the River Fealge, Convent Stream, the Ballyhalwick Stream and the Garage Stream. The impact of the works on water quality will have a knock-on impact on fisheries and ecology of the area. For example, an increase in suspended solids in the water during the construction of the Scheme will have an impact on fisheries in these water bodies. The impact may be direct on the fish, for example, clogging their gills or indirect by clogging their food source (macroinvertabrates) of by silting up their spawning areas.

Similarly, the removal of trees to facilitate the regrading of the river downstream of the flow control device will have an impact on the level of shade in this portion of the river which will impact on fish using it as a nursey/feeding ground.

The removal of trees may also impact on the roosting and foraging habitats for bats.

14.2.2 Humans and air quality and noise

The interaction of noise generated from construction plant and tools will also be the source of dust emissions during the work. Both dust and noise can be regarded as 'nuisance' during construction and it is this that the public are most likely to complain about.

The generation of dust and noise is closely linked with the volumes of traffic generated during different stages of the construction programme. Truck washing measures, dedicated truck routes and rumble strips at the site exit can help to significantly reduce dust generation.

14.2.3 Ecology, water quality and hydromorphology

Changes in the hydromorphological regime in the rivers and streams will have an indirect impact on water quality and ecology. Discussions with the IFI have been considered although a 45 m regrading of the River Fealge downstream of the flow control structure will impact on fisheries and water quality downstream. Similarly, the concrete structure to support the trash screen in the Garage Stream will impact on the water quality and fisheries in the stream.

The replacement of the natural riverbed in the Convent Stream with U-shaped concrete will impact on the hydromorphology and ecology of the stream.

14.2.4 Socio-economic and Landscape and Visual

Views of the river and the channel walls will be disrupted during the construction stages. This will have a temporary impact on visual and on the socio-economic fabric of the town. Temporary fencing, dewatering equipment, sections of dry river bed will all interact to disrupt the visual and cultural experience in the town by pedestrians and tourists.

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Appendices

Appendix A: Confirmation Drawing -Mott MacDonald

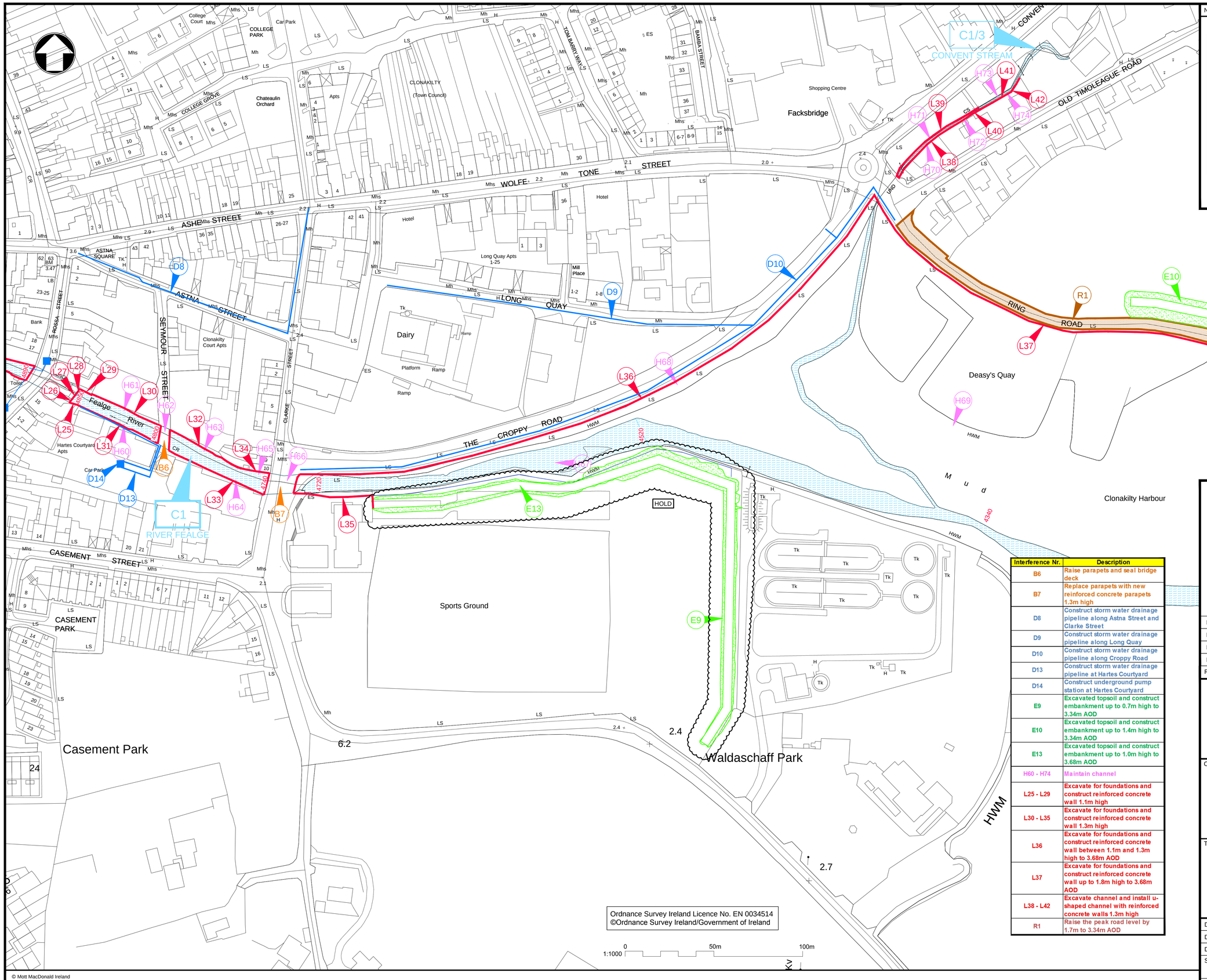
Appendix B: Bat Survey Report- Bat Eco-Services

Appendix C: Fish Survey Report- Triturus Services

Appendix D: Archaeology Assessment

A Appendix- Confirmation Drawings

Mott MacDonald



Notes

KEY PLAN
Scale NTS

CONFIRMATION COPY

Interference Nr.	Description
B6	Raise parapets and seal bridge deck
B7	Replace parapets with new reinforced concrete parapets 1.3m high
D8	Construct storm water drainage pipeline along Astna Street and Clarke Street
D9	Construct storm water drainage pipeline along Long Quay
D10	Construct storm water drainage pipeline along Croppy Road
D13	Construct storm water drainage pipeline at Hartes Courtyard
D14	Construct underground pump station at Hartes Courtyard
E9	Excavated topsoil and construct embankment up to 0.7m high to 3.34m AOD
E10	Excavated topsoil and construct embankment up to 1.4m high to 3.34m AOD
E13	Excavated topsoil and construct embankment up to 1.0m high to 3.68m AOD
H60 - H74	Maintain channel
L25 - L29	Excave for foundations and construct reinforced concrete wall 1.1m high
L30 - L35	Excave for foundations and construct reinforced concrete wall 1.3m high
L36	Excave for foundations and construct reinforced concrete wall between 1.1m and 1.3m high to 3.68m AOD
L37	Excave for foundations and construct reinforced concrete wall up to 1.8m high to 3.68m AOD
L38 - L42	Excave channel and install u-shaped channel with reinforced concrete walls 1.3m high
R1	Raise the peak road level by 1.7m to 3.34m AOD

Legend:

- EMBANKMENT
- REPAIR / REPLACE CHANNEL WALL
- MAINTAIN CHANNEL
- BRIDGE REPAIR
- SURFACE WATER SEWER
- PUMP STATION
- ROAD LEVEL ADJUSTED

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Title
River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (1 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
MMD-332149-N-DR-00-XX-0004

1:1000 0 50m 100m

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Interference Nr.	Description
B1, B4, B5	Repair / replace existing bridge parapet 1.1m high
B2, B3	Replace railings with solid bridge parapets 1.1m high
D1	Construct storm water drainage pipeline along Kent Street
D2	Construct storm water drainage pipeline along Connelly Street
D3	Construct underground pumping station on Kent Street with outfall to river
D4	Construct storm water drainage pipeline in Kent Street Car Park
D5	Construct underground pumping station in Kent Street Car Park with outfall to river
D7	Construct underground pumping station on Rossa Street with outfall to river
G 17	Infill of gaps and low points in river bank
H26 - H59	Maintain channel
L8 - L15	Repair / replace existing channel wall / bank
L16 - L24	Excavate for foundations and construct reinforced concrete wall 1.1m high
L45, L46, L47	Repair / replace existing channel wall

Notes

KEY PLAN
Scale NTS

Legend:

- REPAIR / REPLACE CHANNEL WALL
- MAINTAIN CHANNEL
- BRIDGE REPAIR
- SURFACE WATER SEWER
- PUMP STATION

CONFIRMATION COPY

0 1:1000 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.14	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Title
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Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (2 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	
Scale at A1	Status		Rev	Security	
1:1000	PRE		P3	STD	

Drawing Number
MMD-332149-N-DR-00-XX-0005

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Interference Nr.	Description
H4	Regrade channel for flow control structure and spillway
H5 - H28	Maintain channel
L4 - L8	Repair / replace existing channel wall
L43, L44, L45	Repair / replace existing channel wall

Notes

KEY PLAN

Scale NTS

Legend:

REPAIR / REPLACE WALLS

MAINTAIN CHANNEL

CONFIRMATION COPY

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Title

River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (3 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
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Interference Nr.	Description
G8, G9	Replace 2Nr. existing culverts under the road with a single culvert structure
G10, G11	Install trash screen in river channel
R2	Construct access road and site entrance for access to trash screen

Notes

KEY PLAN
Scale NTS

Legend:

REPLACE CULVERT

TRASH SCREEN

ACCESS ROAD

CONFIRMATION COPY

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Title
River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (4 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
MMD-332149-N-DR-00-XX-0007

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Area Flooded during Fluvial Events (m2)						
Interference Nr.	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
G1	0.00	2,554.86	6,204.81	15,243.18	30,080.51	41,989.56
G2	466.54	16,149.00	20,241.63	30,621.11	44,970.54	55,447.94
G3	9,587.74	19,462.87	20,741.18	22,449.71	24,292.74	25,563.71
G4	4,421.55	10,383.36	11,221.01	12,796.43	15,857.78	18,170.73
G5	18,482.60	20,492.62	20,958.46	21,709.23	22,381.50	22,748.31
G6	6,592.52	8,705.28	9,000.74	9,621.74	10,188.38	10,480.80
G7	8,576.31	10,849.21	10,968.39	11,014.23	11,017.57	11,017.57

Interference Nr.	Description
G1 - G7	Increasing extent and depth of flooding during flood event
E6	Excavated topsoil and construct embankment up to 6.1m high to 14.6m AOD
E7	Excavated topsoil and construct embankment up to 6.1m high to 14.6m AOD
E8	Excavated topsoil and construct embankment up to 6.1m high to 14.6m AOD
H1, H2	Regrade channel for flow control structure
H3	Construct overflow spillway from embankment and flow control structure
H4	Regrade channel for flow control structure and spillway
H5	Maintain channel
SI1, SI2	Construct reinforced concrete flow control structure for penstock

Notes

KEY PLAN
Scale NTS

Legend:

EMBANKMENT

SLUICE GATE

SPILLWAY

1% AEP STORAGE AREA OUTLINE

CONFIRMATION COPY

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Trim
Co. Meath

Title
River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (5 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
MMD-332149-N-DR-00-XX-0008

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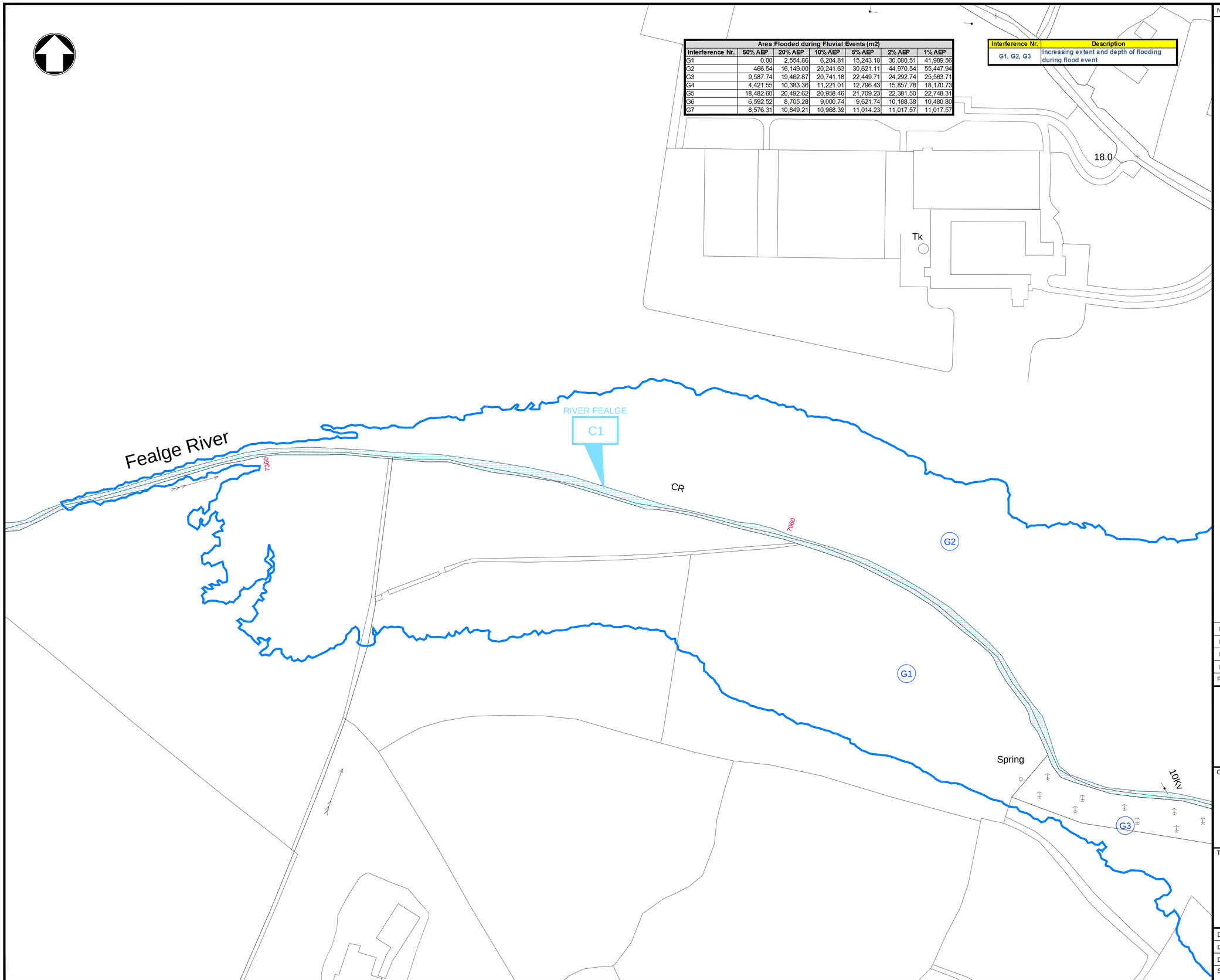
Area Flooded during Fluvial Events (m2)						
Interference Nr.	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
G1	0.00	2,554.86	6,204.81	15,243.18	30,080.51	41,989.56
G2	466.54	16,149.00	20,241.63	30,621.11	44,970.54	55,447.94
G3	9,587.74	19,462.87	20,741.18	22,449.71	24,292.74	25,563.71
G4	4,421.55	10,383.36	11,221.01	12,796.43	15,857.78	18,170.73
G5	18,482.60	20,492.62	20,958.46	21,709.23	22,381.50	22,748.31
G6	6,592.52	8,705.28	9,000.74	9,621.74	10,188.38	10,480.80
G7	8,576.31	10,849.21	10,968.39	11,014.23	11,017.57	11,017.57

Interference Nr.	Description
G1, G2, G3	Increasing extent and depth of flooding during flood event



Notes

KEY PLAN
Scale NTS

Legend:

1% AEP STORAGE AREA OUTLINE

CONFIRMATION COPY

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

Title
River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (6 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
MMD-332149-N-DR-00-XX-0009

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Interference Nr.	Description
E11	Excavate topsoil and construct embankment up to 1.0m high to 16.5m AOD
G12 / G18	Remove existing ditch / hedging and replace with timber post and rail fence and gate

27.6
17.8
17.3
17.3
16.8
CR
7940
C1
RIVER FEALGE
G12
7820
G18
E11
CR
7570
Fealge River

Notes

KEY PLAN
Scale NTS

Legend:

EMBANKMENT

CONFIRMATION COPY

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Title
River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (7 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
MMD-332149-N-DR-00-XX-0010

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Interference Nr.	Description
E3, E4, E5	Excavate topsoil and construct embankment up to 1.0m high to 22.1m AOD
E12	Excavate topsoil and construct embankment up to 0.7m high to 26.3m AOD
L1, L2, L3	Excavate for foundations and construct reinforced concrete wall 1.1m high
D15	Pipe existing surface water channel and connect through proposed headwall
G13 - G16	Infill of gaps and low points in river bank

Notes

KEY PLAN
Scale NTS

Legend:

EMBANKMENT

REINFORCED CONCRETE WALL

SURFACE WATER SEWER

CONFIRMATION COPY

1:1000 0 50m 100m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	.2016	DGal	For Information	TDon	BOC
P3	21.09.2016	DGal	For Information	TDon	BOC
P2	08.12.2014	DGal	For Information	TDon	BOC
P1	26.11.2014	DGal	For Information	TDon	BOC

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Title
River Fealge (Clonakilty)
Certified Drainage Scheme

Proposed Flood Defence Works
Scheme Layout (8 of 8)

Designed	-		Eng check	T Donovan	
Drawn	D Gallagher		Coordination	-	
Dwg check	-		Approved	B O'Connor	

Scale at A1	Status	Rev	Security
1:1000	PRE	P4	STD

Drawing Number
MMD-332149-N-DR-00-XX-0011

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B Appendix- Bat Survey Report

Bat Eco Services

DR TINA AUGHNEY, BAT ECO SERVICES

River Fealge (Clonakilty)

Certified Drainage Scheme

Winter Assessment - Bat Survey

Dr Tina Aughney

2016

Report prepared for:

JBA Consulting, Unit 3, Greenogue Business Plaza, Greenogue Business Park, Rathcoole, Dublin, D24 YN81.

ULEX HOUSE, DRUMHEEL, LISDUFF, VIRGINIA, COUNTY CAVAN
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SUMMARY

Site:	River Fealge and tributaries, Clonkilty, Co. Cork
Development:	Certified Drainage Scheme
Proposed work:	Felling of trees / treelines / hedgerows
Report by:	Dr Tina Aughney
Bat species recorded:	Potential Bat Roost (PBRs) sites.

1. Introduction

Sections of the River Fealge and tributaries were surveyed by the Dr Tina Aughney, Bat Eco Services, in relation to potential bat roosts and potential bat commuting routes / foraging areas. Such surveying was completed due to the fact that bats are protected species under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000). Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions. Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All bat species are protected under Annex IV of the EU Habitats Directive, while the lesser horseshoe bat is listed under Annex II. Member states are required to designate Special Areas of Conservation for all species listed under Annex II in order to protect them.

Therefore a winter assessment was requested to determine the potential bat usage of this proposed development and in view of the fact all bat species are protected under Irish and EU legislation.

1.2 Methodology

The sections to be surveyed were visited during the daytime on 10th and 11th December 2016 and assessed according to:

a) Presence of mature trees
b) Degree of treeline/hedgerow network in the landscape
c) Location (rural / urban)
d) Presence of building likely to provide roosting sites

Using these points, the bat potential of each area surveyed was assessed and is reported in Section 2.

Trees deemed potentially suitable as bat roosts were further assessed to determine their scale of value. The importance of trees to bats varies with species, season and foraging behaviour. For Leisler's bats, trees are essential for both summer and winter roosts, while Daubenton's and Natterer's bats utilise trees more often during the summer months. Other species such as brown long-eared bats and pipistrelle bats avail of trees in the autumn and winter months. In general, individual males throughout the season use tree roosts more often, while females will use trees for temporary night roosts or night perches for consuming prey. Hollow trees are widely used by bats for both summer and winter roosts (weather

dependent) and bats will roost in ‘sound’ trees in crevices, holes and under split bark. Bats rest, give birth, raise young and hibernate in tree holes, crevices and beneath loose bark. Species of trees utilised by bats include oak, ash, beech and Scots pine. Trees, especially native ones, also play host to numerous insect species which are prey items for bat species. Trees also provide shelter for swarming insects which bats will avail of. In addition, trees are important commuting routes for bats. A gap in a hedge/treeline of greater than 10m may force some species of bats to seek an alternative commuting route. It is recommended that any trees proposed to be felled or subject to tree surgery works should be subjected to a bat survey to ensure that trees are felled without harming potentially roosting bats.

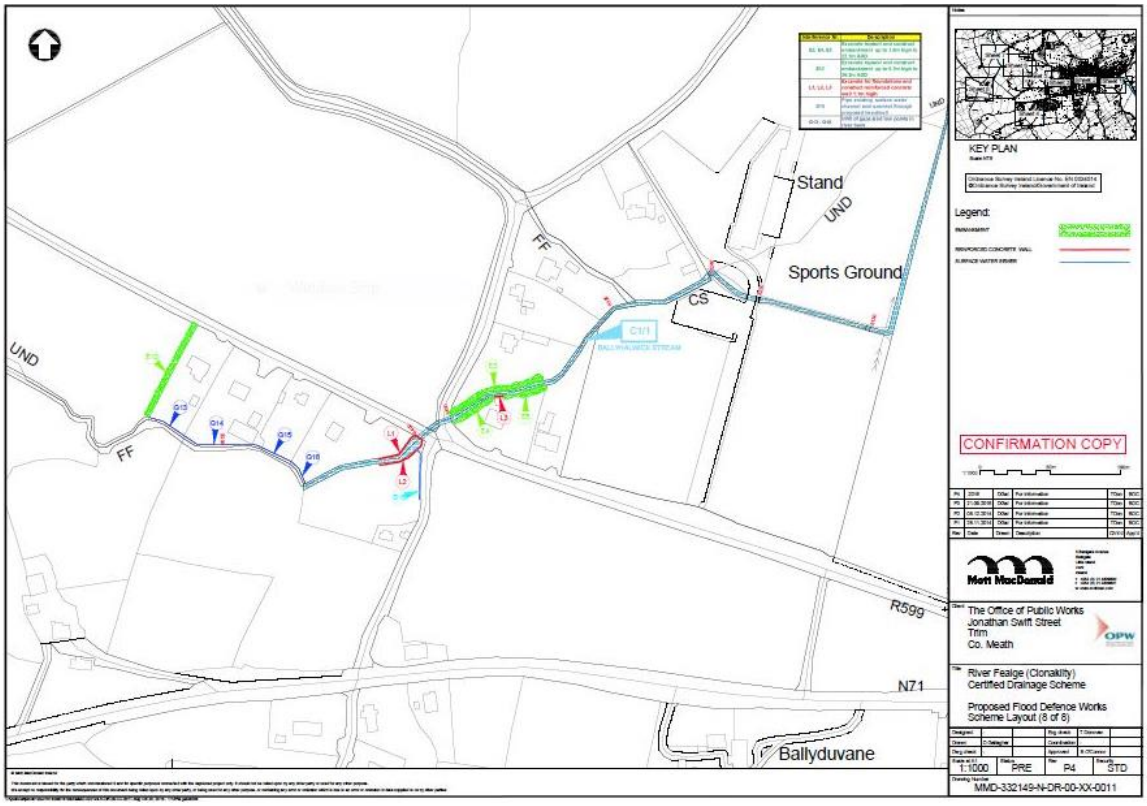
Presence of bats is indicated principally by their signs, such as staining, lack of spider webs in tree holes, crevices, feeding signs or droppings - though direct observations are also occasionally made. Trees should be examined for crevices, split limbs, loose bark, dead wood and presence of ivy, which are all typically used as roosting sites by bats. Trees should be assessed as to whether they have the potential to provide roosting site for bats according A, B or C value with A-value being the most suitable for roosting bats and C-value trees tend to be ivy-clad trees.

2. Bat Potential

Location: Ballyhalwick Stream

Map: Proposed Flood Defence Works Scheme Layout (8 of 8)

Description: Stream located west of Clonakilty, approximately 2m wide. This stream flows under two local roads through two set of natural stone culverts. It is a rural area with one-off housing. The landscape is well connected with hedgerows and treelines. There is no street lighting.



Surveyed Points

Code Name	Description	Bat Potential	Recommendation
G13 Note: G13 – G16 can be considered as one treeline/ hedgerow	Treeline / hedgerow located to rear of new build. Primarily deciduous hedgerow with individual trees with heavy ivy growth.	Two trees with heavy ivy growth deemed as PBR C value. Hedgerow provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees Protect trees adjacent to the work area from damage
G14	Treeline / hedgerow located to rear of new build. Primarily deciduous hedgerow with individual	Hedgerow provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees

	trees with heavy ivy growth.		Protect trees adjacent to the work area from damage
G15	Treeline / hedgerow located to rear of new build. Primarily deciduous hedgerow with individual trees with heavy ivy growth.	Two trees with heavy ivy growth deemed as PBR C-value (marked with **Red Circle** in photograph below, RHS). Hedgerow provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees Protect trees adjacent to the work area from damage
G16	Four large mature trees as single stands. One deciduous, three conifers.(Photograph below: LHS)	No PBR value. Potential commuting routes for bats and feeding areas for bats as part of the landscape.	Summer bat survey
 			
D15	Deciduous hedgerow - low quality. Section of hedgerow removed to facilitate entrance to house under construction.	No PBR value Limited bat foraging and commuting route potential	No recommendations

<table>
<tr><td colspan="4">  </td></tr>
<tr><td>E3</td><td>Small area of woodland located along stream, primarily comprised of conifer trees. Some mature specimens.</td><td>Potential foraging area for bats. Some individual trees deemed suitable to provide roosting sites for bats. At least two deciduous trees deemed as PBRs (C-value) but these are located adjacent to a house (appox 15m from stream) and therefore unlikely to be within the clearance zone of the immediate area adjacent to the stream (Red Circle).

The trees immediately adjacent to the stream are not deemed as PBRs.</td><td>Summer bat survey

Retain trees / woodland

Retain PBRs

Protect trees adjacent to the work area from damage</td></tr>
<tr><td colspan="4">   </td></tr>
</table>

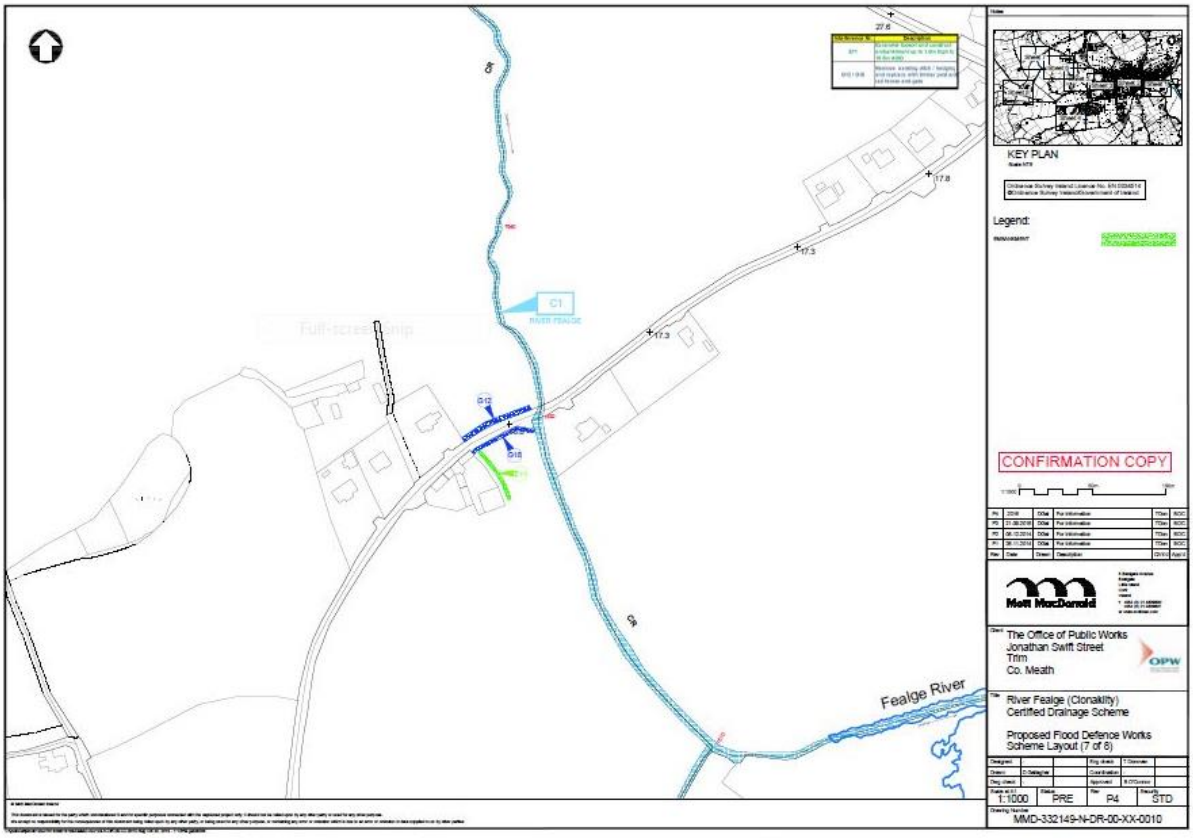
SUMMARY

1. Survey this area as part of a Summer Bat Activity Survey.
2. Retain trees where possible.
3. If felling of trees is required, the 4 PBR trees (C-value – heavy ivy growth) should be felled on a mild day, outside the bird nesting season, and left on the ground for 24 hours before removal.
4. For every 4 C-value tree felled, 1 woodcrete bat box is required to be hung.
5. Any works undertaken on bridges/culverts requires bat mitigation measures (please see Mitigation Section for more details).

Location: Kilgarrif

Map: Proposed Flood Defence Works Scheme Layout (7 of 8)

Description: Stream located north-west of Clonakilty, approximately 2m wide. This stream flows under one local road via a natural stone bridge. It is a rural area with one-off housing. The landscape is well connected with hedgerows and treelines. There is no street lighting.



Surveyed Points

Code Name	Description	Bat Potential	Recommendation
G12	Individual immature ash trees along side of road	Trees have no PBR value Landscape provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees


G18	Low hedgerow along side of road	Little commuting and foraging value to bats.	No recommendations

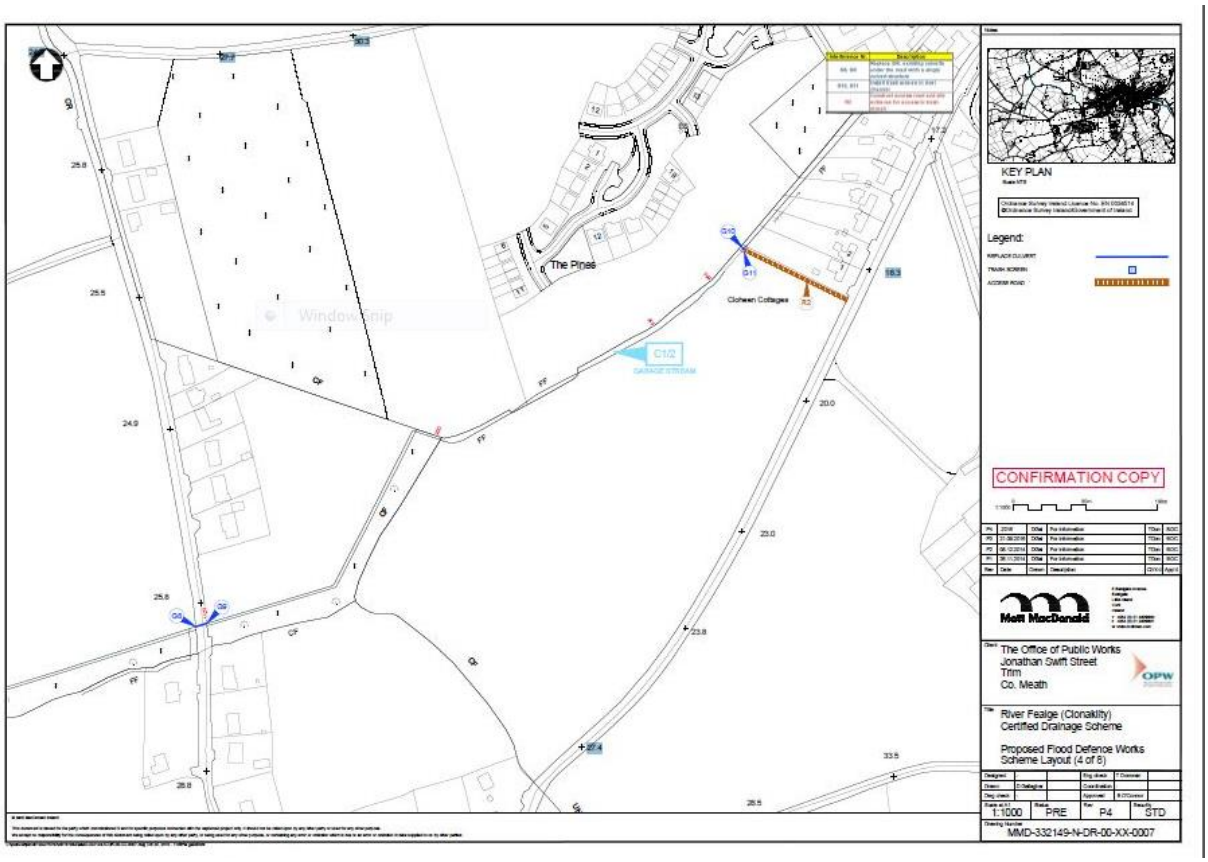
SUMMARY

1. Survey this area as part of a Summer Bat Activity Survey.
2. Retain trees where possible.
3. For every 5 trees (non-PBR) felled, 1 woodcrete bat box is required to be hung.

Location: Cloneen

Map: Proposed Flood Defence Works Scheme Layout (4 of 8)

Description: Garage Stream is located south-west of Clonakilty and is approximately 1m wide. This stream flows along a treeline/hedgerows at the boundary of cereal and grassland agricultural fields. It is a rural area with one-off housing. The landscape is well connected with hedgerows and treelines. There is no street lighting. There is evidence of drain cleaning and some scrub/hedgerow/tree removal along this stream.



Surveyed Points

Code Name	Description	Bat Potential	Recommendation
G10 G10 & G11 are located beside each other.	Individual mature ash tree located at corner of cereal field.	Tree has a PBR C-value due to ivy growth on tree. Landscape provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees Protect trees adjacent to the work area from damage
G11	Individual mature ash tree located at corner of cereal field.	Tree has a PBR C-value due to ivy growth on tree. Landscape provides potential commuting routes	Summer bat survey Retain hedgerow / trees

		for bats and feeding areas for bats.	Protect trees adjacent to the work area from damage




G8 / G9 G8 & G9 are located beside each other.	This area provides good foraging and commuting habitat for bats. On both sides of the road there are stands of trees creating a small woodland area.	Ash Tree has a PBR C-value due to ivy growth on tree (**Red Circle** in photo). Landscape provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees Protect trees adjacent to the work area from damage


Culvert adjacent to G8/G9	This area provides good foraging and commuting habitat for bats. On both sides of the road there are stands of trees creating a small woodland area.	2 concrete pipes. No potential roosting sites for bats.	It is presumed that a new culvert will replace the concrete pipes. Therefore it is recommended that BAT TUBES are inserted in to the culvert (Pease see Mitigation Section of report for more details).
			

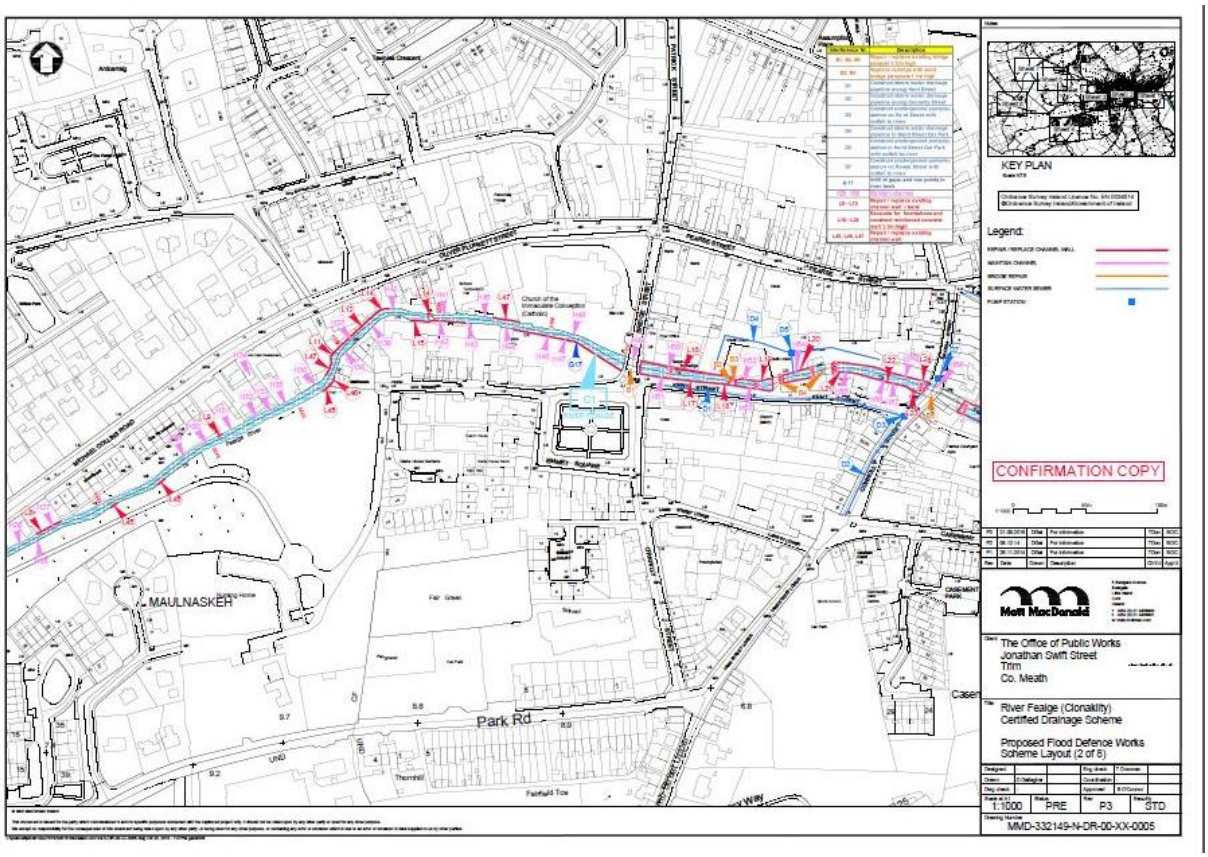
SUMMARY

1. Survey this area as part of a Summer Bat Activity Survey.
2. Retain trees where possible.
3. If felling of trees is required, the 1 PBR trees (C-value – heavy ivy growth) should be felled on a mild day, outside the bird nesting season, and left on the ground for 24 hours before removal.
4. For every 4 C-value tree felled, 1 woodcrete bat box is required to be hung.
5. Any works undertaken on bridges/culverts requires bat mitigation measures (please see Mitigation Section for more details).

Location: Weston Lodge (North of Emmet Square)

Map: Proposed Flood Defence Works Scheme Layout (2 of 8)

Description: Fealge River flows through the town of Clonakilty and through the area of Weston Lodge. The river is approximately 5m wide and much of the river bank is canalised. There are numerous bridges, large array of buildings and a small number of trees. There is street lighting and general lighting associated with residential and commercial buildings. In particular, there are a large number of buildings (>100 years old, natural stone wall cladding, slate roofs) which are highly suitable as bat roosts.



Surveyed Points

Code Name	Description	Bat Potential	Recommendation
G17	Individual mature trees located along one river bank.	One tree has a PBR C-value due to spilt limbs and tree holes. Landscape provides potential commuting routes for bats and feeding areas for bats.	Summer bat survey Retain hedgerow / trees Protect trees adjacent to the work area from damage

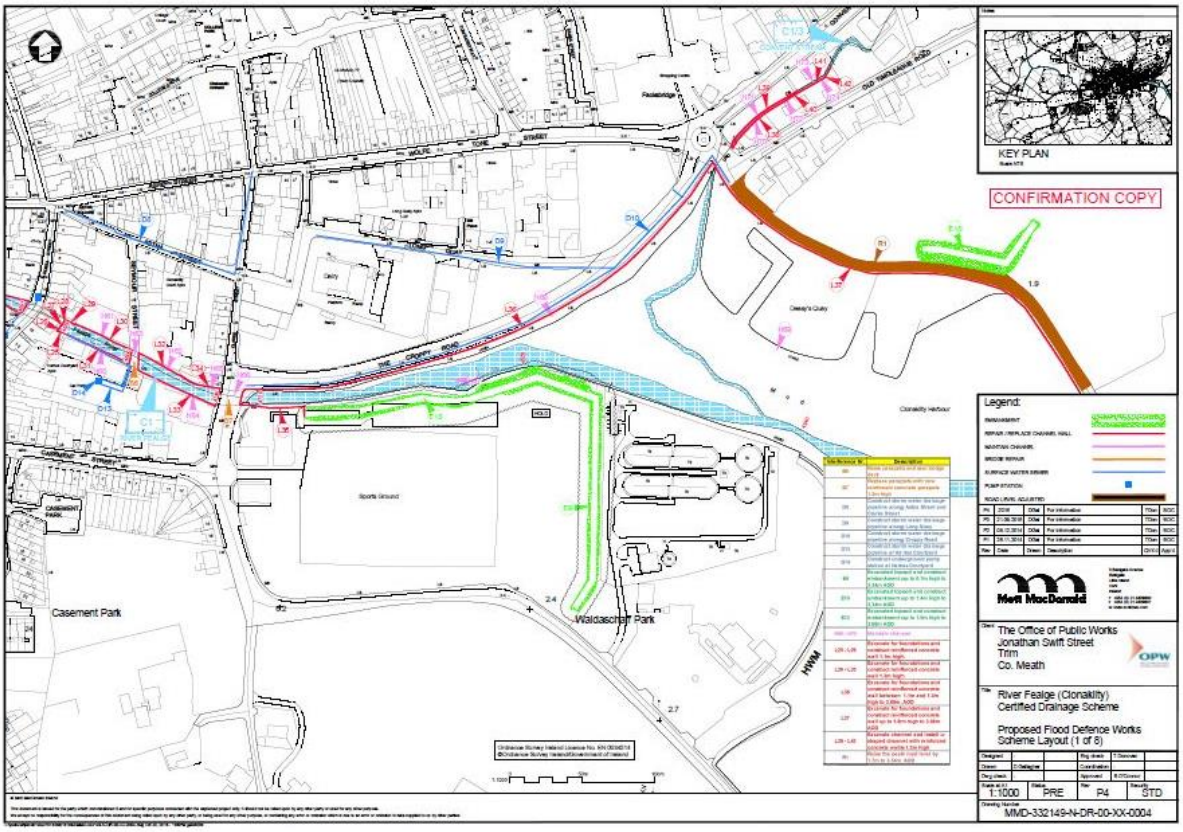

SUMMARY

1. Survey this area as part of a Summer Bat Activity Survey.
2. Retain trees where possible.
3. If felling of trees is required, the 1 PBR trees (C-value) should be felled on a mild day, outside the bird nesting season, and left on the ground for 24 hours before removal.
4. For every 4 C-value tree felled, 1 woodcrete bat box is required to be hung.
5. Any works undertaken on bridges/culverts requires bat mitigation measures (please see Mitigation Section for more details).

Location: Convent Road (N71 approaching Clonakilty)

Map: Proposed Flood Defence Works Scheme Layout (1 of 8)

Description: Fealge River flows through the town of Clonakilty. The width of the river varies greatly in this area as it flows into the estuary. There is street lighting and general lighting associated with residential and commercial buildings. This section of the river is primarily along the road (N71) and is characterised by high earthen banks and individual immature trees planted along road verges.



Surveyed Points

Code Name	Description	Bat Potential	Recommendation
L35	Line of conifer trees, small sections of immature deciduous trees and individual trees.	No PBR potential. Little commuting and foraging habitat for bats.	No recommendations

<table>
<tr><td colspan="4">   </td></tr>
<tr><td>L36</td><td>Individual trees of the road verge along Croppy Road</td><td>No PBR potential.

Little commuting and foraging habitat for bats.</td><td>No recommendations</td></tr>
<tr><td colspan="4">  </td></tr>
<tr><td>E13 & E9</td><td>Trees and treelines located around the sports grounds adjacent to Waldaschaff Park and Model Railway Centre.

Line of conifer trees, small sections of immature deciduous trees and individual trees along the park boundary.</td><td>No PBR potential.

Little commuting and foraging habitat for bats.</td><td>No recommendations

The trees in Waldaschaff Park is an potential location for a bat box scheme.</td></tr>
</table>

SUMMARY

1. Retain trees where possible.
2. For every 5 trees felled, 1 woodcrete bat box is required to be hung.
3. Any works undertaken on bridges/culverts requires bat mitigation measures (please see Mitigation Section for more details).

3. Management of Flood Defence: Bats

This report will draw on guidelines already available in Europe and will use the following documents:

- *A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.*
- *Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.*
- *National Biodiversity Plan. Department of Arts, Heritage, Gealtacht and the Islands.*
- *The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.*

Disturbance/removal of riverside vegetation as a result of planned works will impact on local bat populations due to the following possibilities:

- Dark riverine corridors will be open to lighting pollution from adjacent street lights and lighting of residential and industrial areas.
- Reduction in insect prey items and foraging areas
- Disturbance to commuting routes
- Potential loss of roosting sites in structures and trees within the areas where works are proposed.
- The sealing up of crevices in bridges will have a major impact on local Natterer's bats and Daubenton's bat populations due to the high usage of the bridges by these bats species. In order to reduce this impact, mitigation works should involve retaining crevices for bats post-works and incorporating bat tubes into the structure during maintenance works if possible (see http://www.nhbs.com/1fr_schwegler_bat_tube_tefno_161276.html for information on bat tubes). Discussion with engineers is recommended to determine the most suitable option for these structures.

Summer Bat Activity Survey:

a) Undertake summer activity surveys in good weather conditions from mid-April to mid-September in the locations recommended.
b) Undertaken Dusk and Dawn surveys – one night per location.
c) Undertake static surveillance using a broadband recording devices – minimum of one night per location.

Mitigation works should involve:

a) Felling of trees according to recommendations and a bat box scheme to be incorporated to replace potential roost loss.
b) Protection of riverside vegetation / habitats to maintain foraging and commuting habitat.
c) Protection of woodland and dense treelines to retain important bat foraging areas.

d) Any bridge that have the potential for roosting sites and are planned to have works should be surveyed and alternative roosts provided.

1.1 Mitigation Measures

General Mitigation Measures

In survey areas where habitats present currently provide good commuting and some foraging potential for bats, it is best practice to avoid damaging measures. It is proposed that the following measures be put in place to avoid or lessen the degree of impacts of potential development on bats.

Mitigation by avoidance

2. Treelines and shrubs should remain in-situ and remain protected from potential management work.
3. Minimise damage to the woodland habitat adjacent to the bridges / culverts and along the river/streams, in general.
4. Ensure that all equipment, construction materials are stored on the roadway and not in adjacent habitats to the bridges.
5. Avoid the use of chemicals (weed killers etc.) within the development zone. Undertake physical removal of weed species only.
6. Open areas required to facilitate works should limited to areas where tree and hedgerows are not present. Lighting of such work spaces can also disrupt traditional foraging grounds for bats and therefore should be limited and should not occur during foraging period (30 minutes prior to sunset to 30 minutes after sunrise).

Mitigation Measures for Bats – Bridges/Culverts in general

Retain crevices for roosting bats and provide roosting sites post-works.

a) In relation to bridges with crevices suitable for roosting bats: in discussion with engineers, a selection of crevices should be retained and blocked temporarily. Once works are finished, the crevices should be unblocked to allow bats to use the structures post-works.
b) However, a bat survey is required prior to such works for these bridges/culvert to ensure that there are no bats present prior to and during works. This survey work should involve a detailed examination of all arches and crevices. The bat specialist should mark any crevices to be retained. Such crevices, once no bats are present should be filled with bubble wrap in order to prevent filling in of such.
c) Crevices that remain open will have to be daily checked prior to filling in not unless the canvas sheeting procedure as recommended below in undertaken.

Figure 1: Example of a bat-suitable crevice filled/blocked with bubble wrap to prevent bat occupancy during proposed works (Photograph courtesy of Caroline Shiel).

d) For bridges where proposed strengthening is to be undertaken and with open crevices, a bat inspection of the bridge is recommended the night before works are due to be undertaken. In preparation for this survey, two sheets of canvas that will close the arches (post bat survey), are required to be in place (i.e. canvas sheeting to be erected from the top of the bridge and held in place. When the sheeting is unfurled, the length of it should reach the water level. The width of the sheeting should also ensure that entire opening to the 1/2 arches of the bridges (upstream and downstream) are covered to prevent bats accessing the bridge for the duration of the works. Once the bat inspection and survey determines that there are no bats within the bridge, the canvas sheets are to be released. While the canvas sheeting can be opened during the daytime to allow works to be undertaken, it is of paramount importance that each evening, the canvas sheets are released to close the arches during the night for the duration of the works under the arches. Once the works are finalised and a bat inspection is completed, the crevices blocked to be retained are unblocked and the canvas sheets removed.

Figure 2 a, b, c: Example of canvas sheets used to close the bridge once it has been declared bat free by a bat specialist.

d) Bat tubes should be incorporated into new structures, where possible – e.g. into the parapet walls for example or attached to the underside of box culverts.

Figure 3: Example of a bat tube incorporated into the parapet walls of a newly maintained bridge (Ross Bridge, County Clare).

d) A further bat inspection is recommended prior to works and also a meeting with on-site engineers to in relation to the bridge.
e) Works are recommended outside the bat maternity season.

1 Removal of trees

It is recommended that all PBR trees are retained. However if some of these trees are required to be removed, please follow guidelines below:

a) Minimise the removal of mature trees, where possible.
b) If the trees are to be removed, felling should be undertaken during the months of September, October and February during mild weather conditions.

An assessment of trees according to their PBR value determines the methodology of felling. Trees with B-value PBR have a medium suitability for roosting bats and require more intensive procedures prior to felling, e.g.

- C-Value trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.

2 Alternative roosting sites – Bat Boxes

If trees are proposed to be felled then, a bat box scheme is required to mitigate for this. The number of bat boxes is calculated according to the number of trees to be felled and their PBR value. Bat box locations (exact trees for erection of bat boxes) should be undertaken by bat specialist prior to construction works are undertaken.

For every four C-value trees to be felled – one bat box is required
For every five matures trees to be felled – one bat box is required

Such a bat box scheme can be erected in Waldaschaff Park, Clonakilty.

Details of sourcing these boxes and bat tubes and erection can be supplied. 'Schwegler' woodcrete bat box designs are recommended:
www.nhbs.com

The main function of bat boxes is to provide alternative safe roosting sites for groups of bats where natural sites become unavailable. The internal diameter of a bat box is required to be sufficient to allow bats to cluster together in numbers to retain body heat. It is important to understand the life cycle of bats and their tendency to use an array of roosting sites through the year. In summary, bats require different roost conditions for hibernation, during the sensitive time of rearing their young (maternity roost), night roosts for resting stops during night feeding and satellite roosts in between the main hibernation and maternity season. Roosting conditions also vary with each species. In general, hibernation boxes require greater insulation (wall thickness of 100 mm timber) to provide a constant temperature for bats throughout the winter to prevent bats from freezing. All other boxes, typically called summer boxes, are designed to provide secure and dry sheltered conditions. These boxes have relatively thin walls (about 20-30 mm timber) and are used by bats outside the hibernation period. These requirements mean that any Bat Box Schemes should provide suitable bat boxes to cover the general requirements of different bat species all year around.

'Woodcrete' boxes are made of a mixture of concrete, sawdust and clay moulded into to shape. They have the advantage of allowing natural respiration, stable temperature and durability. 'Woodcrete' boxes last, on average, for 25 years.

To ensure that bats use the bat boxes, it is very important to site them carefully and this should be undertaken by a bat specialist. Some general points to follow include:

- Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 3 metres above and below position of bat box.
- Diameter of tree should be wide and strong enough to hold the required number of boxes.
- Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
- Bat boxes should be erected at a height of 4-5 metres to reduce the potential of vandalism and predation of resident bats.

- It is recommended to erect a number of bat boxes on one tree at an array of aspects. South facing boxes will receive the warmth of the sun, which is necessary for maternity colonies. In large bat box scheme it is generally recommended to have three bat boxes arranged at the same height facing North, South-East and South-West. This ensues a range of temperatures are available all day. If the South facing boxes become warm, bats can safely remove to the cooler North facing box.

- Locations for bat boxes should be selected to ensure that the lighting plan for the proposed site does not impact on the bat boxes.

Acceptance of boxes by bats is less predictable than those for birds. Therefore, it is essential to monitor their use over a period of time. Those boxes that remain unused within two years of date of erection should be re-located. Bat boxes should also be checked in wintertime for general wear and tear and to remove droppings from the previous summer use.

NB: Bats use boxes intermittently and the chance of finding a bat in a box at the time of inspection is considered to be 1 in 10.

Bat boxes should be inspected, by bat licence holder (bat specialist), at least once within 12 months of erection at appropriate season in order to monitor bat use and the species using boxes. This should be followed up with another inspection within 24 months of setting up. At this point, any bat boxes not used should be re-located to a new site. Any bats found should be counted and identified to species level. All data collected should be submitted to Bat Conservation Ireland.

Safety is also essential during erection and monitoring of bat boxes. Use of hard hats, a strong aluminium ladder with safety strap for trees, and use of gloves (if handling bats) are recommended. Only a licensed person (NPWS Licence) can handle bats.

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Appendices

Bat ecology – general

The bat is the only mammal that is capable of true flight. There are over 1,100 species worldwide, representing almost a quarter of all mammal species. There are 47 species in Europe - in Ireland, ten species of bat are currently known to exist, which are classified into two families, the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats).

Prey

All the European bat species feed exclusively on insects. A Pipistrelle, weighing only 4 to 8 grammes, will eat up to 3000 insects every night, ensuring a build up of fat in the bat's body to allow it to survive the winter deep in hibernation.

Breeding and longevity

Irish bats can produce one young per year but, more usually, only one young is born every two years (Boyd & Stebbings, 1989). This slow rate of reproduction inhibits repopulation in areas of rapid decline. Although bats have been known to live for twenty or more years, this is rare as most die in their first and the average lifespan, in the wild, is four years.

Threats

All bat species are in decline as they face many threats to their highly developed and specialised lifestyles. Many bats succumb to poisons used as woodworm treatments within their roosting sites (Racey & Swift, 1986). Agricultural intensification, with the loss of hedgerows, treelines, woodlands and species-rich grasslands have impacted bat species also. Habitual roosting or hibernation sites in caves, mines, trees and disused buildings are also often lost to development. Summer roosts are prone to disturbance from vandals. Agricultural pesticides accumulate in their prey, reaching lethal doses (Jefferies, 1972). Chemical treatments in cattle production sterilise dung thus ensuring that no insects can breed within it to be fed upon by bats. Likewise, river pollution, from agricultural runoff, reduces the abundance of aquatic insects. Road building, with the resultant loss of foraging and roosting sites is a significant cause in the reduction of bat populations across Europe.

Extinction

As recently as 1992, the greater mouse-eared bat *Myotis myotis* became the first mammal to become extinct in Britain since the wolf in the 18th century.

Ireland Red List No. 3: Terrestrial Mammals

Bats

Species: Common Name	Irish Status	European Status	Global Status
Brandt's bat	Data deficient	Least Concern	Least Concern
Daubenton's bat	Least Concern	Least Concern	Least Concern
Whiskered bat	Least Concern	Least Concern	Least Concern
Natterer's bat	Least Concern	Least Concern	Least Concern
Leisler's bat	Near threatened	Least Concern	Least Concern
Nathusius' pipistrelle	Least Concern	Least Concern	Least Concern
Common pipistrelle	Least Concern	Least Concern	Least Concern
Soprano pipistrelle	Least Concern	Least Concern	Least Concern
Brown long-eared bat	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat	Least Concern	Least Concern	Least Concern

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C Appendix- Fish Survey Report

Triturus Environmental Services

Fisheries Impact Assessment of the proposed River Fealge (Clonakilty) Drainage Scheme, Co. Cork

Prepared by Triturus Environmental Services
for JBA Consulting

January 2017

1. Introduction

Following severe flooding in Clonakilty during 2012, Catchment Flood Risk Assessment and Management (CFRAM) proposals for the town were developed. Primarily these incorporated flood maps and flood relief scheme options for the town. Collectively the project the River Fealge (Clonakilty) Drainage Scheme was commissioned by the OPW and Phase I of the scheme (development and design stage) was undertaken by Mott McDonald Ireland Ltd. The scheme has since progressed through the Stage (II) public consultation process. JBA consulting prepared an Ecological Impact Assessment for the scheme of which the fisheries impact was informed by the Clonakilty Flood Relief Scheme Aquatic & Ecological Assessment report prepared by INIS consultants (2014).

In light of additional but localised flood relief infrastructure and minor amendments to the scheme not subject to the original fisheries assessment, Triturus Environmental Services were commissioned by JBA to undertake additional fisheries surveys of proposed additional works areas. The additional areas encompassed four riverine sites that had not been assessed as follows;

- Proposals for the installation of a U-Shaped channel on the **Convent stream** (adjacent to the N71 approaching Clonakilty from Cork city).
- The replacement of existing culverts (G8 & G9) and installation of a trash screen (G10 & G11) on the **Garage Stream**.
- An extension of the area to be regarded on the **River Fealge** (approximating 45m).
- Bankside works on the **Ballyhalwick stream**. These have yet to be determined in full.

The fisheries survey would help evaluate the importance of the fisheries resource in the River Fealge catchment. The findings of the baseline surveys would inform the evaluation of the fisheries asset and provide recommendations to minimise fisheries related impacts as a result of construction and operational phases of the flood relief scheme. The findings of this fisheries impact assessment report will be used to inform the Ecological Impact Statement being prepared by JBA.

2. Methodology

Site Location

The study area that formed the basis of the fisheries impact assessment includes the River Fealge and tributaries the Ballyhalwick and Garage Streams. An additional smaller stream known as the Convent Stream, flowing into the north east corner of Clonakilty Bay was also surveyed (see Table 2.1 & Figure 2.1). The River Fealge is a swift middle sized west Cork river (4-6m wide) with good riparian cover and abundant instream *Ranunculus* vegetation. The Feagle River catchment predominantly runs through improved agricultural grassland, with localised pockets of scrub, more marginal grazing land and woodland also present. The lower reaches of the river inclusive of it's tributaries also flow through the peri-urban and urban areas of Clonakilty town and hinterland. The River Fealge rises at Ahagilla and flows south west through Clonakilty town, draining into Clonakilty Bay SAC (site code 00091) and SPA (site code 4081). The River Fealge is joined by smaller tributaries, the Ballyhalwick Stream, Garage Stream and the Cappeen Stream, the later tributary not forming part of the current fisheries impact assessment. As previously stated, another small stream, known as the Convent Stream (not a tributary of the River Fealge), i.e. flowing into the north east corner of Clonakilty Bay was also surveyed (see Figure 2.1 below for site survey locations).

The River Fealge is listed as a locally important biodiversity area in the Clonakilty Development Plan 2009-2015 (Clonakilty Town Council, 2009). Inland Fisheries Ireland do not have site specific stock census data for the river, but have confirmed that it supports stocks of brown trout (*Salmo trutta*), sea trout (*Salmo salar* complex), Atlantic salmon (*Salmo salar*) and European eel (*Anguilla anguilla*) (pers. comm.). Furthermore, no fisheries data was available for the River Fealge following a search of Inland Fisheries Ireland WFD Fish monitoring database. The EPA collects biological water quality on the Fealge River near a bridge crossing at Dunnes Stores to the west of the town (EPA station RS20C050300). The most recent water quality collected during 2015, identified Q4 (good status) water quality and was thus meeting the requirements of the Water Framework Directive (2000/60/EEC).

The Argideen River located approximately 2km north west of Clonakilty, is much better known salmonid river than the River Fealge, with larger runs of Atlantic salmon and seatrout. Unlike the River Fealge, much of the Argideen River has been divided into angling syndicates and beats for recreational rod and line fishing. While the Argideen is designated 'Salmonid Water' under the EU 'Freshwater Fish' Directive (1978) and also listed on the Quantification of the Freshwater Salmon Habitat Asset in Ireland (McGinnity et al. 2003), the River Fealge does not fall under these designations. This may be because the runs of anadromous salmonids are less (i.e. Atlantic salmon and sea trout) or because of a lack of overall fisheries knowledge on the river. Nonetheless, the River Fealge still remains a productive wild brown trout river based on data from a recent electro-fishing survey conducted by INIS (2014). Good numbers of European eel and smaller numbers of Atlantic salmon were also recorded present.

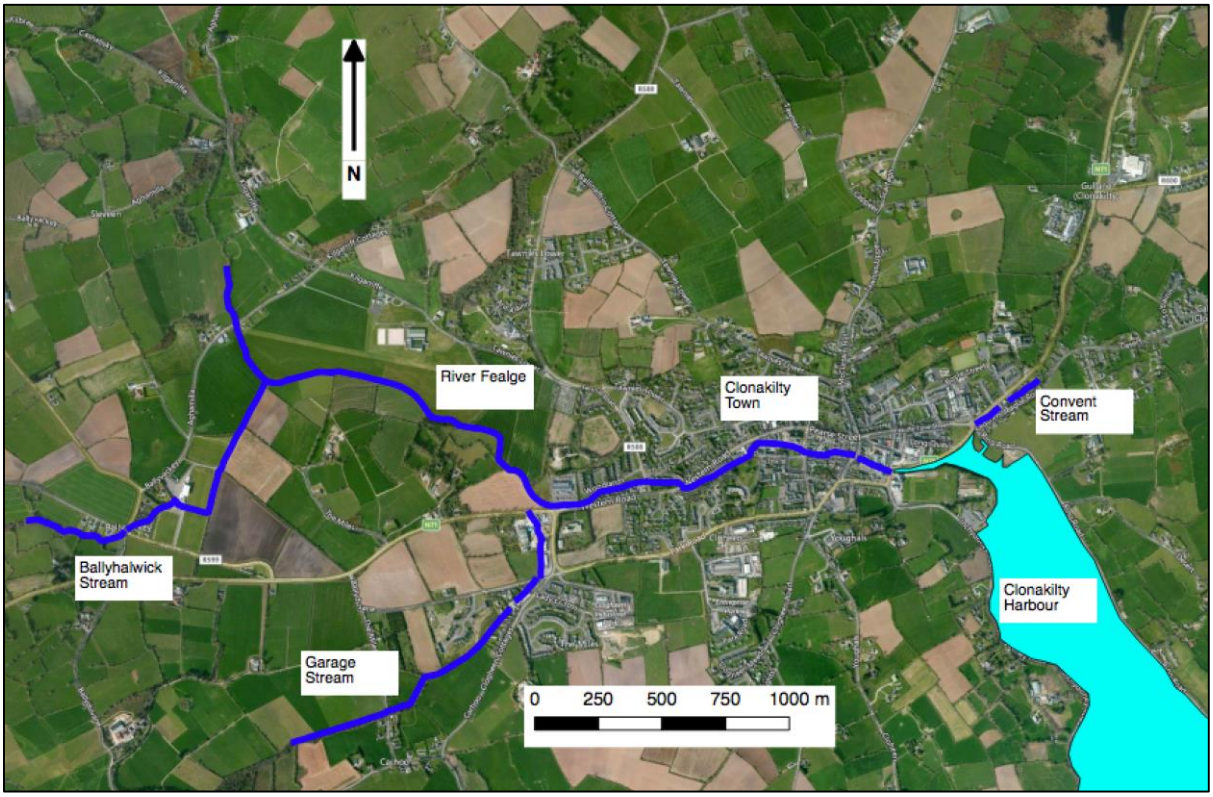

Figure 2.1 – Location of riverine survey sites (Clonakilty Flood Relief Scheme) prepared on Bing Aerial base mapping.

Table 2.1 – Summary of Riverine Survey Sites according to EPA classification

River Name (EPA)	River Name other	River Type	EPA Code
Clonakilty Stream	Ballyhalwick Stream	Semi-natural stream with modified channel reaches	20C05
Tawnies Lower	Garage Stream	Semi-natural small stream with localised significant channel modifications	20T26
Clonakilty Stream	River Fealge	Semi-natural River with localised channel modifications	20C05
Not Present on EPA database	Convent Stream	Highly modified small stream	n/a

Field Survey

The field survey work was conducted during base flow levels on the River Fealge and tributaries and also on the Covent Stream (not part of the Fealge catchment) on the 3rd and 4th of January 2017.

Fisheries Habitat

Fisheries habitat was assessed using the Life Cycle Unit method (Kennedy, 1984) to map river sites as nursery, spawning and holding water, by assigning quality scores to each type of habitat (Refer to Table 2.1 below for summary of criteria). This procedure was applied in assessing fisheries habitat at each of the flood relief zones in the main channel of the Convent Stream and in the Fealge River and tributaries where proposed works will be undertaken. In addition, a broad appraisal/ overview of the upstream and downstream habitat was undertaken to evaluate their importance for salmonid and lamprey spawning etc. Each watercourse was divided in sections depending on size (e.g. A, B, C & D) with larger lengths of channel having upto 4 sections. This helped compartmentalise summaries of the overall channel characteristics and helped better define potential impacts. It also facilitated a better overview of a greater longitudinal area of river rather than point sampling. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the rivers (i.e. channel profiles, substrata etc.). Fisheries habitat was mapped using Quantum GIS 2.16 and Bing Aerial Base Mapping.

Table 2.1 - Salmonid Habitat Classification prepared by Triturus and adapted from the Life Cycle Unit Score (Lower Scores indicate superior habitat). Habitat Scores that fall between respective classes based on site observations (to allow for better target separation) are denoted 0.5 (e.g. habitat class 1-2 - i.e. good to high quality = 1.5)

Holding	Nursery	Spawning	**Habitat Class**
High quality holding habitat defined by deep pool sequences with well oxygenated water, mature riparian cover and natural river profile. Adult salmonids will likely be visible when water clarity is good.	High quality nursery habitat exhibits substantial areas of faster glide and riffle habitat often accompanied by beds of floating river vegetation in pristine water. The site should also retain a natural river profile with good riparian cover with juvenile salmonids visible when walking the channel.	High quality spawning habitat should have good to high quality water (i.e. Q4 or Q4-5). The river should exhibit natural holding pool habitat and glide tailing with well sorted clean and un-bedded gravels. Modifications to the channel should be absent in the survey area. Siltation levels should be light or only present as natural patches in pool slacks (but more likely to have a higher sand content). Siltation should never be moderate to heavy (i.e. visible on gravel surfaces with silt plumes underfoot).	**1 (High Quality)**
Good quality holding habitat retains deep pool and scour habitat with moderate levels of riparian cover and a semi-natural river profile. Some adult salmonids should be visible during spawning migrations and good water clarity.	Good quality nursery habitat should have good to moderate quality water (at worst EPA Q3-4). It should have good tracts of riffle and glide habitat and a natural to semi-natural river profile. Siltation levels should be slight but not heavy. The channel should also exhibit cover but not at the expense of excluding light entry to the channel which is important for instream primary production and the sustenance of salmonid populations.	Good quality spawning habitat should have good to moderate quality water (at worst EPA Q3-4). The river should have a natural or semi-natural profile. It should exhibit holding pool habitat and glide tailing with well sorted clean and un-bedded gravels. Siltation levels should can be light but never moderate to heavy (i.e. not visible on gravel surfaces with no silt plumes underfoot).	**2 (Good Quality)**

Holding	Nursery	Spawning	**Habitat Class**
Moderate quality holding habitat exhibits pockets of deeper water capable of supporting some adult salmonids but lower than those classes described above. Extensive pool sequences absent.	Moderate quality nursery habitat should habitat typically occurs in semi-natural channels where modifications are visible (e.g. channel straightening, deepening etc.). These channels often have smaller pockets of well oxygenated riffle and glide water. Often the channel beds are strewn with blanket algae and sedimentation is visible reducing the overall viability of nursery habitat. Heavily canopied sections of channel with very low light levels are also lower quality nursery areas.	Moderate quality spawning habitat should exhibit pockets of spawning habitat but not extensive areas of natural habitat as would be represented by classes 1 & 2 above. Moderate quality spawning areas are often in modified reaches of channel (e.g. artificially straightened) and exhibit moderate levels of siltation, nutrient enrichment etc. Substrate classes may also be more boulder and cobble dominated rather than well sorted gravels with lesser proportions of cobble.	**3 (Moderate Quality)**
Very limited or absent examples of deeper pockets of holding water with poor cover and modified river habitat. No adult salmonids visible.	Poor quality nursery habitat essentially indicates limited or entirely absent nursery habitat. It can also be represented by highly degraded river reaches where pollution, invasive species, river modifications and other impact sources have rendered the channel unviable to juvenile salmonids.	Poor quality spawning habitat is in either physically unsuitable spawning habitat (i.e. wrong substrate classes) or in modified habitat where the quality of the gravels have been seriously degraded or removed entirely. Significant river alterations can also encourage sediment deposition that can alter the character of the channel entirely, rendering it unviable for spawning salmonids.	**4 (Poor Quality)**

Impact Assessment

The target fisheries habitat that is an ecological receptor to potential impacts associated with a development, can form part of a nature conservation site (e.g. designated salmonid water or SAC with conservation objective fish fauna. It can also be non-designated watercourse i.e. not listed under the Salmonid Regulations (S.I. no. 293 of 1988) or other designation, but still contain annexed fish species e.g. Atlantic Salmon, Lamprey or red listed species such as European eel. The **assessment of the significance of predicted impacts** to the ecological receptor (in this case the fisheries habitat) is based on both the **value of a receptor** and the **nature and magnitude** of the predicted impact that the project will have on it. The value of the fisheries habitat as with other ecological evaluations, is characteristically defined in terms of it's significance by geographical scale i.e. local scale importance to international importance (these are summarised in Table 2.2 below).

Valuation of Receptors

The value of the fisheries habitat asset of the survey area was assessed with reference to:

- The importance of the habitat in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations).
- Any social benefits that the fisheries habitats and fish population delivers (e.g. Angling Asset) and any associated economic benefits.
- The valuation of fisheries designated sites takes into account different levels of statutory and non-statutory protection.
- Assessment of the fisheries habitat depends on a number of factors, including the size of the habitat, its conservation status and quality. The assessment also takes account of connected off-site fisheries habitat that may increase the value of the on-site habitat through association (e.g. adjoining estuaries etc.).
- The final valuation of the fisheries habitat depends on a number of factors used widely in other ecological assessment including distribution, status, rarity, vulnerability, and the population sizes of fish present. This scale has broadly been development in the context of importance from that locally to internationally dependant on the rarity of the species relative to the species distribution globally (refer to Table 2.2 below).

Table 2.2 – Categories for the evaluation of receptor fisheries habitat

Criteria	Level of Value (Target attributes)
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (or a site considered worthy of such designation). A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive). **Designated salmonid waters. Major salmon fisheries.**
National	A nationally designated site e.g. Natural Heritage Area (NHA), a proposed Natural Heritage Area (pNHA), statutory Nature Reserve, or a site considered worthy of such designation. A viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring substantial population of a nationally important species, e.g. listed on The Wildlife Act 1976 or The Wildlife (Amendment) Act 2000. A species included in the Irish Red Data Lists/Books. **Significant populations of breeding salmonids. Major trout river fisheries and commercially important coarse fisheries.**
Regional	Species and habitats of special conservation significance within County Cork, as identified in the County Cork Biodiversity Action Plan. An area subject to a project/initiative under the County Cork Biodiversity Action Plan. A regularly occurring substantial population of a nationally scarce species. **Waters containing some resident salmonids or good stocks of coarse fish species.**
Local	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration. A good example of a common or widespread habitat in the local area. Species of national or local importance, but which are only present very infrequently or in very low numbers within site area. **Small waterbodies with some coarse fisheries value or some potential salmonid habitat.**
Less than Local	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest. Common and widespread species. **No significant population of any species of fish.**

Magnitude of Impacts

Ecological impacts can be categorised and assessed in a number of ways. They can be considered to be:

- **Positive** - A change which improves the quality of the environment.
- **Neutral** - A change that does not affect the quality of the environment.
- **Negative** - A change which reduces the quality of the environment. A negative impact can be sufficiently minimised or eliminated by the adoption of appropriate mitigation measures.
- **Uncertain** - When the full consequences of a change in the environment cannot be described. In addition, the nature of impact can also be described in a number of ways, including:
- **Direct/Indirect** - a direct impact could include the loss of a species or habitat, whereas an indirect impact could be as a result of noise, dust or disturbance.
- **Irreversible** - when the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost. Alternatively, impacts can be temporary in nature, with the baseline condition restored after a period of time; this could occur over the short-term (1-2 years), medium-term (2-10 years) or long-term (+10 years).
- **Cumulative** - the addition of many small impacts to create one larger, more significant impact.
- **Synergistic** - Where the resultant impact is of greater significance than the sum of its constituents.

These factors are assessed together to determine the magnitude of the impact on the status of a habitat or species population, and on the integrity of the site that supports them. Professional judgement is then used to assign the impacts on the receptors to one of four classes of magnitude, detailed in Table 2.3 below.

Table 2.3 – Magnitude of Impacts

Magnitude	Definition
High	An irreversible or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.
Medium	An irreversible or long-term impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group. If adverse, this is unlikely to threaten its sustainability; if beneficial; this is likely to be sustainable but is unlikely to enhance its conservation status.
Low	A short-term but temporary impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is within the range of variation normally experienced between years.
Negligible	A short-term but temporary impact on the integrity of a site or conservation status of a habitat, species assemblage/community, population or group that is

Magnitude	Definition
	within the normal range of annual variation.

Significance of Impacts

The significance of an impact is a product of the value of the ecological receptor and the magnitude of the impact on it, moderated by professional judgement. Table 2.4 shows a matrix which is used for guidance in the assessment of significance, with impacts being considered to be of major, moderate or minor significance, or negligible. Impacts can also either be assessed as positive or negative using the same matrix.

Table 2.4 – Significance of Impacts Matrix

Value of Receptor	**Magnitude of Impact**			
	High	**Medium**	**Low**	**Negligible**
International	Major	Major	Moderate	Neutral
National	Major	Moderate	Minor	Neutral
Regional/ County	Moderate	Minor	Minor	Neutral
Local	Minor	Minor	Negligible	Neutral
Less than Local	Negligible	Negligible	Negligible	Neutral

Duration of Impacts

Duration of impacts follows EPA (2015) guidance as summarised in Table 2.5 below.

Table 2.5 – Duration of Impacts

Effect Type	Term of Effect
Momentary Effects	Lasting from seconds to minutes
Brief Effects	Less than a day
Temporary Effects	Less than 1 Year
Short-term Effects	1-7 Years
Medium-term Effects	7-15 Years
Long-term Effects	15-60 Years
Permanent	Over 60 Years

Residual Impacts

Where significant impacts are identified, mitigation measures will be proposed as part of the Fisheries Impact Assessment process in order to avoid, reduce or minimise them. The impact assessment section assigns a final significance level to the impact described, which takes into account the implementation of any stated mitigation measures; these are the residual impacts.

3. Results

Existing Environment

Ballyhalwick Stream

Section A

The upper reaches of the survey area the Ballyhalwick Stream (i.e. Section A) were approximately 3m wide with depths ranging between 0.2m to 0.6m. The Ballyhalwick Stream retained largely a natural profile with meanders and a well defined thalweg with localised channel modification (i.e. straightening or historical bank works). The channel comprised of 40% riffle, 40% glide and 20% pool habitat. The river substrata were composed of 30% cobbles, 65% gravels and <5% boulder, sand and silt with low to moderate levels of siltation. There was some evidence of bedded cobbles and gravels, indicating longer term siltation impacts to the channel. However, excellent quality spawning habitat was recorded locally in the upper reaches of section A on a meander (ITM 53412, 541220). This area of habitat was the most pristine of any encountered in sections A, B and C (the later two sections described below). Here a large pool habitat grading into deep glide had good quality clean well sorted gravel with adult salmonids present. This was considered the best quality spawning habitat within section A. Lamprey habitat was found further downstream on two meanders adjoining residential properties, where two $5m^2$ beds of soft organic rich silt had accumulated on the depositional concave areas of the meanders (ITM 535518, 541177 & ITM 535506, 541194). Refer to Figure 3.1 below for a graphic summary of the fisheries habitat evaluation.

Section B

Section B was located downstream of the R599 road crossing at Ballyduvane, extending to the boundary of Clonakilty GAA club. The stream was largely bordered by residential properties and became more canopied downstream. Immediately downstream of the bridge crossing of the R599, the stream looses energy and abundant gravels are present that are considered to be of value for spawning and also as a nursery habitat (i.e. moderate to good quality). The absence of pool habitat in this section of the river indicated it was of moderate to poor quality as a holding habitat. Refer to Figure 3.1 below for a graphic summary of the fisheries habitat evaluation.

Section C

Section C of the Ballyhalwick Stream was located in the grounds of Clonakilty GAA club at Ahamilla. The stream was approximately 3m wide and 0.3m deep with a bankful height of 1m. The stream had been realigned historically to facilitate the construction of the playing

fields etc. Despite historical realignment the stream retained a good semi-natural instream profile with clean gravels and evident good numbers of brown trout. The river comprised 45% glide, 45% riffle and 10% pool. The substrata were dominated by 10% boulder, 60% cobble, 25% coarse and medium gravel with 5% by area sand and silt. The stream in section C, had good *Ranunculus sp.* cover (estimated at 30%) coupled with a good river profile, together provided a good quality nursery for salmonids. Only one area of lamprey habitat was located in section C adjoining a road box culvert crossing into the GAA club encompassing 4m^2 of habitat (535839, 541312). Of note a second concrete plinth crossing further downstream between the playing fields had a steel grid trash screen that was considered impassable to salmonids (ITM 535923, 541287). At the lower reaches of section C, a good quality spawning area adjoined a deep pool habitat with abundant salmonids (ITM 535993, 541460). This was considered the best quality spawning habitat encountered in the lower survey reaches of the Ballyhalwick Stream. Overall the Ballyhalwick Stream in section C was considered of most importance as a nursery (i.e. good – scoring 2) but of lesser quality as a holding and spawning habitat overall (i.e. moderate – scoring 3 for both categories). Refer to Figure 3.1 below for a graphic summary of the fisheries habitat evaluation.

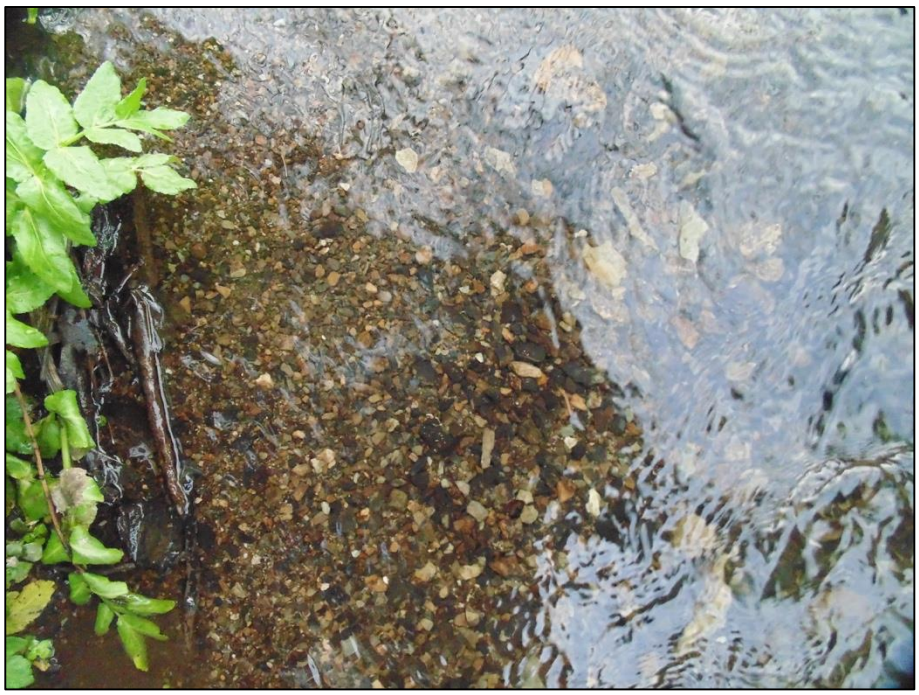

Plate 3.1 – Clean Gravels in the upper Ballyhalwick Stream (Section A)

River Fealge

Section A

The uppermost survey area (i.e. section A) on the River Fealge was an example of a very good quality natural to semi-natural salmonid river. It was characterised by clean riverine gravels, beds of *Ranunculus* sp. and submerged *Berula erecta* vegetation (upto 30% cover), an open channel (localised shading only) with a well developed riparian zone on the south bank. The riparian corridor had species including Alder (*Alnus glutinosa*), Willow (*Salix cinerea sp*.), Hawthorn (*Craetagus monogyna*) and Bramble (*Rubus fruticosus*) present. The channel also had a very good river profile with 50% riffle, 45% glide and and 15% pool habitat. The channel had good depth ranges between 0.3m and 1.5m and was ranged between 5m and 8m in width. Abundant salmonids were visible in the clear river water indicating a healthy balanced population. The river also had very good quality un-bedded and clean substrata. They comprised of 20% cobble, 20% coarse gravel, 55% medium and fine gravels with the remaining 5% by surface area accounting for sand and silt. The sand and silt did not form extensive beds suitable for lamprey. In summary the spawning and nursery value of the stream was good to high (i.e. 1.5) with the holding value slightly lower (i.e. good – 2). Overall section A is considered a very good quality salmonid habitat. The habitat may also support European eel. Refer to Figure 3.2 for a graphic summary of the fisheries habitat evaluation.

Section B

Section B of the River Fealge was overall of lower quality in terms of fisheries habitat the sections A and C located upstream and downstream respectively (see Figure 3.2). The River Fealge at section B was heavily canopied with riparian vegetation (i.e. Alder, Willow. Hawthorn and Bramble) reducing the light quantities entering the river. The river also has evidence of historical bank stabilisation with cobble rip rap installed along sections. The substrata had a higher quantity of cobble than upstream or downstream likely as a result of local changes in the stream gradient that appeared slightly steeper increasing river energy locally. The substrata comprised 10% boulder and bedrock, 40% cobbles and 50% coarse, medium and fine gravels with no observed softer silt habitat. The presence of shade, boulder and cobble refugia indicates that section B may be of importance to European eel that favour such habitats. The river at section B was predominantly of glide (i.e. 70%) with riffle and pool accounting for 20% and 10% by surface area respectively. The water depths ranged between 0.3 and 0.7m with a channel width of 4-5m. These characteristics coupled with the afore mentioned substrate types provided for a better nursery habitat than for spawning or holding habitat. As such the Life Cycle Unit Scores for spawning and holding habitat where moderate (i.e. score of 3) with the nursery habitat component being moderate to good (i.e. 2.5). Refer to Figure 3.2 for a graphic summary of the fisheries habitat evaluation.

Section C

Section C was a semi-natural section of channel that had historical fisheries improvement works installed. These appeared to be functioning well, with large flagstone installations below a riffle and glide section of river creating excellent pool habitat for adult salmonids. This area provided the best holding habitat for adult salmonids encountered during the catchment walkover surveys. The pool habitat was upto 2.5m deep with good quantities of clean mixed gravel and lower quantities of cobble. Substrata comprised 10% boulder, 40% cobble with 50% coarse and medium gravels and the remaining 10% of silt and sand. Indeed, the presence of good quantities of softer substrata adjoining gravels created the best lamprey habitat recorded during the survey also. This was located in the depositional areas on the pool margins and also adjoining the bridge abutment (i.e. bridge crossing entrance to Dunnes Stores; ITM 0537305, 0541289). The river profile overall comprised 30% riffle, 40% glide and 30% pool, indicating a mixed well define thalweg (i.e. river profile). Aquatic plants recorded included *Ranunculus sp., Rorrippa nasturtium aquaticum, Callitriche sp.* and *Apium nodiflorum*. *Ranunculus sp.* cover was approximately 20%, a very important species for cover and food provision in salmonid rivers. Overall section C was considered and excellent quality fisheries habitat with scores for holding habitat as high (i.e. 1) with spawning and nursery as good to high (i.e. 1.5). Refer to Figure 3.2 for a graphic summary of the fisheries habitat evaluation.

Section D

The lower River Fealge (i.e. tidal channel sections) was also surveyed. This area was exclusively of shallow riffle glide habitat at low tide and was considered a good trout nursery (i.e. score of 4). Fast flowing open and large tidal sections of river channel in known salmonid rivers can have high densities of trout (e.g. River Bandon at Innishannon) because of high productivity and thus are important nursery areas. The lower River Fealge may also be of importance to sea trout migrating upstream, although it is very difficult to identify juvenile sea trout from brown trout. The lower River Fealge may also be of importance to European eel elvers that can be present at high abundances in the lower tidal reaches of river channels as has been observed in other surveys in West Cork (pers. obs.).

Plate 3.2 – River Fealge (Section C) illustrating excellent holding habitat

Garage Stream

Section A

The upper reaches of the survey were undertaken at Carhoo, Clonakilty. The Garage Stream at this location was shallow averaging 0.1m deep and bordered by Bracken scrub and Alder woodland to the south with improved grassland to the north. Despite evidence of historical re-straightening, the channel bankfull height remained low (i.e. 0.5m) facilitating good light entry to the Garage Stream. The stream also had clear water and visually clean river gravels. The stream substrata comprised 25% cobble, 25% coarse gravel, and 45% medium to fine gravels with the remaining 5% by area composed of sand and silt. The instream habitat consisted of 50% riffle, 45% glide and 5% pool, the shallower water habitats being dominant. The best quality spawning area was immediately downstream of the existing culvert, where a deeper pool (circa 0.4m) adjoined good quality gravels (refer to Figure 3.3). Further downstream throughout the wider reaches of section A, the gravels however, were partially bedded meaning their viability for spawning, coupled with shallow water was lower overall than the upstream area containing pool habitat. In summary the spawning and nursery value of section A were moderate to good for both (i.e. score of 2.5). Holding pool habitat was limited and as such was evaluated as moderate (i.e. score of 3).

Section B

Overall section B of the Garage Stream was a poorer quality habitat in terms of fisheries value. Much of the channel had been straightened historically as is evident from Figure 3.3. The deeper bankfull height 1-2m, narrow channel width (i.e. 1m) and the virtual absence of meanders exemplifies historical alteration of the stream in section B. Furthermore, the lower reaches of the habitat have been impacted by a long stand of Japanese Knotweed (circa. 100m) largely concentrated on the east bank bordering Well Court. The unconsolidated banks evidently are contributing to sedimentation of the river gravels that were heavily silted. This was evident from silt plumes underfoot, bedded gravels and Knotweed leaf deposition. Incidentally the siltation may have encouraged a small area of lamprey amocoete habitat upstream of the road culvert at Well Court in a small pool. The habitat was approximately 2m^2 and of lower quality (ITM 537212, 540996) given the depth of sediment was <8cm and situated on harder sub-structure of gravels making it borderline for lamprey. The substrate of the wider section B area comprised 10% boulder, 40% cobble, 30% coarse, medium and fine gravels and 20% silt. The channel was dominated by glide habitat (60% of channel area), with lower quantities of riffle (30%) and pool (10%). The heavy shading, because of deep embankment and lower quality gravels reduce the streams nursery value (i.e. moderate – 3) and the limited pool habitat and shallower water indicate lower quality holding habitat (i.e. also moderate – 3). Furthermore, the heavily silted gravels indicate poorer spawning substrata. In addition, higher quantities of boulder and cobble make it less viable for spawning, especially for brown trout which are the most likely salmonid species using the habitat (i.e. spawning score of 3.5 – moderate to poor). Low densities of European eel may also occur in the habitat.

Section C

The lower reaches of the Garage Stream (e.g. adjacent to Clonakilty car hire) were marginally better in terms of fisheries habitats than upstream when considering all of the habitat attributes (see Figure 3.3). The channel was approximately 2m wide with 0.3 depth and appeared to have relatively low levels of siltation, west of the car hire and downstream of the culvert at Well Court. This section of the Garage Stream had some moderate to good spawning habitat (ITM 537241, 0541063) for brown trout with well sorted non-compacted gravels. This section also had approximately 8m^2 of lamprey habitat (i.e. organic rich sand and silt bordered by finer gravels) adjoining a pool at ITM 537187, 541003. The invasive plant Japanese Knotweed was present (20m^2) immediately downstream of the culvert at Well Court (ITM 537232, 541025), more extensive areas were present upstream of the culvert.

Overall the substrata of survey (section C) comprised approximately 30% cobble, 30% coarse gravel, 30% medium and fine gravels with the remaining 10% comprising sand and silt. Section C in terms of river profile comprised 15% pool, 30% riffle and 55% glide habitat with relatively open cover as a result of no riparian treeline or hedgerow habitat for the majority of the western bank. The eastern bank had Gorse (*Ulex europaeus*), Hawthorn, Sycamore (*Acer pseudoplatanus*) and bramble species on a small earthen embankment. Water Parsnip

(*Berula erecta*), Creeping Buttercup (*Ranunculus repens*) and Lesser Celendine (*Ficaria verna*) bordered the stream.

The lower extent of section C (i.e. behind Clonakilty Service Station) declined in quality because of storm drain input and historical realignment of the river. This was evident from increased sedimentation of the gravels, with a deeper (circa 1-1.5m) straightened channel, in addition to increased shading. Despite the lower quality of the lower extents overall the stream scored well for spawning and nursery (i.e. moderate to good – 2.5 and good – 2 respectively), with a lower score for holding habitat given limited pools (i.e. moderate – 3). Refer to Figure 3.3 for a graphic summary of the fisheries habitat evaluation.

Plate 3.3 – Garage Stream (Section C) illustrating moderate to good quality spawning and nursery habitat

Convent Stream

Section A

The Convent Stream is located south east of the N71 Convent Road (Flaxbridge area of Clonakilty Town, opposite Supervalue). The Stream discharges to the Clonakilty estuary where Croppy Quay intersects the Ring Road. Only one section of the Covent Stream was surveyed (i.e. section A given the stream's short length. The stream was heavily modified being straightened and deepened historically. The stream was also heavily shaded bounded by two masonry stone retaining walls with evident Japanese Knotweed encroachment on the north bank. The stream water had evident pollution entering it, based on visual inspection and odour. The river profile was exclusively of shallow riffle and glide habitat (circa. 0.2m deep) with <5% pool habitat present. The substrata were dominated by cobble habitat (mostly bedded into the substrate) making up 75% by surface area. Lesser amounts

25% by surface area of coarse, medium, fine gravels, silt and sand covered the remaining interstitial space. The substrata suffered from siltation, evident cover on substrata and bedded nature indicating continual sedimentation of the channel despite a very swift flow rate. The channel is not considered of value to salmonids as a spawning (scoring poorly for i.e. 4) but may be a lower quality nursery containing a small residual population (i.e. moderate – 3). Overall the Convent Stream is considered a more optimal habitat for more tolerant water quality species i.e. European eel. Eel as a species are known to occur in shaded cobble strewn lower reaches of rivers such as the Convent Stream. Refer to Figure 3.4 for a graphic summary of the fisheries habitat evaluation.

Plate 3.4 – Convent Stream (Section A) illustrating highly modified channel

Clonakilty Bay

Clonakilty Bay is an important estuarine habitat for a range of estuarine species, most notably sea bass (*Dicentrarchus labrax*) and golden bream (*Sparus aurata*), the later species being nationally uncommon (Quigley, 2015). Golden bream as a species were a rare vagrant until the 1970's in Irish waters but are present annually in the warmer months in Clonakilty Bay. The bay also contains three species of mullet, golden grey mullet (*Chelon aurata*), grey mullet (*Chelon labrosus*) and thin lipped mullet (*Chelon remada*), all of which are recreational angling target species as with bass and golden bream. The sandy banks of the bay support flounder (*Platichthys flesus*) and occasional brill (*Scophthalmus rhombus*). Large shoals of sandeel (*Ammodytes tobianus*) utilise the middle and outer bay and the mouth of the estuary is an important area for spawning sandeel. Small numbers of sea trout also feed in the estuary. Other fish present include ballan wrasse (*Labrus bergylta*) and Pollack (*Pollachius pollachius*) in the rocky outcrops of the outer bay. Clonakilty Bay forms an important part of the angling asset of West Cork and nationally is a very important shore angling venue.

Plate 3.5 – Golden Bream from Clonakilty Bay

Plate 3.6 – Mouth of Convent Stream discharging to Clonakilty Bay

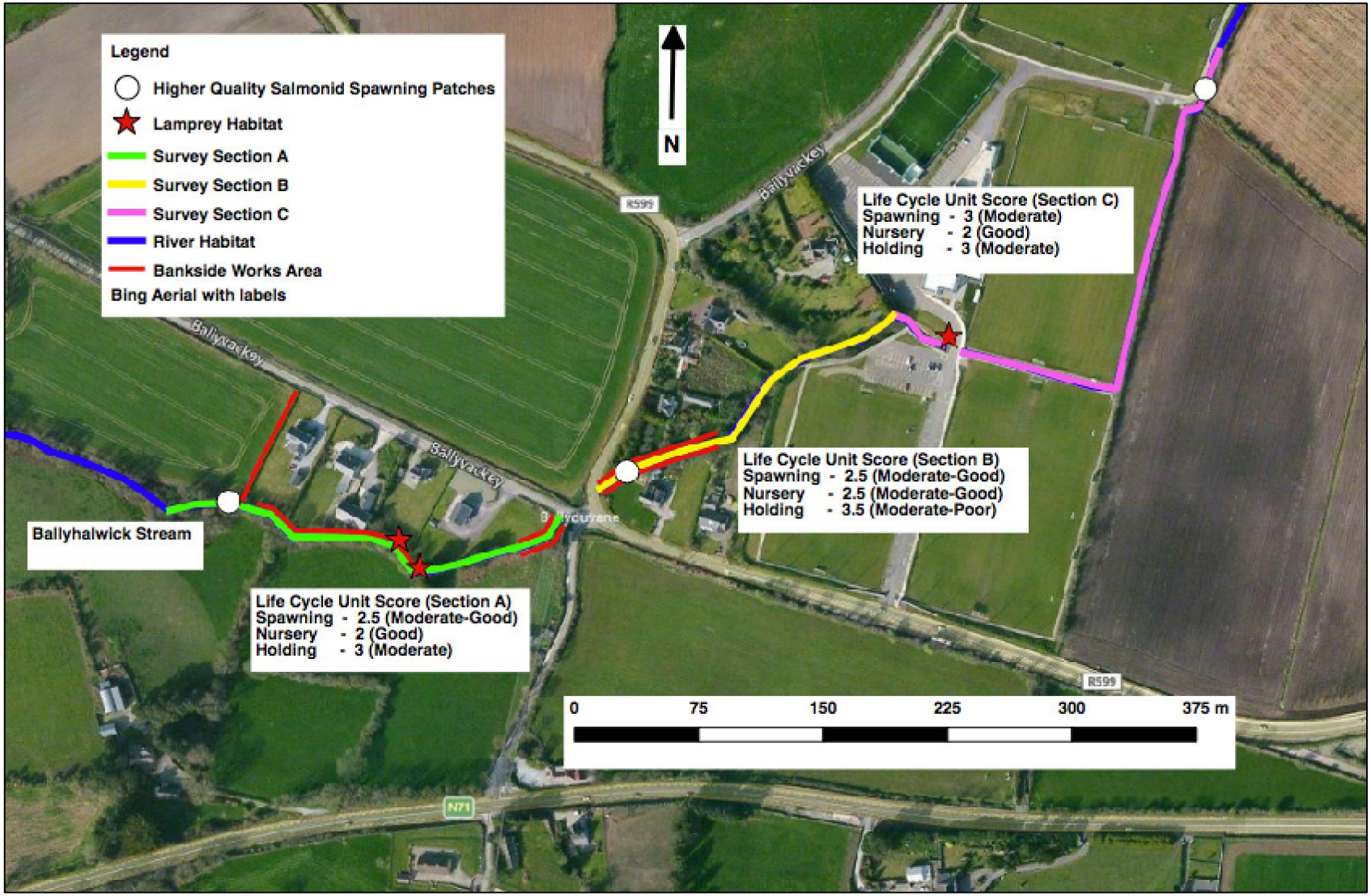

Figure 3.1 – Fisheries habitat Map of the Ballyhalwick Stream (illustrating lifecycle unit scores) for the habitat survey sections.

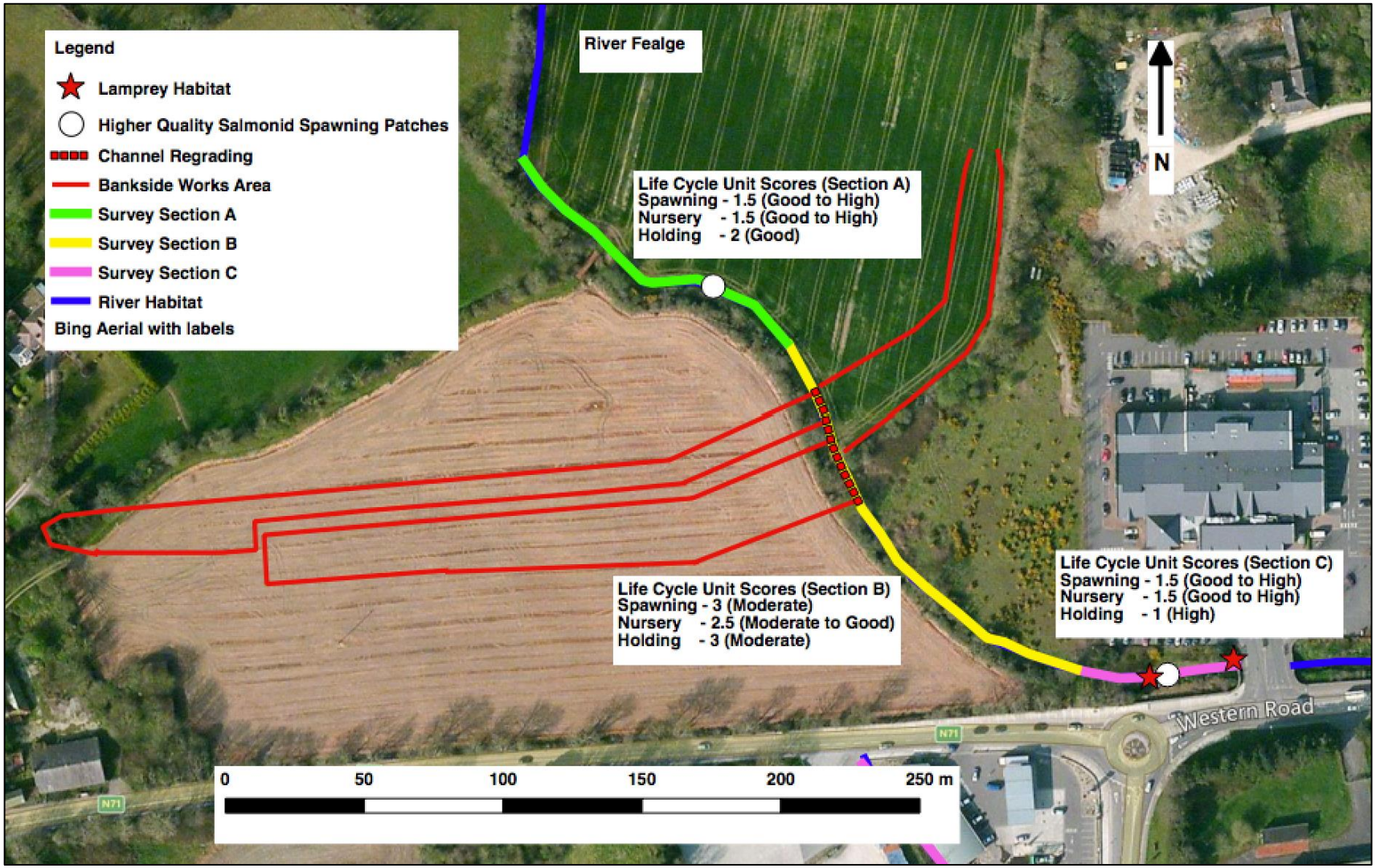

Figure 3.2 – Fisheries habitat Map of the River Fealge (illustrating lifecycle unit scores) for the habitat survey sections.

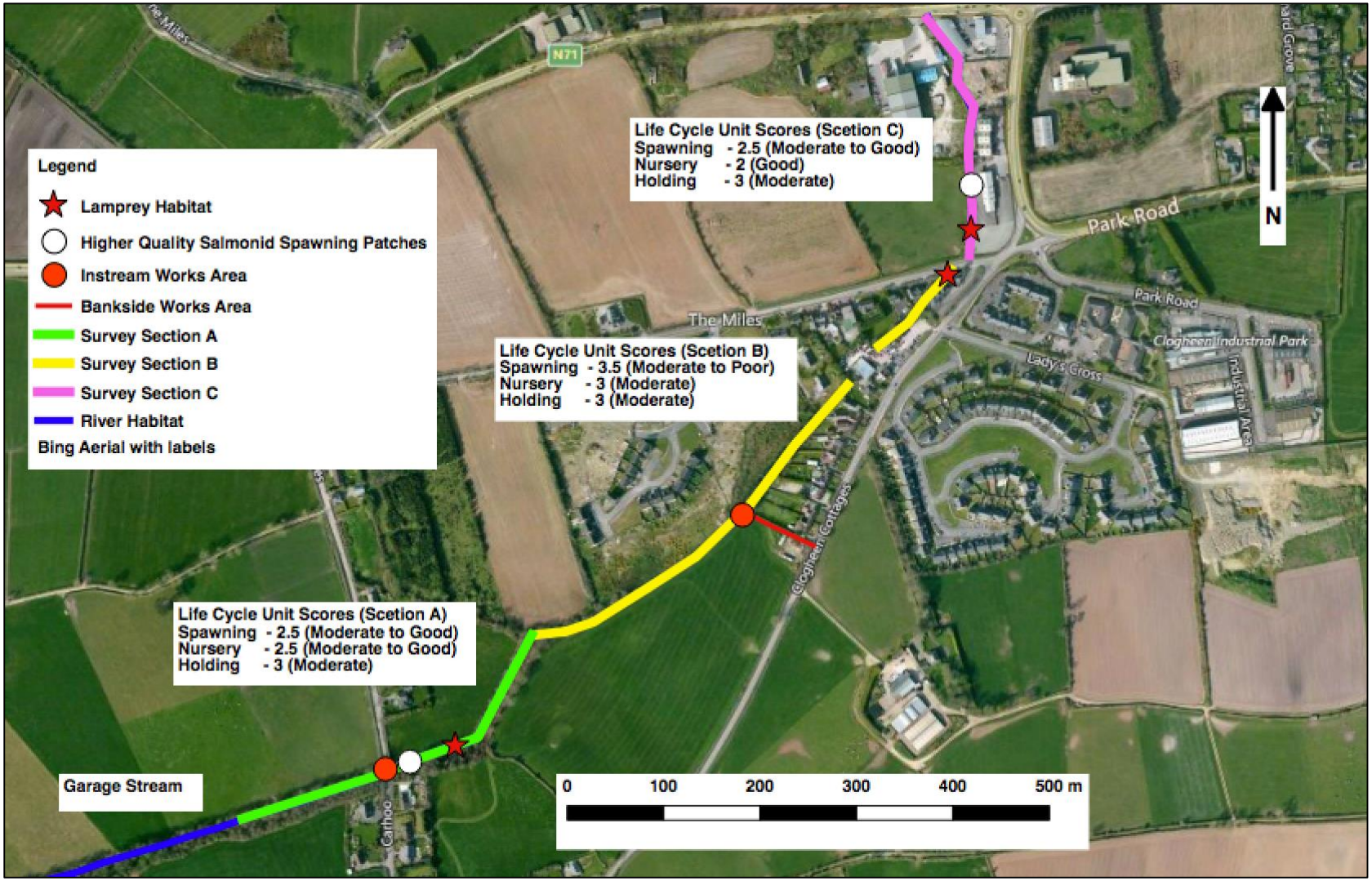

Figure 3.3 – Fisheries habitat Map of the Garage Stream (illustrating lifecycle unit scores) for the habitat survey sections.

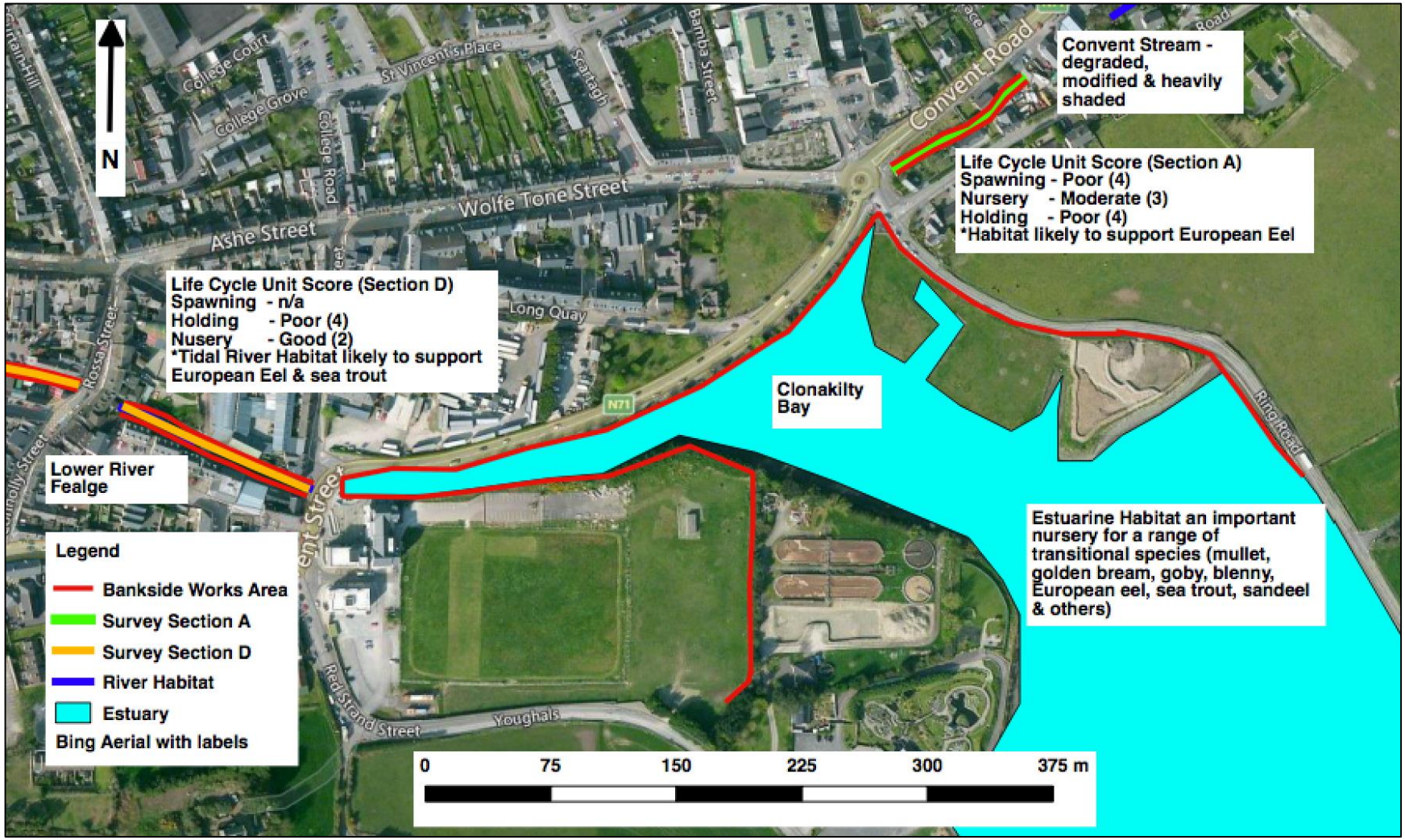

Figure 3.4 – Fisheries habitat Map of the Convent Stream and Lower River Fealge (illustrating lifecycle unit scores) for the habitat survey section.

4. Evaluation of Fisheries Habitat

This section evaluates the importance overall of each section of the survey sites in term of holding, nursery and holding habitat. It then summarises the overall value of each of the watercourses as to provide as baseline as to the magnitude of potential impacts in the proceeding impact assessment section. The results of the fisheries valuation are summarised in Table 4.1 below. A summary of the overall findings of the fisheries report are also presented below.

Ballyhalwick Stream

The Ballyhalwick Stream did not form part of the fisheries surveys conducted by INIS consultants (INIS, 2014). The Ballyhalwick stream was considered a semi-natural small stream with modified profile but retaining naturalness by virtue of good water flows and localised unaltered stretches of channel. Supports evident moderate densities of brown trout (visually observed within the channel) but may also support lamprey locally and European eel. The channel may also support low densities of Atlantic salmon but these are likely downstream of section B given the presence of an impassable trash screen (i.e. blocking migration of adult salmonids). Some lamprey habitat was identified but this was localised in the context of the wider river and characteristic of many of the spate rivers in west Cork. The Ballyhalwick Stream had moderate to good quality spawning and nursery habitat with lesser quality holding habitat, due to limited deeper pool habitat over the course of the river (see Figure 3.1 in the results section). Due to smaller size, modified channel and lower overall importance regionally it is considered of **Local Importance**.

River Fealge

The River Fealge was surveyed by INIS consultants during 2014 between Ahamilla and Clonakilty town centre. Brown trout, European eel, three-spined stickleback, stoneloach and Atlantic salmon were recorded during the survey. The most numerous species were brown trout (n=275), followed by European eel (n=39) across four survey sites. Very small numbers of Atlantic salmon were recorded (n=3) with only slightly higher numbers of stickleback (n=4) and stone loach (n=5) over the four electro-fishing sites. As would be expected the cobble strewn lower reaches of the river had good numbers of European eel, a species that appears to be recovering in recent years (pers. obs.) in light of longer term, large declines over the past 50 years.

The River Fealge is considered a semi-natural watercourse with local channel modifications but retaining a good semi-natural profile upstream with characteristic floating river vegetation community of a Cork sandstone river (i.e. *Ranunculus* dominated lower diversity community). The cover of *Ranunculus* likely increases in the summer and the high winter cover (approx. 30%) would indicate moderate levels of organic enrichment. Despite the high cover of *Ranunculus*, the river has retained good status Q4 water quality based on the most 2015 water quality data collected by the EPA.

The notable high density salmonid population present in what is considered a regionally a good sized river heightens it importance. The presence of Atlantic salmon (Annex II species) albeit at much lower densities than trout, improves further it's overall fisheries value. The densities of salmon may be higher upstream as only four sites were electro-fished by INIS consultants during 2014 and Atlantic salmon density is not always consistent across survey sites in lowland rivers. The Fealge River system is also known to contain lamprey (Annex II species) and European eel (ICUN red listed species) according to INIS (2014). While the former mentioned species (i.e. lamprey) was not recorded in the four electro-fishing sites, the later species (i.e. European eel) was recorded at moderate to high densities in the environs of Clonakilty Town centre. The absence of lamprey during the electro-fishing survey should not be used as a proxy for lamprey presence in the rest of the Fealge system as lamprey habitat is typically 'patchy' across the longitudinal length of rivers and distribution can often be clumped (pers. obs.). This was reflected during the current survey, where lamprey habitat was as identified 'patchy' in local pockets as illustrated n Figure 3.2 on the River Fealge (i.e. present locally in Area C). The Fealge had mixed quality spawning, nursery and holding pool habitat that changed over the surveyed areas (see Figure 3.2) Overall the spawning and nursery habitat was good to high quality with some lesser quality habitat in section B. The holding habitat quality was also mixed but was best in section A and C. Section C, the lower reach of the survey area had deep pool and scour habitat meaning it scored high in the holding pool habitat category. Refer to Figure 3.2 for summaries. The River Fealge is also listed as an area of local biodiversity importance on the Clonakilty Development Plan 2009-2015 (Clonakilty Town Council, 2009). Larger salmonid bearing watercourses with good status (Q4) water quality, such as the River Fealge can be considered of **County Importance**.

Garage Stream

The Garage Stream has been re-straightened and deepened extensively over it's course, but still retains some localised semi-natural habitat. The swift flows in the lower river help maintain some moderate to good quality nursery and spawning habitat in sections A and C of the survey area (see Figure 3.3). Despite this the river had typically poor holding habitat. Overall the stream character was narrow and and shallow stream with a heavily modified profile for over 50% of channel length with the lowest quality habitat being present in section B and the lower end of section C (the upper reaches of section C being of good quality). The stream supported small numbers of brown trout (visible during survey) but may also support lamprey locally and European eel. Due to smaller size, more extensive modified channel length, shallow depth and lower overall importance regionally, it is considered of **Local Importance**.

Convent Stream

The convent stream was considered the poorest quality fisheries habitat of all of the survey areas. The stream had a short catchment length and largely contained between retaining walls in a deep shaded channel profile. The stream was shallow and evidently suffering from pollution due to the odour of the channel and presence of abundant *Asellus aquaticus* and *Tubificid* worms (i.e. invertebrate indicators of poor water quality). Overall the stream was

considered of low value but may have some lower potential as a brown trout nursery. The Covent Stream however, is most likely to support European eel, a more pollution tolerant species that favours shaded cobble strewn rivers close to estuaries (i.e. Clonakilty Bay). While the stream is likely of some fisheries value, it's short length, modified instream habitat and heavily shaded nature indicates it of **Local Importance**.

Table 4.1 – Summary of Fisheries Evaluation of watercourses surveyed as part of the Clonakilty Flood Relief Scheme

River Name	Section	Life Cycle Unit Evaluation	Overall Evaluation	Rationale
Ballyhalwick Stream	A (within works area)	Spawning – Moderate to Good Nursery - Good Holding - Moderate	**Local Importance**	Semi-natural small stream with modified profile but retaining naturalness by virtue of good water flows and localised unaltered stretches of channel. Supports evident moderate densities of brown trout but may also support lamprey locally and European eel. Due to smaller size, modified channel and lower overall importance regionally it is considered of Local Importance.
	B (within works area)	Spawning – Moderate to Good Nursery – Moderate to Good Holding - Moderate		
	C (downstream of works)	Spawning - Moderate Nursery - Moderate to Good Holding - Moderate		
River Fealge	A (upstream of works)	Spawning – Good to High Nursery – Good to High Holding - Good	**County Importance**	Semi-natural watercourse with local channel modifications but retaining a good semi-natural profile upstream with characteristic floating river vegetation community of Cork sandstone river (i.e. *Ranunculus* dominated lower diversity community). High density salmonid population present in what is considered a regionally larger river system. Of note is the occurrence of Atlantic salmon (Annex II species) albeit at much lower densities than trout. System also contains lamprey (Annex II species) and European eel (ICUN red listed species). The River Fealge is also listed as an area of local biodiversity importance in the Clonakilty Development Plan 2009-2015. Larger salmonid bearing watercourses with good status (Q4) water quality such as the River Fealge are deemed to be of County Importance.
	B (within works area)	Spawning - Moderate Nursery – Moderate to Good Holding - Moderate		
	C (downstream of works)	Spawning – Good to High Nursery – Good to High Holding - High		
	D (within works area)	Spawning – n/a (tidal channel) Nursery – Good Holding - Poor		

River Name	Section	Life Cycle Unit Evaluation	Overall Evaluation	Rationale
Garage Stream	A (within works area)	Spawning – Moderate to Good Nursery – Moderate to Good Holding - Moderate	**Local Importance**	Semi-natural small and shallow stream with heavily modified profile for over 50% of channel length but retaining some naturalness. Supports small numbers of brown trout but may also support lamprey locally and European eel. Due to smaller size, more extensive modified channel length, shallow depth and lower overall importance regionally, it is considered of Local Importance.
	B (within works area)	Spawning – Moderate to Poor Nursery – Moderate Holding - Moderate		
	C (downstream of works)	Spawning – Moderate to Good Nursery – Good Holding - Moderate		
Convent Stream	A (within works area)	Spawning – Poor Nursery – Moderate Holding - Poor	**Local Importance**	Short and very heavily modified stream of limited fisheries value. While it may have some value as a low quality trout nursery it is more likely to be of value to European eel given it's cobble strewn and heavily shaded nature. Evident reduced water quality based on site observations. Considered of Local Importance.
Clonakilty Bay	n/a	n/a – Estuarine Habitat (Overall an important nursery and feeding area for a number of fish species	**International**	Designated as an SAC. The fish community within the bay is diverse and forms a very important recreational angling base. The fish species within also form part of an important estuarine ecosystem. The estuary is an important nursery for the nationally uncommon Golden Bream *Sparus aurata.*

5. Impact Assessment

Construction Phase Impacts

The construction phase impacts are likely to result from significant instream and bankside works. These include the proposed regarding of the instream channel profile locally (2 areas), the installation of trash screens (1 area) and sluice system (1 area) and the construction of flood embankments and flood walls (multiple sites). The instream works may directly impact the fisheries habitat locally through the removal of hard substrata (valuable for spawning) and nursery habitat. Indirect impacts include the settlement of suspended solids on river gravels downstream of works areas on the riparian verges (i.e. flood walls and embankments). Further associated impacts include pollution by chemicals such as concrete and hydrocarbons used during construction, in addition to vibration during piling or other works. Potential fisheries related impacts associated with the construction phase are summarised in Table 5.1 below. Operational phase impacts are discussed in the next section.

As part of instream works the construction of a new channel in the dry would be favourable. However, based on engineering constraints etc. works may be required in the existing channel in the dry via overpumping in conjunction with aquadam/ sandbag placement in the channel. This would create a temporary, impediment to fish passage along the river. However, the impact of an impediment to fish passage would be reduced as instream works are only permitted outside of the salmonid spawning period (i.e. permitted in July through September – refer to IFI, 2016). Direct mortality of fish buried in gravels and weed beds can occur during the placement of sand bags and aqua dam structures to facilitate water diversions and within the pumping equipment etc. However, such direct impacts are considered to be restricted to the works area of the river and should not effect the salmonid populations upstream or downstream, i.e. outside of the impact zone. This is considered as in-channel works are likely to be relatively localised and confined to the immediate vicinity of instream structures (e.g. sluice location, or instream trash screen, culvert areas etc.) at the zone of intersection of embankments, headwalls and flood walls at the river verge.

Consequently, the magnitude of **likely direct construction impacts** are considered to be **medium term minor negative** for the Covent Stream, Garage Stream, Ballyhalwick Stream and the River Fealge as a result of instream and bankside works.

Likely indirect construction related impacts are considered to be **medium term minor negative** for the for the Covent Stream, Garage Stream, Ballyhalwick Stream and the River Fealge as a result of instream and bankside works. These include as already stated silt mobilisation, cement and hydrocarbon pollution incidents which could impact upon water quality and turbidity levels. These pollutants can settle out in spawning / nursery area gravel, cobble and *Ranunculus* habitat and impact juvenile fish.

Table 5.1 – Potential construction Phase Impacts

Watercourse Name	Location relative to survey area (Section	Works Proposals	Risks
Ballyhalwick	Section A & B (Figure 3.1)	- Bankside regarding works - Piping of small adjoin surface water channel and connecting to Ballyhalwick via headwall. - Excavation & construction of concrete flood wall - Construction of embankment downstream of existing culvert crossing	- Escapement of solids in surface water drainage. - Escapement of concrete & other pollutants from construction areas. - Indirect impacts to instream river gravels (moderate to good quality spawning) from bankside construction works.
Fealge	Section B (Figure 3.2)	- Installation of flood water storage embankment & spillway - Installation of sluice gate system instream	- Escapement of solids in surface water drainage. - Escapement of concrete & other pollutants from construction areas. - Direct impact to substrate & channel profile from instream channel regrading. Associated impacts to existing salmonid and European eel population locally. - Indirect impacts to instream river gravels (good quality spawning downstream) from bankside construction works.
Garage	Section A & B (Figure 3.3)	- Installation of new road culverts (G8 & G9) - Installation of new instream trash screen & bankside access road	- Escapement of solids in surface water drainage. - Escapement of concrete & other pollutants from construction areas. - Direct impact to substrate & channel profile from instream culvert excavation & replacement (also from trash screen installation downstream). Associated impacts to existing salmonid and

Watercourse Name	Location relative to survey area (Section	Works Proposals	Risks
			European eel population locally. - Indirect impacts to instream river gravels (pockets of better quality spawning habitat downstream) from bankside construction works.
Convent	Section A (Figure 3.4)	- Construct new concrete walls. - Excavate & reinstate new U-shaped channel	- Escapement of solids in surface water drainage. - Escapement of concrete & other pollutants from construction areas. - Direct impact to substrate & European eel habitat. Possible impacts to low density stock of salmonids if present (no e-fishing survey conducted as yet).
Clonakilty Bay	Inner Clonakilty Bay (Figure 3.4)	- Excavate & build Embankment - Excavate Foundations & construct concrete wall	- Escapement of solids in surface water drainage. - Escapement of concrete & other pollutants from construction areas. - Indirect impacts to juvenile fish that use inner bay as a nursery.

Operational Phase Impacts

The operational phase of the proposed flood relief scheme relates to the everyday operation of the design once infrastructure is in situ. Potential operational phase impacts are summarised in Table 5.1 below.

During the operation of the proposed flood storage area, the installation of sluice gates that form part of the flood storage facility of the River Fealge (see section B figure 3.2) are likely to cause a temporary impediment to fish movements during migratory periods coinciding with high water levels, when the facility will be operational. The operation is considered to be infrequent (i.e. once every 1 to 2 years), meaning restrictions to fish passage are only during high velocity spates.

The proposed sluice gates will be of an undershot design, maintaining a minimum 200mm high submerged orifice space (to allow for some unrestricted movement of water). The water velocities experienced through the resulting orifice during some flood events may be impassable to all species including powerful swimming adult salmonids.

Despite the restriction of fish passage, it will be temporary, relatively infrequent and unavoidable, if occurring during the spawning season, there is a risk that spawning areas will not be accessible and therefore recruitment may be compromised in the worst case scenario.

The smooth surface of the concrete surface of the sluice structure may provide for difficult passage of elvers and lamprey, species with slower swimming speeds than salmonids.

To allow successful operation of the sluice gates, a sill or similar structure, will be required within the channel in which the gates can lock to prevent water movement downstream in a flood event. This will result in the permanent habitat loss of a small area of in-channel habitat due to the replacement of natural channel substrate with concrete, stone and other construction materials. This may result in a very localised loss of channel habitat exploitable by fish.

The operation of the flood storage facility will likely result in a **permanent minor negative impact** to lamprey, salmonids and European eel in the **River Fealge**.

There is proposed regarding of the **Convent Stream** also to create a U-Shaped channel to convey flood waters more efficiently. The regarding of the channel will result in the permanent loss of fisheries habitat and result in a **permanent minor negative impact** to fish species (likely dominated by European eel).

There is also the risk of scour of the river bed at the outfall of the flood storage area where an increase in peak velocity will be experienced during the release of stored volume; this may potentially directly displace fish spawning habitat as the gravel survey identified that

the section of channel where the embankment will be located is of good spawning potential. However, the area of impact will be extremely localised around the new structure and therefore an impact of low magnitude is therefore anticipated, resulting in a **permanent minor negative impact**.

Furthermore, the operation of the flood storage area and sluice gates will interrupt the flow of the river during flood events by holding water back. Within the confines of the storage facility, an increase in fine sediment deposition is likely to temporarily compromise the moderate spawning habitat quality currently present in this area (section B map 3.2) giving rise to a permanent **minor negative impact** on salmonid species, in term of local spawning habitat and invertebrate foodstuff.

Localised deposition may however create habitat for burrowing lamprey ammocoetes creating locally a permanent **minor positive impact** for lamprey species.

The redistribution of sediments downstream of the storage facility (due to reduction in peak flows arising from the storage facility but increased velocities due to increased confinement within the channel) and potential for net reduction in extent of spawning gravels due to coarse sediment deposition within the storage area is likely to result in a **permanent minor negative impact** to all fish species occurring in the River Fealge.

Where culverts are to be replaced in the Garage Stream, physical barriers to upstream fish migration could be created. Elevated velocities associated with a lack of bed heterogeneity, along with engineered head differences associated with incorrect placement are possible. Such effects have the potential to give rise to a **long term minor negative impact.**

Trash screens are also to be included on the Garage Stream, meaning bar spacing has the potential to restrict the upstream migration of larger fish species, particularly adult salmonids. This would constitute a **permanent minor negative impact**.

Table 5.1 – Potential Operational Phase Impacts

Watercourse Name	Location relative to survey area (Section	Works Proposals	Risks
Ballyhalwick	Section A & B (Figure 3.1)	- Piping of small adjoin surface water channel and connecting to Ballyhalwick via headwall. - New flood walls & embankments	- New source of solids escapement from new channel (i.e. storm water drain) - Potential hydro-morphological changes, i.e. changes to channel profile after flooding and resultant changes in the patterns of erosion and deposition
Fealge	Section B (Figure 3.2)	- Installation of flood water storage embankment & spillway - Installation of sluice gate system instream	- Potential hydro-morphological changes, i.e. changes to channel profile as a result of regarding and instream sluice system. Resultant changes in the patterns of erosion and deposition. - Impediment to fish caused by sluice gates during the operation of flood storage area
Garage	Section A & B (Figure 3.3)	- New road culverts (G8 & G9) - Installation of new instream trash screen & bankside access road	- Changes in water velocities, depths and fish passage as a result of culvert installations/ trash screen. - Potential hydro-morphological changes, i.e. changes to channel profile as a result of new instream structures (i.e. culverts & trash screen). Resultant changes in the patterns of erosion and deposition.
Convent	Section A (Figure 3.4)	- New flood walls - New U-shaped channel	- Potential hydro-morphological changes, i.e. changes to channel profile as a result of regarding of U-shaped channel. - Resultant changes in the patterns of erosion and deposition.
Clonakilty Bay	Inner Clonakilty Bay (Figure 3.4)	- New flood walls and embankments	- Potential local changes to the patterns of sediment transport and deposition during high water levels.

Mitigation

In order to mitigate identified construction and operational impacts on fisheries the following mitigation measures will be implemented;

- In-channel working will be minimised, wherever possible.
- In-channel working during the salmonid spawning season will not occur (November to June inclusive). Refer to *Guidelines on protection of fisheries during construction works in and adjacent to watercourses*, IFI (2016).
- During the construction phase it will be ensured that fish can migrate past the works areas and areas of in-channel working following consultation with IFI.
- Any pumps used for over-pumping must be 'fish -friendly' and fitted with appropriate screens.
- Avoid working in areas identified as being suitable for fish spawning, where practicable.
- If possible, hard engineering of the river bed will be avoided.

Any riverbed materials removed or disrupted as part of the works will be reinstated or replaced and any areas where new bed materials will be installed (i.e. wall footings, bed armour to prevent scour, sluice gate area), will be designed to replicate natural bed conditions.

Existing bed material will be used to cover new bed materials, wherever possible. Bed material removed from the river will be stored on the bankside. The storage facility will be such that there will be no loss of sediments from the material stored and no external contamination (e.g. a bunded plastic sheet or sealed plastic container). Once excavations are complete, and any new material has been introduced, the stored material will be replaced over the bed. Once normal flows are restored after demobilisation, the replaced material will be redistributed by the currents. These measures will ensure no net loss of material and no significant changes to bed sediment morphology or composition.

Pollution prevention measures should follow those as stated in section 9.59 of the EcIA prepared by JAB consultants.

Include appropriate bristle substrate within a pass facility for elvers/lamprey at the proposed sluice structure, and specify a board finish to the concrete on the deck of the proposed sluice structure and up to a height of 300mm above the equivalent Q70 water level at the structure. Ideally a rough surface is prepared to encourage river moss growth, that is known to be helpful for European eel passage on weirs.

Introduce spawning gravels at morphologically/hydraulically appropriate locations upstream of the storage area, equivalent to the extent of potentially compromised spawning gravels within the confines of the storage facility.

Ensure that all culverts and trash screens are designed and installed in line with published

best practice (e.g. Armstrong et al 2010; Turnpenny & O'Keefe 2005).

To ensure the impacts on altered sediment transport processes downstream of the embankment are as predicted and any net loss of in-channel habitats are quantified, a monitoring programme is proposed that consists of the following commencing at the point of scheme commissioning.

- Repeat hydromorphological audit that captures change associated with flood events of significant and known magnitude (key return periods to be agreed with IFI).
- Annual fish population survey for at least three years to capture changes in length-frequency distribution and abundances
- It is recommended that multiple pass depletion is employed to get accurate density readings and six replicate sites are fished.
- The electro-fishing sites should also overlap but not be limited to those of INIS (2014).

Should the above demonstrate that the magnitude of change to sediment transport processes is significant and there is a net change in extent and quality of in-habitat, further reach-scale remediation will be agreed with IFI and implemented. This could include the installation of in-channel features to maintain the extent and quality of existing spawning gravels (for salmonids and lamprey species) and fine sediment deposits (for adult Brook Lamprey).

Culvert Installation

The installation of culverts should follow best practice from both Inland Fisheries Ireland (i.e. IFI, 2016) and the National Roads Authority (i.e. NRA, 2008). A method statement must be prepared and agreed upon by Inland Fisheries Ireland in advance of works commencement. Recommendations of particular note include the following;

- Where required, all embedded culverts should be over-sized so that they can be set a minimum of 500mm below bed-level (unless stated otherwise by IFI) and set to follow the natural gradient of the bed so as to maintain natural river habitat characteristics. Ideally, the gradient should not exceed 3% and never exceed 5%.

- Where box and or pipe culverts are installed, IFI require that the approach and departure channels for such installed culverts are back-filled to a depth of up to 500mm with clean round gravel, in such size range as required where IFI determine that the material in the newly formed channel is unsuitable in terms of fish habitat.

- Any installed/modified culvert should not be less than 900mm in diameter to allow for the passage of fish. Where closed (i.e. box, pipe) culverts are required, culverts should be of similar width to that of the natural low-flow channel. It should be noted that pipe culverts are generally not acceptable except at sites demonstrating little or no significant fisheries value or potential.

- Any culverts should accommodate the speed of the slowest swimming species (i.e. European eel and lamprey) and water velocities should not exceed 1.2m/s (culverts <24m in length) or 0.9m/s (culverts >24m in length).
- Baffles should be provided within the culvert structure to locally reduce flow velocity thus aiding fish swimming/passage upstream without undue stress.
- In all cases, the culvert should be laid at a level and grade which allows the upstream invert to remain drowned (by back-watering) under low-flow conditions, to a depth suitable for the easy passage of the largest species frequenting the stream (e.g. 100mm for Brown trout, 150mm for Atlantic salmon)

Ecological Clerk of Works

An Ecological Clerk of Works (ECoW) should be present during the installation of the new instream structures (i.e. sluice gates, trash screens & culverts) and during the installation of embankments and headwalls at prior agreed periods during the construction phase. This will help ensure that mitigation is implemented effectively in order to maintain water quality targets in the River Felage, tributaries, Convent Stream and Clonakilty Bay. Broadly these include low suspended solids and turbidity with no leakage of concrete or hydrocarbons in accordance with a well thought out method statement. The ECoW should also guide construction staff during high risk construction activities and make every effort to prevent water pollution and damage to sensitive fisheries habitat (as identified in this report). The works should be undertaken in strict accordance with method statements agreed with Inland Fisheries Ireland in advance of commencement of works. The ECoW should have at least 5 years experience in riverine infrastructural works and should have a high level knowledge of fisheries. This knowledge base and onsite construction experience is required given the sensitivity of the River Fealge and Clonakilty Bay in particular.

Fish Salvage at Culvert Installation Sites

Areas likely to support juvenile lamprey have only been identified in the Ballyhalwick Stream adjacent to bankside regarding proposals but not adjacent to instream works. However, salmonids and European eel do occur adjacent to instream works areas and these species should be salvaged in advance of instream works. It is recommended that salmonids and eel are removed by means of electro-fishing and translocated upstream of the works area by under DCMNR licence in advance of culvert installation works. This will ensure local populations of fish are not significantly impacted. The fish salvation operation will be agreed as part of the schedule of works within the construction method statement to be agreed with Inland Fisheries Ireland.

Residual Impact

Once mitigation has been implemented in full in accordance with the contractor's method statement that will be agreed with IFI in advance of commencement of works, residual impacts are considered **long term minor negative** for the River Fealge, Ballyhalwick Stream, Garage Stream, Clonakilty Bay and the Covent Stream.

Despite physically not being a good quality salmonid stream, **Long term minor negative impacts** are considered for the **Covent Stream** given there is significant channel regrading proposed. In addition, the channel length is naturally short relative to the proposed working area and the full fisheries status remains unknown without electro-fishing meaning the impact magnitude should be as stated.

If must be noted however, follow up electro-fishing annually for 3 years after the installation of the flood relief infrastructure may identify no changes in the density and length-frequency (year class distributions) of salmonids, lamprey and European eel at upstream and downstream control stations at various sites in the catchment of the proposed works. Should this be the case impact significance may be reduced to **negligible**.

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D Appendix- Archaeological Assessment

Rubicon Heritage

Project code: CFRI13
Client: JBA Consulting Engineers and Scientists Ltd
Date: January 2017

A Supplementary Archaeological, Architectural and Cultural Heritage Impact Assessment of the Clonakilty Flood Relief Scheme

Report Author: Teresa Bolger
Planning Reference: N/A
Report Status: Version 1.0

RUBICON HERITAGE

REFERENCE SHEET FOR PLANNING AUTHORITY

Planning Ref. No.: N/A

National Grid Ref. (Irish Grid):

Townland/s: Desert; Kilgarriff; Maulnaskehy; Miles; Scartagh; Tawnies Upper; Tawnies Lower; Youghals

Town/ City Clonakilty

County: Cork

Postal Address (if applicable):

OS 6" Sheet No.: 135

Planning Authority: Cork County Council

Relevant RMP No. CO135-05200, CO135-052002-, CO135-050001-, CO135-050002-, CO135-052003-, CO135-053001-, CO135-053002-, CO135-053003-, CO135-132----, CO135-145----, CO135-146----, CO135-147----:

Reason for assessment: EIA

Summary: Please see *Non-Technical Summary*

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FIGURES

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NON-TECHNICAL SUMMARY

The purpose of this report is to assess the importance and sensitivity of the known as well as the potential archaeological, architectural and cultural heritage environment of the proposed development site on the Clonakilty Flood Relief Scheme, to identify the impact of the proposed development on this environment and to propose mitigation measures to reduce any impacts on said environment. It is a supplement to the original assessment contained within the *Environmental Impact Statement* (EIS) for the scheme. The original EIS was published in December 2015. However, subsequent to this certain changes were made to specific elements of the scheme design. This report itemises these alterations and assesses their impact on archaeological, architectural and cultural heritage sites. The report should be read alongside both the EIS and the series of previous archaeological studies undertaken that define and refine the baseline archaeological, architectural and cultural heritage environment, including the original impact assessment undertaken in 2014 and the test trenching report, architectural and cultural heritage survey, condition survey and underwater archaeological impact assessment all undertaken in 2015.

These previous studies have demonstrated that at total of a total of 113 individual cultural heritage sites) are located within the study area for this assessment. No National Monuments or sites with Preservation Orders are located within the study area but there are 12 Recorded Monument (RMPs), 65 Protected Structures and 56 NIAH sites. The river Fealge itself and its estuary are considered to be an area of archaeological potential (CH#113) for the purposes of this assessment. In addition, the urban core of Clonakilty has been designated an Architectural Conservation Area (ACA) and a Zone of Archaeological Potential (ZAP). No significant changes to the statutory listings—National Monuments, Sites with Protection Orders, Record of Monuments and Places, Record of Protected Structures and National Inventory of Architectural Heritage—have occurred since the original baseline environment was defined for the purposes of the EIS.

The design changes outlined in this report will result in changes to the construction phase impacts. Reduction in the scale of impacts will occur largely as a result of a commensurate reduction in the scope of required groundworks at specified locations. New impacts and increases in the scale of impacts will occur largely as a result of new groundworks elements or increases in the scope of required groundworks.

The following updated mitigation measures are subject to approval by Cork County Council and the National Monuments Service, Department of Arts, Rural, Regional and Gaeltacht Affairs:

1. Full archaeological excavation of the RMP *fulacht fia* site CH#010 should be undertaken in advance of construction to ensure the preservation by record of site. This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004. No specific mitigation measures appear to be necessary in relation to the RMP *fulachta fia* site (CH#012) as there are no indications that any sub-surface features relating to the site survive within the floodbank footprint. Archaeological monitoring of groundworks should be sufficient to manage any remaining risks.

2. Any RMP sites adjacent to construction works (including CH#009 and CH#011) should be fenced off from the works for the duration of construction activities and should not be utilised in any temporary capacity such as spoil stockpiles, site access or haul routes or site compounds/storage area.

3. Full archaeological excavation of the foundation corridor for the reinforced concrete wall (L37) on the south side of the Ring Road should be carried out in advance to construction to endure the preservation by record of the affected sections of the Deasy's shipyard site (CH#105). This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

4. Repair and replacement of the channel wall at L15 will remove the historic fabric of the c.1807 Brewery (CH#002) which is an RMP site. If the wall is not repairable and must be replaced, the wall should be fully archaeologically recorded, including archaeological monitoring of any new foundations for any new channel wall.

5. In order to identify buried or unknown archaeological remains, archaeological monitoring of all groundworks (including any enabling works or temporary works) associated with the proposed scheme will be carried out during the construction phase. This should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

6. Any dredging works undertaken with the R Feagle or its estuary, or similar works to improve or maintain the river channel, should be subject to a programme of archaeological monitoring. This should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

7. Where possible, every reasonable effort will be made to preserve *in situ*, or reduce the impact on any identified archaeological material through design. The current policy of the Minister for Arts, Heritage and the Gaeltacht is that preservation in situ of archaeological sites is the preferred option. Where known archaeological sites are adjacent to proposed works and are to be preserved *in situ*, these areas will be fenced off for the duration of construction works and will not be utilised in any temporary capacity such as spoil stockpiles, site access or haul routes or site compounds/storage area.

8. Where preservation *in situ* cannot be achieved, either in whole or in part, then a programme of full archaeological excavation will be implemented to ensure the preservation by record of the portion of the site that will be directly impacted upon. This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

9. If existing river walls or revetments are to be directly impacted then a detailed written and photographic record of the affected section of walling or revetment should also be compiled along with a historic buildings survey (to NIAH standards) prior to its removal. Notable areas where recording should be undertaken include (but are not limited to):
    - L22—masonry building with a water door on the south bank
    - L30—masonry building with a water door west of the Seymour Street pedestrian bridge
    - L32—19th century masonry building east of the Seymour Street pedestrian bridge

10. Repair work to masonry walls or revetments, in particular the early drystone revetments should be undertaken by experienced masons and under the supervision of a conservation architect, conservation engineer or other suitably qualified and/or experienced professional.

11. A condition survey has been undertaken of the five RMP sites within the Fluvial Storage Area (O'Flaherty and Millar 2015b). The recommendations of that report should be applied (subject to the advice of the National Monuments Service, DAHRRGA).

12. In order to preserve the architectural character and minimise impacts on the setting of architectural heritage sites it is recommended that new tidal defence walls be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.

13. Any alterations to or reinforcement of bridges which are protected structures should be undertaken in consultation with the Cork County Conservation Officer and following the guidance in *Architectural Heritage Guidelines for the Planning Authorities*.

14. The results of any archaeological monitoring and/or excavation will be submitted in a report to the Local Authority, the Heritage and Planning Division, Department of Arts, Heritage Rural, Regional and Gaeltacht Affairs and the National Museum of Ireland.

1 INTRODUCTION

This report details the additional archaeological, architectural and cultural heritage issues that need to be addressed in respect of the Clonakilty Flood Relief scheme along the River Flealge in the townlands of Desert, Kilgarriff, Maulnaskehy, Miles, Scartagh, Tawnies Upper, Tawnies Lower and Youghals, in Clonakilty, Co. Cork (Figure 1). The original Environmental Impact Statement for the scheme was published in December 2015. However, subsequent to this certain changes were made to specific elements of the scheme design. This report itemises these alterations and assesses there impact on archaeological, architectural and cultural heritage sites. These works were undertaken on behalf of JBA Consulting.

1.1. Objective

This study aims to assess the baseline archaeology and cultural heritage environment, to evaluate the likely significant impacts that the proposed development will have on this environment and to provide mitigation measures, in accordance with the policies of the Department of Arts, Heritage and the Gaeltacht (DAHG) and Cork County Council, the National Monuments Acts 1930-2004 and best practise guidelines, to ameliorate these impacts.

This report draws on the following previous studies undertaken during the pre-planning stage of the project:

- Bolger, T, O'Flaherty, E & Troy, C (2014) *An Archaeological, Architectural and Cultural Heritage Impact Assessment of a Proposed Development Site on the Clonakilty Flood Relief Scheme*
- Long, P & MacLeod, R (2015) *Report on archaeological test trenching on the Clonakilty Flood Alleviation Scheme located at Desert (Carbery East (E.D.) By.) and Miles, Co. Cork*
- O'Flaherty, E & Millar, J (2015) *Architectural and Cultural Heritage Survey: Clonakilty Flood Relief Scheme*
- O'Flaherty, E & Millar, J (2015) *Archaeological Condition Survey, Fluvial Storage Area, Miles Townland: Clonakilty Flood Relief Scheme*
- Bolton, J (2015) *Clonakilty, Co. Cork: Underwater archaeological impact assessment*.

These reports should be consulted for information on the overall character of the baseline archaeological, architectural and cultural heritage environment of the scheme. Summary information only will be presented in this document.

1.2. Legislative and Policy Framework

This assessment has been undertaken in accordance with the provisions of the following legislative procedures which are further detailed in Appendix 5:

- EIA Directive 85/337/EEC as amended by 97/11/EC and 2003/35/EC
- National Monuments Acts 1930-2004
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999
- Local Government (Planning and Development) Acts 2000-2001

This assessment was undertaken in accordance with the policies set out in Chapter 12 of the Cork County Development Plan 2014 and Chapter 4 of the Clonakilty Development Plan 2009-2015

1.3 Overview of Identified Significant Constraints

A total of 113 individual cultural heritage sites (Appendix 1) are located within the development site and 12 of these (CH#1–12) are recorded monuments. The majority of the remaining sites are protected structures within the town of Clonakilty. In addition the urban core of Clonakilty has been designated an Architectural Conservation Area and a Zone of Archaeological Potential. The river Fealge itself and its estuary are considered to be an area of archaeological potential (CH#113) for the purposes of this assessment.

No significant changes to the statutory listings—National Monuments, Sites with Protection Orders, Record of Monuments and Places, Record of Protected Structures and National Inventory of Architectural Heritage—have occurred since the original baseline environment was defined for the purposes of the *Environmental Impact Statement*.

Site Type	Summary
RMPs/ National Monuments/ Sites with Preservation Orders/ Sites listed in the Register of Historic Monuments	There are 12 RMPs incorporated by the study area. None of these RMPs are National Monuments; or have Preservation Orders placed on them.
Protected Structures	There are 65 Protected Structures incorporated by the study area.
Architectural Conservation Areas (ACAs)	There is one Architectural Conservation Areas incorporated by the study area.
Sites Listed in the NIAH	There are 56 sites listed in the NIAH incorporated by the study area.
Undesignated Cultural Heritage Sites	There are 21 undesignated cultural heritage sites incorporated by the study area. Twelve of these constitute townland boundaries which are incorporated by the study area.
Areas/features of archaeological potential	During the field survey of the study area 5 individual features or areas of archaeological potential were identified.

Table 1.1 – Summary of baseline environment

The initial Impact Assessment of the proposed scheme (Bolger et al. 2014) identified impacts on the following sites:

- CH# 003—a holy well (RMP CO135-050001-)
- CH# 004—a mill site (RMP CO135-050002-)
- CH# 009—an enclosure site (RMP CO135-132----)
- CH# 010—a fulacht fia (RMP CO135-145----)
- CH# 011—a fulacht fia (RMP CO135-146----)
- CH# 012—a fulacht fia (RMP CO135-147----)
- CH# 022—Bridge St bridge (PS 20000182)
- CH# 029—a house (NIAH 20846033)
- CH# 031—a water pump (NIAH 20846046)
- CH# 059—a water mill (PS 20000078)
- CH# 063—Kent St bridge (PS 20000191)
- CH# 067—Rossa St bridge (PS 20000205)
- CH# 102—Zone of Archaeological Potential for Clonakilty
- CH# 103—Architectural Conservation Area for Clonakilty
- CH# 109—site of mill race

- CH# 110—Walling/revetment of Feagle River
- CH# 111—Footbridge (site of) crossing river Feagle
- CH# 113— Fealge River and Estuary (Area of Archaeological Potential)

Targeted test excavation was carried out at four of the RMP sites (Long & MacLeod 2015)—the enclosure site in Desert (Carbery East (E.D.) By.) (CH#009) and the three *fulacht fia* sites in Miles (CH#010–012). The results of archaeological test trenching indicated that subsurface remains of one *fulachta fia* site (CH#010; CO135-145) are present within the foot print of the proposed flood bank in Miles townland. Radiocarbon dating of a sample of willow oak from this site returned a Late Bronze Age date of 1071–899 BC (SUERC 60918).Construction of the flood bank associated with the proposed fluvial storage area will directly impact on this site. There is no evidence to suggest that any sub-surface remains of the second *fulachta fia* site (CH#012; CO135-147) survive within the proposed floodbank footprint. The third *fulach fia* site (CH#011; CO135-146) lies outside the footprint of the floodbank. There were no indications of any features associated with the enclosure site (CH#009; CO135-132) within the footprint of the tidal floodbank in Desert townland.

An Underwater Archaeological Impact Assessment (UAIA) was completed in November 2015, incorporating a metal detector survey as well as wade and snorkel surveys (Bolton 2015). This assessment identified potential impacts on:

- CH#002—Brewery (RMP CO135-052002-)
- CH#105—Deasy shipyard
- CH# 110—Walling/revetment of Feagle River
- CH# 113— Fealge River and Estuary (Area of Archaeological Potential)

2 PROPOSED DEVELOPMENT AND SITE LOCATION

2.1. Proposed Development

The proposed flood defences incorporate a fluvial storage area with new tidal defences along the river bank and at start of the estuary (Figure 2). The main elements of the proposed defences are described in detail in the original *Environmental Impact Statement* (EIS).

Subsequent to the completion and publication of the EIS the following additions or alteration were made to the design:

- B2—Changed Distance from 6m to 12m. Measurement on drawing at pedestrian Bridge at the Credit Union
- B6—Changed description of work. Installation of a short wall at Seymour Street Bridge.
- D8—Included Clarke Street and increased distance from 130m to 200m. Re-directing the storm water sewer to a new Irish Water storm drain along Ashe Street. The Irish Water sewer has capacity and discharge location is at the same point as currently is.
- D9—Reduced distance from 300m to 220m. Construct storm water drain along Long Quay
- D13—New - drainage at Courtyard. Construct storm water drain at Harte's Courtyard
- D14—New - pump station at Courtyard
- D15—New - pipe existing land drain. Pipe existing surface water channel and connect through proposed headwall
- E3—Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by 300 mm
- E4—Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by 300 mm
- E5—Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by 300 mm
- E6—Raised height from 14.0m to 14.6m. Raise embankments at Ballyhalwick Stream by 300 mm
- E7—Raised height from 14.0m to 14.6m.
- E8—Raised height from 14.0m to 14.6m.
- E10—Reduced distance from 200m to 95m. Revised layout and location of the embankment in the farmers land beside the Ring Road. Possible short flood wall along the road to help reduce the size of the embankment. The embankment will be 95 m in length.
- E11—New - embankment at Hennessy property. 1 m high embankment at the side of a nearby property. This interference is linked to G12 and G18.
- E12—New - embankment at Cullinane property. New embankment as residents experienced flooding from Ballyhalwick Stream. 900 mm high embankment approx.. 75 m in length.
- E13—New - embankment at Waterfront instead of proposed wall. Replacement of the proposed wall by an embankment. Height of embankment approx. 1 m with a setback distance of 3 m from the waters edge.
- G10—Reduced distance from 810m to 650m. Relocating the trash screen in the Garage Stream.
- G11—Reduced distance from 810m to 650m. Relocating the trash screen in the Garage Stream.
- G12—New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate.
- G13—New - infill of gaps on river bank
- G14—New - infill of gaps on river bank
- G15—New - infill of gaps on river bank
- G16—New - infill of gaps on river bank
- G17—New - infill of gaps on river bank

- G18—New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate.
- H1—Increased distance from 5m to 45m. Regrade channel for flow control structure
- H2—Increased distance from 5m to 45m
- H67—Updated
- L2—Registered owner updated.
- L4—Reduced distance from 85m to 25m. Repair / replace existing channel wall / bank
- L6—Increased distance from 10m to 20m. Repair / replace existing channel wall / bank
- L7—Reduced distance from 25m to 2m. Repair / replace existing channel wall / bank
- L8—Reduced distance from 26m to 20m. Repair / replace existing channel wall / bank
- L9—Increased distance from 4m to 15m. Repair / replace existing channel wall / bank
- L11—Increased distance from 5m to 20m. Repair / replace existing channel wall / bank
- L12—Increased distance from 5m to 45m. Repair / replace existing channel wall / bank
- L14—Increased distance from 10m to 15m. Repair / replace existing channel wall / bank
- L15—Reduced distance from 75m to 40m. Repair / replace existing channel wall / bank
- L30—Revised location and registered owner. Distance reduced from 55m to 45m. (Swapped with L31). Excavate for foundations and construct reinforced concrete wall 1.3m high.
- L31—Revised location and registered owner. Distance increased from 45m to 55m. (Swapped with L30)
- L35—Reduced distance from 255m to 50m. Excavate for foundations and construct reinforced concrete wall 1.3m high
- L37—Increased height from 1.6m to 1.8m. Excavate for foundations and construct reinforced concrete wall up to 1.8m high to 3.68m AOD. Wall located along Deasy's Quay.
- L38—Updated description - u-shaped channel. Excavate channel and install u-shaped channel with reinforced concrete walls 1.3m high
- L39—Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high
- L40—Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high
- L41—Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high
- L42—Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high
- L43—New - repair / replace existing channel wall.
- L44—New - repair / replace existing channel wall.
- L45—New - repair / replace existing channel wall.
- L46—New - repair / replace existing channel wall.
- L47—New - repair / replace existing channel wall.
- R2—New - permanent haul road to access trash screen
- SI1—Changed description from sluice gate to penstock. Increased distance from 5m to 45m.
- SI2—Changed description from sluice gate to penstock. Increased distance from 5m to 45m.

2.2. Site Location

This study area focuses on a portion of the Fealge River, and a number of its tributaries within the town of Clonakilty and the surrounding environs. It includes eight townlands (Table 1) in the barony of Carbery East (E.D.).

Townland	**Parish**	**Barony**
Desert	Desert	Carbery East (E.D.)
Kilgarriff	Kilgarriff	Carbery East (E.D.)
Maulnaskehy	Kilgarriff	Carbery East (E.D.)
Miles	Kilgarriff	Carbery East (E.D.)
Scartagh	Kilgarriff	Carbery East (E.D.)
Tawnies Upper	Kilgarriff	Carbery East (E.D.)
Tawnies Lower	Kilgarriff	Carbery East (E.D.)
Youghals	Kilgarriff	Carbery East (E.D.)

Table 2.2 – Townlands within study area

3. METHODOLOGY USED FOR ASSESSING BASELINE VALUES OF SITES, MAGNITUDE OF IMPACTS AND SIGNIFICANCE OF IMPACTS

3.1 Methodology used for assessing baseline value of sites

In order to categorise the baseline environment in a systemised manner, 'baseline values' have been assigned to each identified site of cultural heritage significance and/or potential within the study area. The baseline value of a site is determined with reference to the 'importance' and 'sensitivity' of the site.

In accordance with NRA Guidelines, the importance of a site is determined based on the following criteria: legal status, condition, historical associations, amenity value, ritual value, specimen value, group value and rarity.

The sensitivity of a site is determined based on its susceptibility to physical impact (see Section 4.3; Methodology Used for Assessing Magnitude of Physical Impacts), as well as susceptibility to impact on setting (see Section 5.4: Methodology Used for Assessing Impacts on Setting).

It should be noted that the National Monuments Act 1930-2004 does not differentiate between recorded archaeological sites on the basis of relative importance or sensitivity. In addition, the Local Government (Planning and Development) Act, 2000 does not differentiate between Protected Structures or Areas of Architectural Conservation on the basis of relative importance or sensitivity either. Consequently, professional judgement has been exercised to rate these features based on their perceived importance and sensitivity in relation to physical impacts and impacts on setting.

Taking the above factors into consideration, the criteria that have been defined are provided in Table 3.1 below.

Subject	Baseline Value
- Recorded Archaeological Monuments - Protected Structures - Architectural Conservation Areas (ACAs)	Very High
- Sites listed in the NIAH that are not Protected Structures - Unregistered built heritage sites that comprise extant remains which are in good condition and/or which are regarded as constituting significant cultural heritage features - Unrecorded features of archaeological potential	High
- Unregistered built heritage sites that comprise extant remains which are in poor condition - Unregistered cultural heritage sites (not including built heritage sites) that comprise extant remains - Townland boundaries that comprise extant remains - Marshy/wetland areas	Medium/High
- Unregistered cultural heritage sites for which there are no extant remains but where there is potential for associated subsurface evidence - Townland boundaries for which there are no extant remains	Medium/Low
- Unregistered cultural heritage sites for which there are no extant remains and where there is little or no potential for associated subsurface evidence	Low

Table 3.1 – Baseline values of sites

Note: 'All other areas' collectively refers to the areas within the proposed development site that do not contain or comprise features of cultural heritage significance.

3.2 Type of impacts

The following table lists the type of impacts that a proposed development may have on the cultural heritage resource:

Type of Impacts	Definition
Direct	Direct impacts arise where an archaeological, architectural and/or cultural heritage feature or site is physically located within the footprint of the proposed development, or its associated physical impact zone, whereby the removal of part, or all of the feature or site is thus required.
Indirect	Indirect impacts arise when an archaeological, architectural or cultural heritage feature is not located within the footprint of the proposed development, or its associated physical impact zone, and thus is not impacted directly. Such an impact could include impact on setting or impact on the zone of archaeological potential of site whereby the actual site itself is not physically affected.
Cumulative	The addition of many impacts to create a large, significant impact.
Undeterminable	Whereby the full consequence that the proposed development may have on the cultural heritage resource is not known
Residual	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.

Table 3.2 – Type of impacts

3.3. Methodology Used for Assessing Physical Impacts

The methodology used to assess the magnitude of potential pre-mitigation impacts, as well as residual impacts, of the proposed development on the baseline environment is presented in Table 3.3 below.

Impact magnitude	Criteria
Severe	- Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeology site is completely and irreversibly destroyed. - An impact that obliterates the architectural heritage of a structure or feature of national or international importance. These effects arise where an architectural structure or feature is completely and irreversibly destroyed by the proposed development. Mitigation is unlikely to remove adverse effects.

Impact magnitude	Criteria
Major	- An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about an archaeological feature/site. - An impact that by its magnitude, duration or intensity alters the character and/or the setting of the architectural heritage. These effects arise where an aspect or aspects of the architectural heritage is/are permanently impacted upon leading to a loss of character and integrity in the architectural structure or feature. Appropriate mitigate is likely to reduce the impact - A beneficial or positive effect that permanently enhances or restores the character and/or setting of a feature of archaeological or cultural heritage significance in a clearly noticeable manner.
Moderate	- A medium impact arises where a change to a site/monument is proposed which though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological feature can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible. - A medium impact to a site/monument may also arise when a site is fully or partly excavated under license and all recovered data is preserved by record. - An impact that results in a change to the architectural heritage which, although noticeable is not such that alters the integrity of the heritage. The change is likely to be consistent with existing and emerging trends. Impacts are probably reversible and may be of relatively short duration. Appropriate mitigation is very likely to reduce the impact. - A beneficial or positive effect that results in partial or temporary enhancement of the character and/or setting of a feature of archaeological or cultural heritage significance in a clearly noticeable manner.
Minor	- An impact which causes changes in the character of the environment, such as visual impact, which are not high or very high and do not directly impact or affect an archaeological feature or monument. - An impact that causes some minor change in the character of architectural heritage of local or regional importance without affecting its integrity or sensitivities. Although noticeable, the effects do not directly impact on the architectural structure or feature. Impacts are reversible and of relatively short duration. Appropriate mitigation will reduce the impact. - A beneficial or positive effect that causes some minor or temporary enhancement of the character of an architectural heritage significance which, although positive, is unlikely to be readily noticeable.

Impact magnitude	Criteria
Negligible	- An impact on archaeological features or monument capable of measurement but without noticeable consequences. - An impact on architectural heritage of local importance that is capable of measure merit but without noticeable consequences. - A beneficial or positive effect on architectural heritage of local importance that is capable of measurement but without noticeable consequences.

Table 3.3 – Criteria used for rating magnitude of impacts

3.4 Methodology used for assessing impacts on setting

There is considerable debate over definitions of setting and approaches to the assessment of setting impacts (Lambrick 2008), with no standardised industry-wide approach. The assessment methodology used here has been developed in house by Rubicon Heritage Services Ltd.

The definition of setting used here is that provided by English Heritage (2008, 39):

> 'Setting' is an established concept that relates to the surroundings in which [an asset] is experienced, its local context, embracing present and past relationships to the adjacent landscape. Definition of the setting of a [cultural heritage asset] will normally be guided by the extent to which material change within it could affect (enhance or diminish) the [asset's] significance.

Hence setting is not simply the visual envelope of the asset in question. Rather, it is those parts of the asset's surroundings that are relevant to the significance of the asset and the appreciation thereof. The same document (*ibid*., 28-32) sets out a range of values that are relevant when considering an asset's significance:

- Evidential;
- Historical (Illustrative and associative);
- Aesthetic (Design and fortuitous); and
- Communal (commemorative/symbolic, social and spiritual).

These values have been used in the current assessment in order to define the setting of the asset. The asset's values are identified and the relationship of these values to the surroundings established. Those elements of the surroundings that contribute to the asset's values are considered to form the setting.

In most instances setting will relate to the historical value of the asset, where an appreciable relationship between the asset and an element of its surroundings helps the visitor understand and appreciate the asset. This may be in terms of a physical relationship, such as between a castle and the natural rise that it occupies, or a more distant visual relationship, such as a designed vista or the view from, for example, one ringfort to another. The former is referred to in this assessment as immediate setting and the latter as landscape setting. Many assets will only have an immediate setting. Some assets will have aesthetic value that relates to the surrounding landscape, such as in the case of a designed view incorporating a distant hill, or that relates to the contribution the asset makes to the local landscape, for example a church spire providing a focal point in a view down a valley.

3.4.1 Factors to Consider When Assessing Impacts Upon Setting

English Heritage (2005) has provided a list of factors to be considered when assessing impacts upon setting. These are broad factors and have been taken into consideration when assessing magnitude of impact and sensitivity. They are summarised in Table 3.4.1.

Factor	Discussion
Visual dominance	Where an historic feature (such as a hilltop monument or fortification, a church spire, or a plantation belonging to a designed landscape) is the most visually dominant feature in the surrounding landscape, adjacent construction of the proposed development may be inappropriate.
Scale	The extent of a proposed development and the number, density and disposition of its associated elements will also contribute to its visual impact.
Intervisibility	Certain archaeological or historic landscape features were intended to be seen from other historic sites. Construction of a proposed development should respect this intervisibility.
Vistas and sight-lines	Designed landscapes invariably involve key vistas, prospects, panoramas and sight-lines, or the use of topography to add drama. Location of a proposed development within key views, which may often extend beyond any designated area, should be avoided.
Movement, sound or light impacts	The movement associated with a proposed development as well as their scale may be a significant issue in certain historic settings. Adequate distance should always be provided between important historic sites and proposed developments to avoid the site being overshadowed or affected by noise and shadow flicker effects.
Unaltered settings	The setting of some historic sites may be little changed from the period when the site was first constructed, used or abandoned. Largely unaltered settings for certain types of sites, particularly more ancient sites, may be rare survivals and especially vulnerable to modern intrusions. This may be a particular issue in certain upland areas.

Table 3.4.1 – Factors to be considered when assessing impacts upon setting (after English Heritage 2005)

3.4.2 Methodology used to assess magnitude of impact on setting

The magnitude of an impact reflects the extent to which relevant elements of the cultural heritage asset's setting are changed by the development, and the effect that this has upon the character and value of the asset and the appreciation thereof. Guideline criteria for magnitude defined as high, medium, low or negligible magnitude are described in Table 3.4.2. As with other criteria presented, this is intended as a general guide, and it is not anticipated that all the criteria listed will be present in every case.

The following are guides to the assessment of magnitude of impact:

- *Obstruction of or distraction from key views*. Some assets have been sited or designed with specific views in mind, such as the view from a country house with designed vistas. The obstruction or cluttering of such views would reduce the extent to which the asset could be understood and appreciated by the visitor. Developments outside key views may distract from them and make them difficult to appreciate on account of their prominence and movement. In such instances the magnitude is likely to be greatest where views have a particular focus or a strong aesthetic character. Sympathetic development may improve key views by removing features that obstruct or distract from key views and hence preserve or enhance the importance of the asset.

- *Changes in prominence*. Some assets are deliberately placed in prominent locations in order to be prominent in the surrounding landscape, for example prehistoric cairns are often placed to be silhouetted against the sky and churches in some areas are deliberately placed on ridges in order to be highly visible. Developments can reduce such prominence and therefore reduce the extent to which such sites can be appreciated or the contribution that they make to the local landscape. Similarly, sympathetic development can enhance the setting of such sites by, for example, removing modern forestry that would otherwise compromise the setting of a cairn that had been placed on a skyline.
- *Changes in landscape character*. A particular landuse regime may be essential to the appreciation of an asset's function, for instance the fields surrounding an Improvement period farmstead are inextricably linked to its appreciation. Changes in land use can leave the asset isolated and reduce its value. In some instances, assets will have aesthetic value or a sense of place that is tied to the surrounding landscape character. Conversely, sympathetic development may restore or preserve the relevant landuse and hence preserve or enhance the relevant value of the asset.
- *Duration of impact*. Impacts that are long term or permanent are generally of greater magnitude than those that are short term.

Readily reversible impacts are generally of lesser magnitude than those that cannot be reversed.

Impacts upon the defined setting will be of greater magnitude than those that affect unrelated elements of the asset's surroundings or incidental views to or from an asset that are unrelated to the appreciation of its value.

Magnitude	Guideline criteria
Major beneficial	The contribution of setting to the cultural heritage asset's significance is considerably enhanced as a result of the development; a lost relationship between the asset and its setting is restored, or the legibility of the relationship is greatly enhanced. Elements of the surroundings that detract from the asset's cultural heritage significance or the appreciation of that significance are removed.
Moderate beneficial	The contribution of setting to the cultural heritage asset's significance is enhanced to a clearly appreciable extent as a result of the development; as a result the relationship between the asset and its setting is rendered more readily apparent. The negative effect of elements of the surroundings that detract from the asset's cultural heritage significance or the appreciation of that significance is appreciably reduced.
Minor beneficial	The setting of the cultural heritage asset is slightly improved as a result of the development, slightly improving the degree to which the setting's relationship with the asset can be appreciated.
Negligible	The setting of the cultural heritage asset is only imperceptibly changed as a result of the development; the only noticeable adverse changes to the landscape are to elements that are not considered relevant to the setting of the cultural heritage asset.
Minor adverse	The contribution of the setting of the cultural heritage asset to its significance is slightly degraded as a result of the development, but without adversely affecting the interpretability of the asset and its setting; characteristics of historic value can still be appreciated, the changes do not strongly conflict with the character of the site, and could be easily reversed to approximate the pre-development conditions.

Magnitude	Guideline criteria
Moderate adverse	The contribution of the setting of the cultural heritage asset to its significance is reduced appreciably as a result of the development and cannot easily be reversed to approximate pre-development conditions. Relevant setting characteristics can still be appreciated but less readily.
Major adverse	The contribution of the setting of the cultural heritage asset to its significance is effectively lost or substantially reduced as a result of the development, the relationship between the asset and its setting is no longer readily appreciable.

Table 3.4.2 – Guideline criteria for assessment of magnitude of an impact on the setting of a cultural heritage asset

3.5 Methodology used for assessing significance level of impacts

The significance level of a construction or operation impact on a feature is assessed by combining the magnitude of the impact and baseline value of the feature. The matrix in Table 5.5 provides a guide to decision-making, but is not a substitute for professional judgement and interpretation, particularly where the baseline value or impact magnitude levels are not clear or are borderline between categories. The permanence of the effects are also taken into account, with irreversible effects being more significant while temporary or reversible changes are likely to be less significant.

Magnitude of Impact	Baseline Value				
	Very High	**High**	**Medium/High**	**Medium/Low**	**Low**
Severe	Very significant	Very significant	Significant	Moderate	Slight
Major	Significant	Significant	Moderate	Moderate	Slight
Moderate	Moderate	Moderate	Moderate	Slight	Negligible
Minor	Moderate	Slight	Slight	Negligible	Negligible
Negligible	Slight	Slight	Negligible	Negligible	Negligible

Table 3.5 – Criteria for assessing significance level of impacts

4 IMPACT ON BASELINE ENVIRONMENT PRIOR TO IMPLEMENTATION OF MITIGATION MEASURES

In accordance the Environmental Impact Assessment Directive (EIA Directive 85/337/EEC as amended by 97/11/EC and 2003/35/EC) which requires that potential impacts on archaeology, architecture and cultural heritage are evaluated, this section assesses the likely significant impacts that the proposed scheme will have on the baseline environment during its construction and operation phases respectively prior to mitigation measures. The methodology used in ascertaining the baseline value of sites, the type, magnitude and significance level of impacts is set out in Section 4 above.

Mitigation measures to ameliorate these impacts and the residual impact that the proposed scheme will have on each site of cultural heritage significance and/or potential are provided in Section 8 below.

The following table details the type, nature, extent, duration, magnitude and significance level of all impacts that the proposed scheme will have on individual cultural heritage sites during both the construction and operation phases of the scheme prior to mitigation. Reduction in the scale of impacts will occur largely as a result of a commensurate reduction in the scope of required groundworks at the specified locations. New impacts and increases in the scale of impacts will occur largely as a result of new groundworks elements or increases in the scope of required groundworks.

		Impact Assessment	
Interference No.	**Brief description of Changes**	**Type**	**Description**
B2	Changed Distance from 6m to 12m. Measurement on drawing at pedestrian Bridge at the Credit Union	N/A	No impact
B6	Changed description of work. Installation of a short wall at Seymour Street Bridge.	N/A	No impact
D8	Included Clarke Street and increased distance from 130m to 200m. Re-directing the storm water sewer to a new Irish Water storm drain along Ashe Street. The Irish Water sewer has capacity and discharge location is at the same point as currently is.	Direct	Potential impact on CH#102 ZAP for Clonakilty as a result of ground reduction.
D9	Reduced distance from 300m to 220m. Construct storm water drain along Long Quay	Direct	Reduced impact as a result of ground reduction however impact not eliminated.
D13	New - drainage at Courtyard. Construct storm water drain at Harte's Courtyard	Direct	New impact as a result of ground reduction
D14	New - pump station at Courtyard	Direct	New impact as a result of ground reduction
D15	New - pipe existing land drain. Pipe existing surface water channel and connect through proposed headwall	N/A	No impact
E3	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by 300 mm	Direct	No new impact; however original impact as a result of ground reduction remains.

		Impact Assessment	
Interference No.	**Brief description of Changes**	**Type**	**Description**
E4	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by 300 mm	Direct	No new impact; however original impact as a result of ground reduction remains
E5	Raised height from 21.9m to 22.1m. Raise embankments at Ballyhalwick Stream by 300 mm	Direct	No new impact; however original impact as a result of ground reduction remains
E6	Raised height from 14.0m to 14.6m. Raise embankments at Ballyhalwick Stream by 300 mm	Direct	No new impact; however original impact as a result of ground reduction remains
E7	Raised height from 14.0m to 14.6m.	Direct	No new impact; however original impact as a result of ground reduction remains
E8	Raised height from 14.0m to 14.6m.	Direct	No new impact; however original impact as a result of ground reduction remains
E10	Reduced distance from 200m to 95m. Revised layout and location of the embankment in the farmers land beside the Ring Road. Possible short flood wall along the road to help reduce the size of the embankment. The embankment will be 95 m in length.	Direct	Reduced impact as a result of ground reduction on CH#009. However impact has not been eliminated.
E11	New - embankment at Hennessy property. 1 m high embankment at the side of a nearby property. This interference is linked to G12 and G18.	N/A	No impact
E12	New - embankment at Cullinane property. New embankment as residents experienced flooding from Ballyhalwick Stream. 900 mm high embankment approx.. 75 m in length.	Direct	Ground reduction could uncover previous unknown archaeological features.
E13	New - embankment at Waterfront instead of proposed wall. Replacement of the proposed wall by an embankment. Height of embankment approx. 1 m with a setback distance of 3 m from the waters edge.	Direct	Reduced impact on historic river walls/revetment (CH#110). However impact on this receptor remains at other locations. Additional impact as a result of ground reduction which could uncover previously unknown archaeological features.
G10	Reduced distance from 810m to 650m. Relocating the trash screen in the Garage Stream.	N/A	No impact
G11	Reduced distance from 810m to 650m. Relocating the trash screen in the Garage Stream.	N/A	No impact

		Impact Assessment	
Interference No.	**Brief description of Changes**	**Type**	**Description**
G12	New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate.	N/A	No impact
G13	New - infill of gaps on river bank	Direct	Potential impact on CH#113 AAP of R Fealge
G14	New - infill of gaps on river bank	Direct	Potential impact on CH#113 AAP of R Fealge
G15	New - infill of gaps on river bank	Direct	Potential impact on CH#113 AAP of R Fealge
G16	New - infill of gaps on river bank	Direct	Potential impact on CH#113 AAP of R Fealge
G17	New - infill of gaps on river bank	Direct	Potential impact on CH#113 AAP of R Fealge and CH#110 river walls/revetments
G18	New - remove ditch - replace with fence. [See E12]. Remove existing ditch / hedging and replace with timber post and rail fence and gate.	N/A	No impact
H1	Increased distance from 5m to 45m. Regrade channel for flow control structure		Potential impact on CH#113 AAP of R Fealge
H2	Increased distance from 5m to 45m		Potential impact on CH#113 AAP of R Fealge
H67	Updated	No impact	No impact
L2	Registered owner updated.	No impact	No impact
L4	Reduced distance from 85m to 25m. Repair / replace existing channel wall / bank	Direct	Reduced impact on CH#113 AAP of R Feagle; however impact has not been eliminated.
L6	Increased distance from 10m to 20m. Repair / replace existing channel wall / bank	Direct	Increased impact on CH#113 AAP of R Feagle.
L7	Reduced distance from 25m to 2m. Repair / replace existing channel wall / bank	Direct	Reduced impact on CH#113 AAP of R Feagle; however impact has not been eliminated.
L8	Reduced distance from 26m to 20m. Repair / replace existing channel wall / bank	Direct	Reduced impact on CH#113 AAP of R Feagle; however impact has not been eliminated.
L9	Increased distance from 4m to 15m. Repair / replace existing channel wall / bank	Direct	Increased impact on CH#113 AAP of R Feagle.
L11	Increased distance from 5m to 20m. Repair / replace existing channel wall / bank	Direct	Increased impact on CH#113 AAP of R Feagle.

		Impact Assessment	
Interference No.	**Brief description of Changes**	**Type**	**Description**
L12	Increased distance from 5m to 45m. Repair / replace existing channel wall / bank	Direct	Increased impact on CH#113 AAP of R Feagle.
L14	Increased distance from 10m to 15m. Repair / replace existing channel wall / bank	Direct	Increased impact on CH#113 AAP of R Feagle.
L15	Reduced distance from 75m to 40m. Repair / replace existing channel wall / bank	Direct	Reduced impact on CH#002 Brewery site and CH#113 AAP of R Feagle, however impact has not been eliminated.
L30	Revised location and registered owner. Distance reduced from 55m to 45m. (Swapped with L31). Excavate for foundations and construct reinforced concrete wall 1.3m high.	Direct	Reduced impact on CH#113 AAP of R Feagle; however impact has not been eliminated.
L31	Revised location and registered owner. Distance increased from 45m to 55m. (Swapped with L30)	Direct	Increased impact on CH#113 AAP of R Feagle.
L35	Reduced distance from 255m to 50m. Excavate for foundations and construct reinforced concrete wall 1.3m high	Direct	Reduced impact on CH#110 river walls/revetments and CH#113 AAP of R Feagle; however impact has not been eliminated.
L37	Increased height from 1.6m to 1.8m. Excavate for foundations and construct reinforced concrete wall up to 1.8m high to 3.68m AOD. Wall located along Deasy's Quay.	Direct	No new impact, however impact on CH#105 Deasy's Shipyard and CH#113 AAP of R Feagle remains unchanged.
L38	Updated description - u-shaped channel. Excavate channel and install u-shaped channel with reinforced concrete walls 1.3m high	N/A	No impact
L39	Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high	N/A	No impact
L40	Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high	N/A	No impact
L41	Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high	N/A	No impact

		Impact Assessment	
Interference No.	**Brief description of Changes**	**Type**	**Description**
L42	Updated description - u-shaped channel. Excavate channel in Convent Stream and install u-shaped channel with reinforced concrete walls 1.3m high	N/A	No impact
L43	New - repair / replace existing channel wall.	Direct	New impact as a result of ground reduction on CH#110 river walls/revetments and CH113 AAP of R Feagle
L44	New - repair / replace existing channel wall.	Direct	New impact as a result of ground reduction on CH#110 river walls/revetments and CH113 AAP of R Feagle
L45	New - repair / replace existing channel wall.	Direct	New impact as a result of ground reduction on CH#110 river walls/revetments and CH113 AAP of R Feagle
L46	New - repair / replace existing channel wall.	Direct	New impact as a result of ground reduction on CH#110 river walls/revetments and CH113 AAP of R Feagle
L47	New - repair / replace existing channel wall.	Direct	New impact as a result of ground reduction on CH#110 river walls/revetments and CH113 AAP of R Feagle
R2	New - permanent haul road to access trash screen	Direct	New impact as a result of ground reduction, which could uncover previous unknown archaeological features.
SI1	Changed description from sluice gate to penstock. Increased distance from 5m to 45m.	Direct	New impact as a result of ground reduction, which could uncover previous unknown archaeological features.
SI2	Changed description from sluice gate to penstock. Increased distance from 5m to 45m.	Direct	New impact as a result of ground reduction, which could uncover previous unknown archaeological features.

Table 4.1—Assessment of impacts as a result of design changes

5 MITIGATION MEASURES AND RESIDUAL IMPACTS

The mitigation strategies outlined in Table 6.1 in this section detail the techniques to be adopted in order to ameliorate the impacts that the proposed development may have on features of archaeological, architectural and/or cultural heritage within the study area during both the construction and operation phases of the scheme. The residual impacts that will remain once these mitigation measures have been implemented are identified in this table also.

The following updated mitigation measures are subject to approval by Cork County Council and the National Monuments Service, Department of Arts, Heritage, Rural, Regional and Gaeltacht Affairs:

1. Full archaeological excavation of the RMP fulacht fia site CH#010 should be undertaken in advance of construction to ensure the preservation by record of site. This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004. No specific mitigation measures appear to be necessary in relation to the RMP fulachta fia site (CH#012) as there are no indications that any sub-surface features relating to the site survive within the floodbank footprint. Archaeological monitoring of groundworks should be sufficient to manage any remaining risks.

2. Any RMP sites adjacent to construction works (including CH#009 and CH#011) should be fenced off from the works for the duration of construction activities and should not be utilised in any temporary capacity such as spoil stockpiles, site access or haul routes or site compounds/storage area.

3. Full archaeological excavation of the foundation corridor for the reinforced concrete wall (L37) on the south side of the Ring Road should be carried out in advance to construction to endure the preservation by record of the affected sections of the Deasy's shipyard site (CH#105). This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

4. Repair and replacement of the channel wall at L15 will remove the historic fabric of the c.1807 Brewery (CH#002). If the wall is not repairable and must be replaced, the wall should be fully archaeologically recorded, including archaeological monitoring of any new foundations for any new channel wall.

5. In order to identify buried or unknown archaeological remains, archaeological monitoring of all groundworks (including any enabling works or temporary works) associated with the proposed scheme will be carried out during the construction phase. This should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

6. Any dredging works undertaken with the R Feagle or its estuary, or similar works to improve or maintain the river channel, should be subject to a programme of archaeological monitoring. This should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

7. Where possible, every reasonable effort will be made to preserve *in situ*, or reduce the impact on any identified archaeological material through design. The current policy of the Minister for Arts, Heritage and the Gaeltacht is that preservation in situ of archaeological sites is the preferred option. Where known archaeological sites are adjacent to proposed works and are to

be preserved *in situ*, these areas will be fenced off for the duration of construction works and will not be utilised in any temporary capacity such as spoil stockpiles, site access or haul routes or site compounds/storage area.

8. Where preservation *in situ* cannot be achieved, either in whole or in part, then a programme of full archaeological excavation will be implemented to ensure the preservation by record of the portion of the site that will be directly impacted upon. This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.

9. If existing river walls or revetments are to be directly impacted then a detailed written and photographic record of the affected section of walling or revetment should also be compiled along with a historic buildings survey (to NIAH standards) prior to its removal. Notable areas where recording should be undertaken include (but are not limited to):
    - L22—masonry building with a water door on the south bank
    - L30—masonry building with a water door west of the Seymour Street pedestrian bridge
    - L32—19th century masonry building east of the Seymour Street pedestrian bridge

10. Repair work to masonry walls or revetments, in particular the early drystone revetments should be undertaken by experienced masons and under the supervision of a conservation architect, conservation engineer or other suitably qualified and/or experienced professional.

11. A condition survey has been undertaken of the five RMP sites within the Fluvial Storage Area (O'Flaherty and Millar 2015b). The recommendations of that report should be applied (subject to the advice of the National Monuments Service, DAHRRGA).

12. In order to preserve the architectural character and minimise impacts on the setting of architectural heritage sites it is recommended that new tidal defence walls be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.

13. Any alterations to or reinforcement of bridges which are protected structures should be undertaken in consultation with the Cork County Conservation Officer and following the guidance in *Architectural Heritage Guidelines for the Planning Authorities*.

14. The results of any archaeological monitoring and/or excavation will be submitted in a report to the Local Authority, the Heritage and Planning Division, Department of Arts, Heritage Rural, Regional and Gaeltacht Affairs and the National Museum of Ireland.

CH No.	Phase	Impact Type	Mitigation Measures	Magnitude of impact prior to implementation of mitigation measures	Baseline Value	Significance level of impact prior to implementation of mitigation measures
CH# 002	Construction	Direct	Repair and replacement of the channel wall at L15 will remove the historic fabric of the c.1807 Brewery (CH#002). If the wall is not repairable and must be replaced, the wall should be fully archaeologically recorded, including archaeological monitoring of any new foundations for any new channel wall.	Moderate	Very High	Moderate
CH# 003	Operation	Indirect	A condition survey has been undertaken of the five RMP sites within the Fluvial Storage Area (O'Flaherty and Millar 2015b). The recommendations of that report should be applied (subject to the advice of the National Monuments Service, DAHRRGA).	Minor	Very High	Moderate
CH# 004	Operation	Indirect	A condition survey has been undertaken of the five RMP sites within the Fluvial Storage Area (O'Flaherty and Millar 2015b). The recommendations of that report should be applied (subject to the advice of the National Monuments Service, DAHRRGA).	Minor	Very High	Moderate
CH# 009	Construction	Direct	• Any RMP sites adjacent to construction works should be fenced off from the works for the duration of construction activities and should not be utilised in any temporary capacity such as spoil stockpiles, site access or haul routes or site compounds/storage area. • Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction phase. • Every reasonable effort should be made to preserve in situ, or reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part, then a programme of full archaeological excavation should be implemented.	Moderate	Very High	Moderate
CH# 010	Construction	Direct	• Full archaeological excavation of the RMP fulacht fia site CH#010 should be undertaken in advance of construction to ensure the	Moderate	Very High	Moderate

CH No.	Phase	Impact Type	Mitigation Measures	Magnitude of impact prior to implementation of mitigation measures	Baseline Value	Significance level of impact prior to implementation of mitigation measures
			preservation by record of site. • This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.			
CH# 011	Construction	Direct	• Any RMP sites adjacent to construction works should be fenced off from the works for the duration of construction activities and should not be utilised in any temporary capacity such as spoil stockpiles, site access or haul routes or site compounds/storage area. • Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction phase. • Every reasonable effort should be made to preserve in situ, or reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part, then a programme of full archaeological excavation should be implemented.	Moderate	Very High	Moderate
CH# 012	Construction	Direct	• No specific mitigation measures appear to be necessary in relation to the RMP fulachta fia site (CH#012) as there are no indications that any sub-surface features relating to the site survive within the floodbank footprint. • Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction phase. • Every reasonable effort should be made to preserve in situ, or reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part,	Moderate	Very High	Moderate

CH No.	Phase	Impact Type	Mitigation Measures	Magnitude of impact prior to implementation of mitigation measures	Baseline Value	Significance level of impact prior to implementation of mitigation measures
			then a programme of full archaeological excavation should be implemented.			
CH# 022	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	Very High	Moderate
CH# 029	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	High	Slight
CH# 031	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	High	Slight
CH# 059	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	Very High	Moderate
CH# 063	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	Very High	Moderate
CH# 067	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	Very High	Moderate
CH# 102	Construction	Direct	• Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction	Moderate	Very High	Moderate

CH No.	Phase	Impact Type	Mitigation Measures	Magnitude of impact prior to implementation of mitigation measures	Baseline Value	Significance level of impact prior to implementation of mitigation measures
			phase. • Every reasonable effort should be made to preserve in situ, or reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part, then a programme of full archaeological excavation should be implemented.			
CH# 103	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	Very High	Moderate
CH# 105	Construction	Direct	• Full archaeological excavation of the foundation corridor for the reinforced concrete wall (L37) on the south side of the Ring Road should be carried out in advance to construction to endure the preservation by record of the affected sections of the Deasy's shipyard site. • This work should be carried out by a suitably qualified archaeologist under license and in accordance with the provisions of the National Monuments Acts 1930-2004.	Moderate	High	Moderate
CH# 109	Construction	Direct	• Archaeological test trenching programme in advance of construction. • Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction phase. • Every reasonable effort should be made to preserve in situ, or reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part, then a programme of full archaeological excavation should be implemented.	Moderate	Medium/ Low	Slight

CH No.	Phase	Impact Type	Mitigation Measures	Magnitude of impact prior to implementation of mitigation measures	Baseline Value	Significance level of impact prior to implementation of mitigation measures
CH# 110	Construction	Direct	• If walls or revetments are to be impacted then a detailed written and photographic record of the affected section of walling or revetment should also be compiled along with a historic buildings survey (to NIAH standards) prior to its removal. • Repair work to masonry walls or revetments, in particular the early drystone revetments should be undertaken by experienced masons and under the supervision of a conservation architect, conservation engineer or other suitably qualified and/or experienced professional.	Moderate	Medium/ High	Moderate
	Operation	Indirect	The new tidal defence walls should be matched to the existing fabric of existing revetments and river walls. This can be achieved either through construction using similar fabric or that facing be applied to new concrete infrastructure to match the historic fabric.	Minor	Medium/ Low	Negligible
CH# 111	Construction	Direct	• Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction phase. • Every reasonable effort should be made to preserve in situ, or reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part, then a programme of full archaeological excavation should be implemented.	Moderate	Medium/ Low	Slight
CH# 113	Construction	Direct	• Archaeological monitoring of all groundworks associated with the proposed scheme should be carried out during the construction phase. • Any dredging works undertaken with the R Feagle or its estuary, or similar works to improve or maintain the river channel, should be subject to a programme of archaeological monitoring. • Every reasonable effort should be made to preserve in situ, or	Moderate	Medium/ High	Moderate

CH No.	Phase	Impact Type	Mitigation Measures	Magnitude of impact prior to implementation of mitigation measures	Baseline Value	Significance level of impact prior to implementation of mitigation measures
			reduce the impact on identified sites or features. • If preservation in situ is not possible either in whole or in part, then a programme of full archaeological excavation should be implemented.			

Table 5.1—Residual impacts after implementation of mitigation measures

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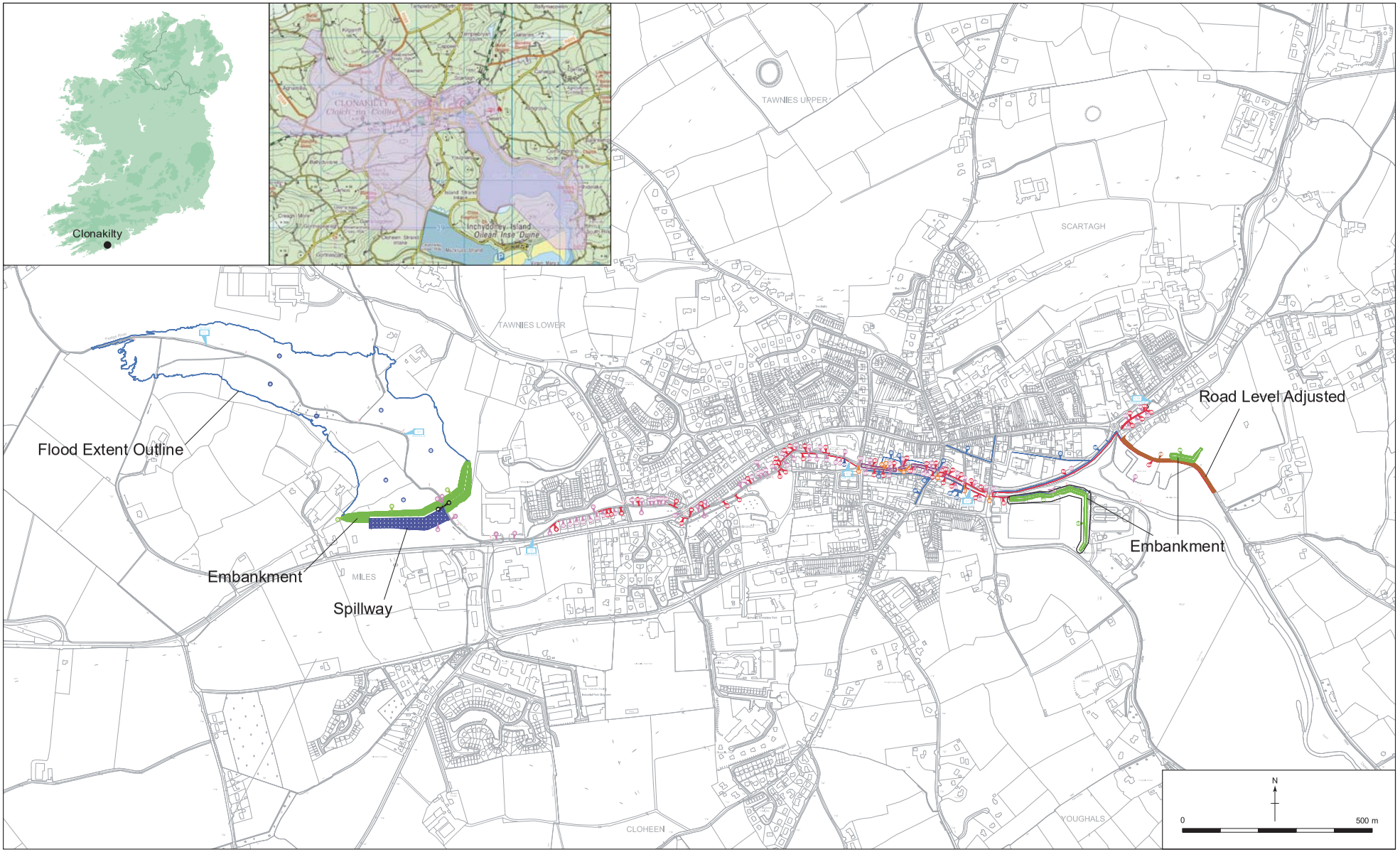


Figure 1 - Clonakilty Flood Relief Scheme, Co. Cork: Site location.

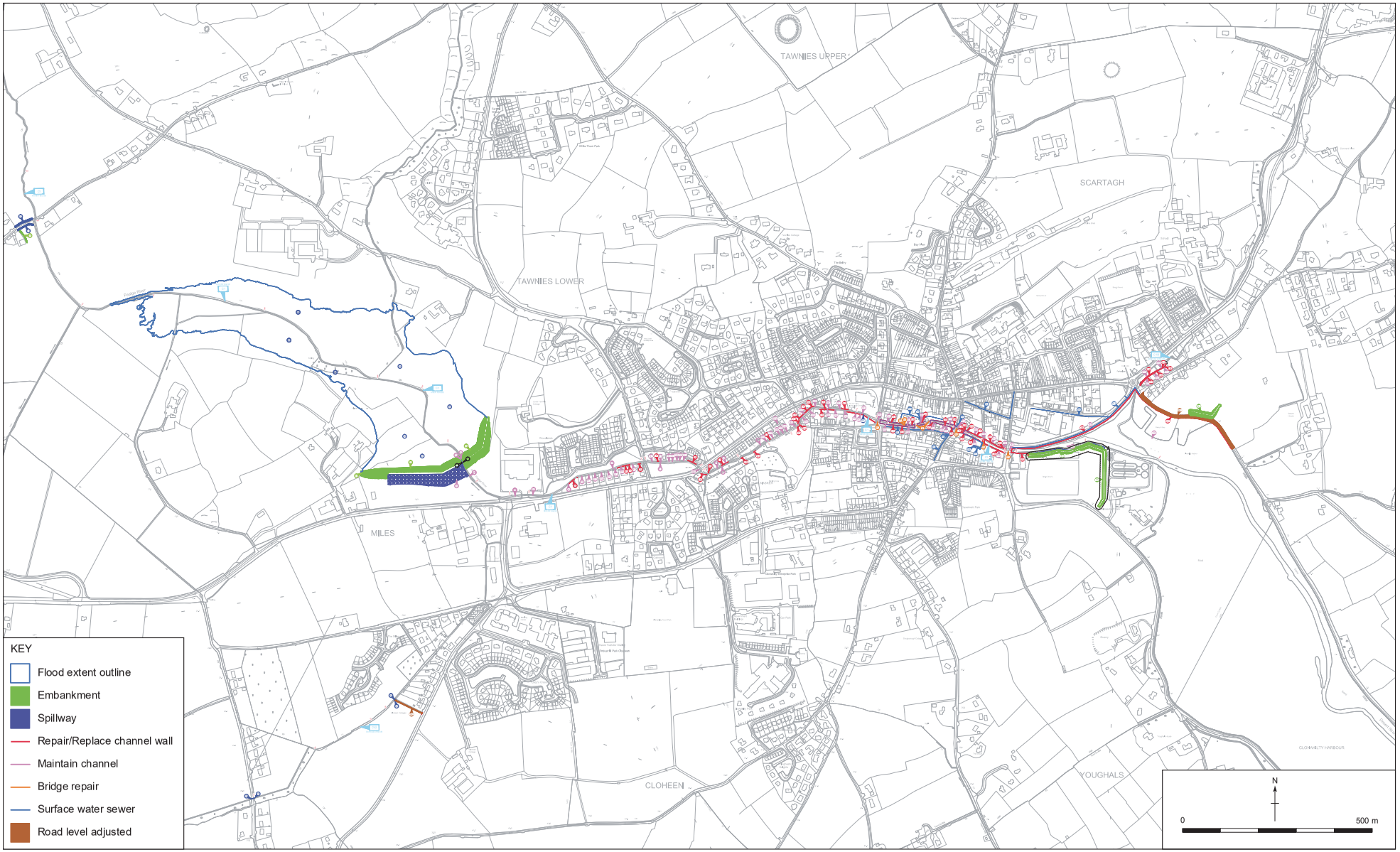
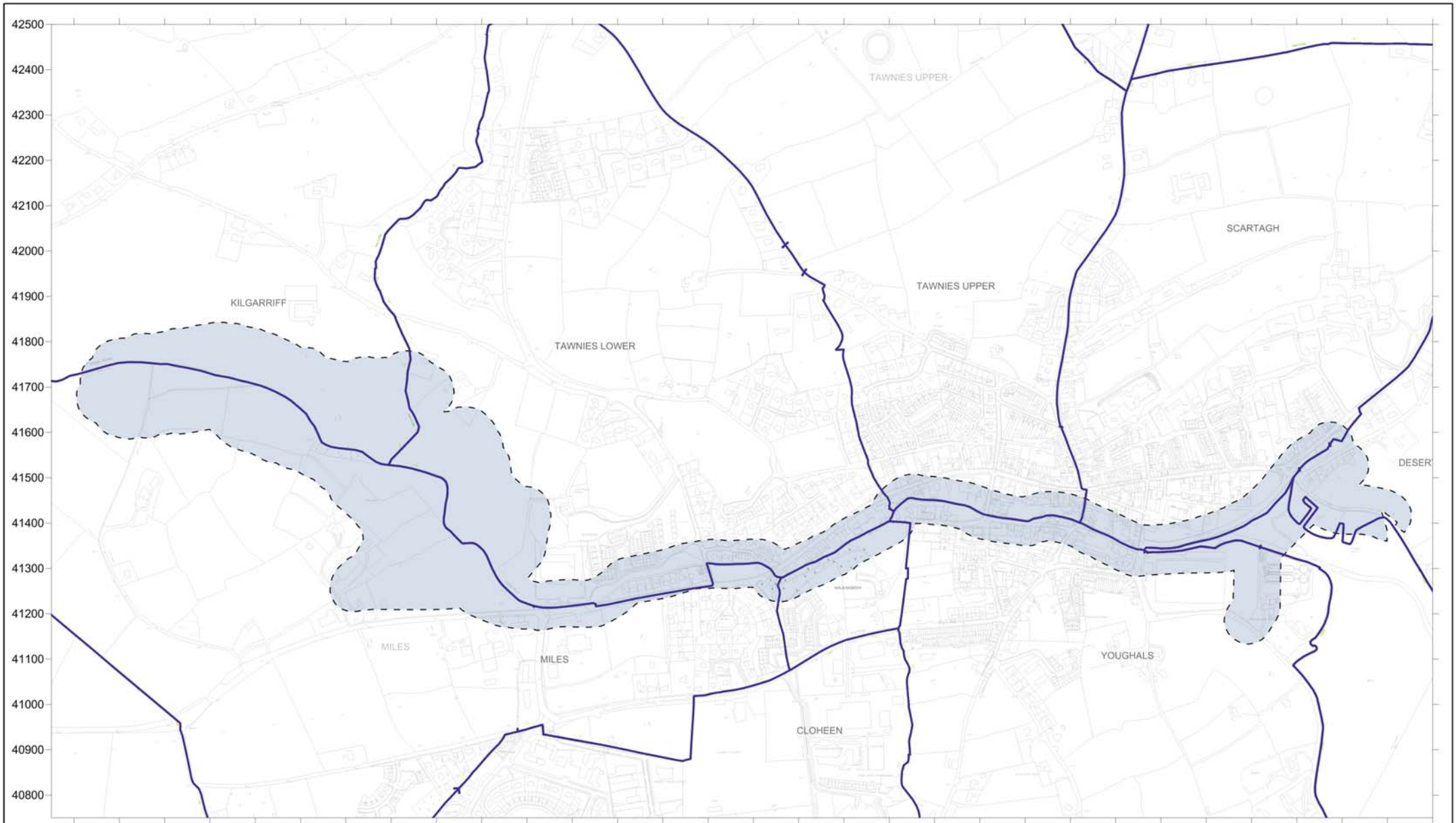


Figure 2 - Clonakilty Flood Relief Scheme Design.



Key

Townland Boundary	
Cultural Heritage Buffer Zone	

N

Project Name: Clonakilty Flood Relief Scheme EIA

Project Code: CFRI14

RUBICON HERITAGE

0m 100m 200m

Figure 3 - Outline of the Study Area for EIA

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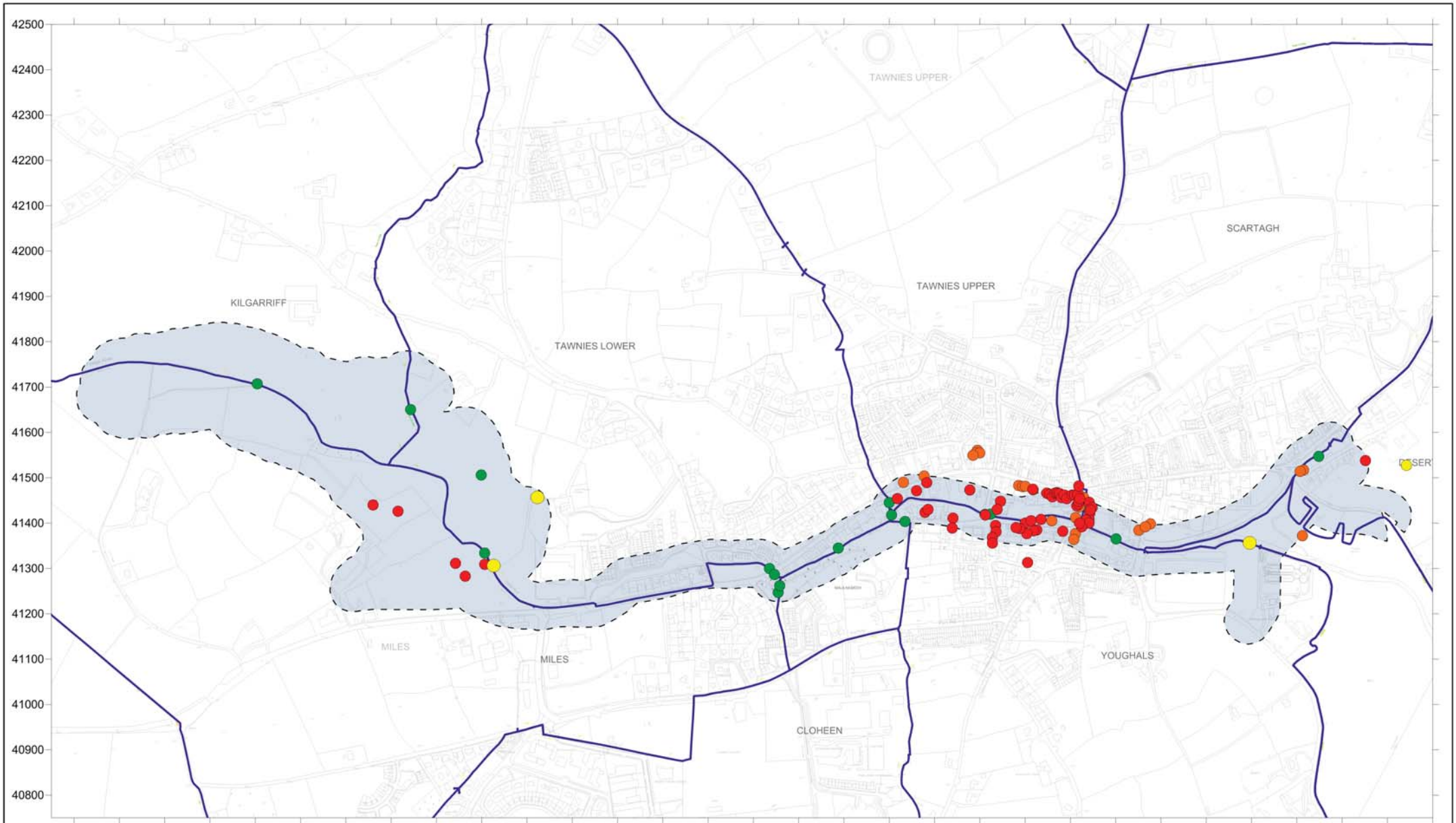
2nd edit by:	Signed off:



Key

Cultural Heritage Buffer Zone	
Very High	
High	
Medium/High	
Medium/Low	

N

Project Name: Clonakilty Flood Relief Scheme EIA

Project Code: CFRI14

RUBICON HERITAGE

0m 100m 200m

Figure 4 - Sites impacted on by the development

Drawn by: EOF	1st edit by:
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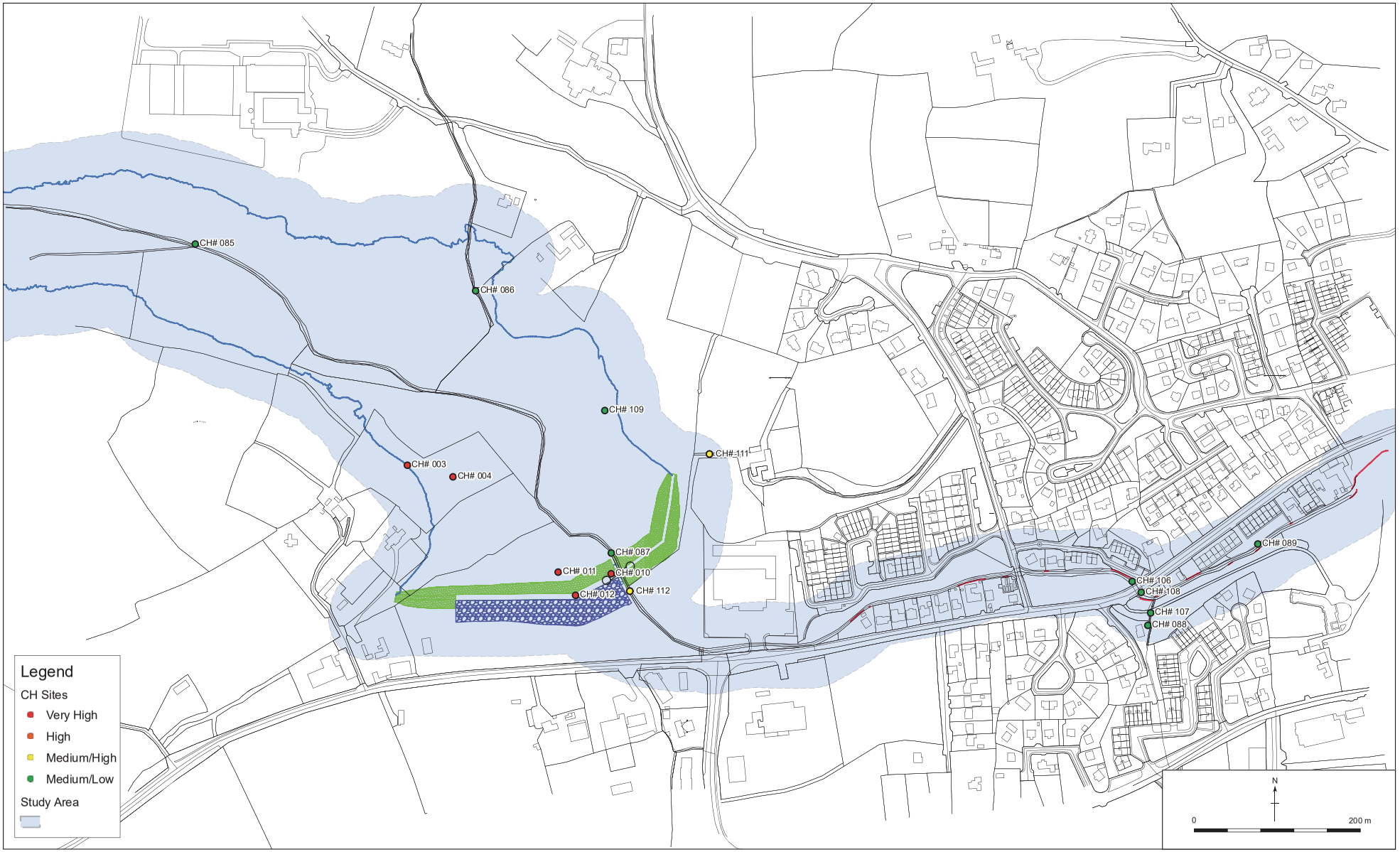


Figure 5 - CH sites impacted on by the development.

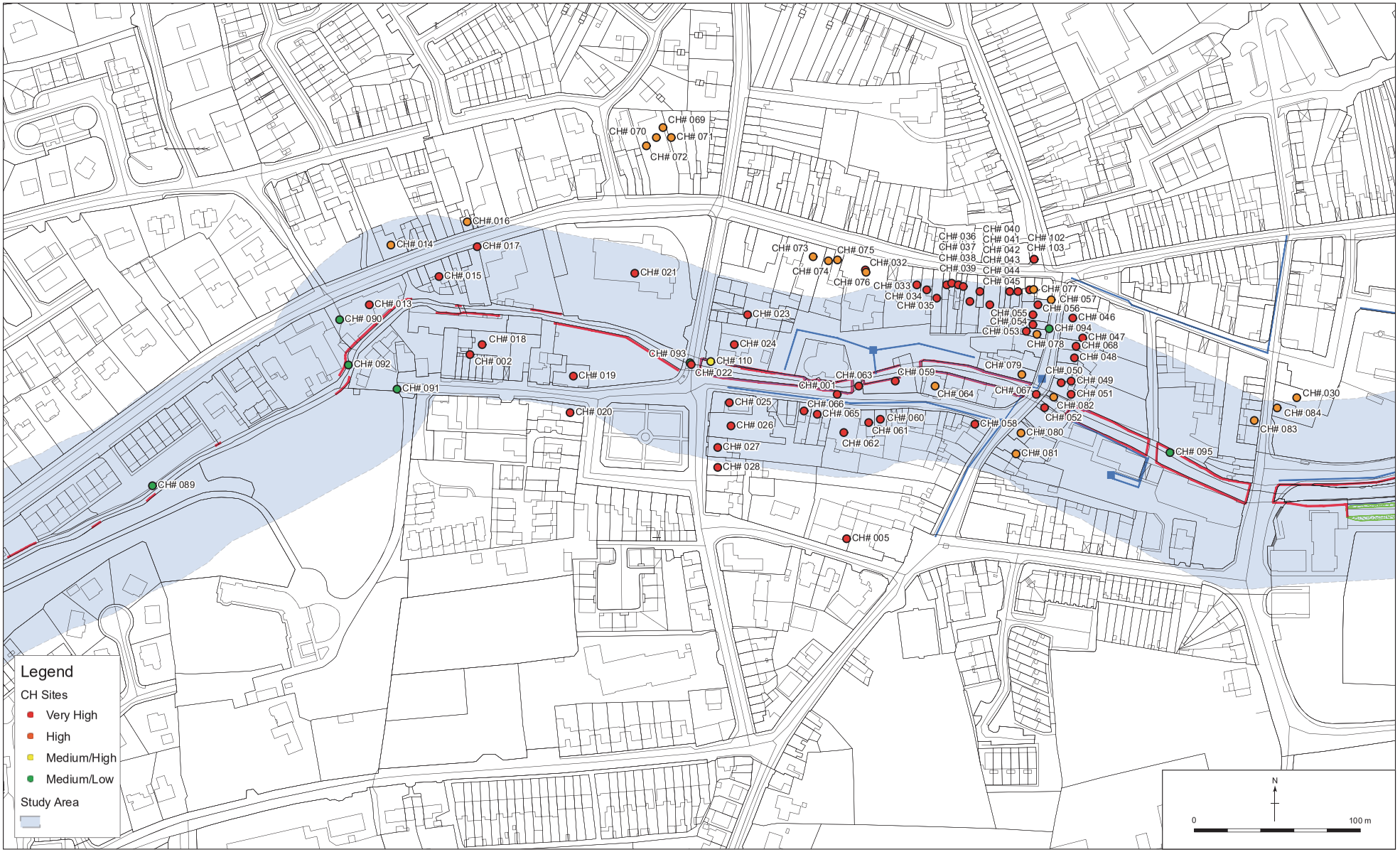


Figure 6 - CH sites impacted on by the development.

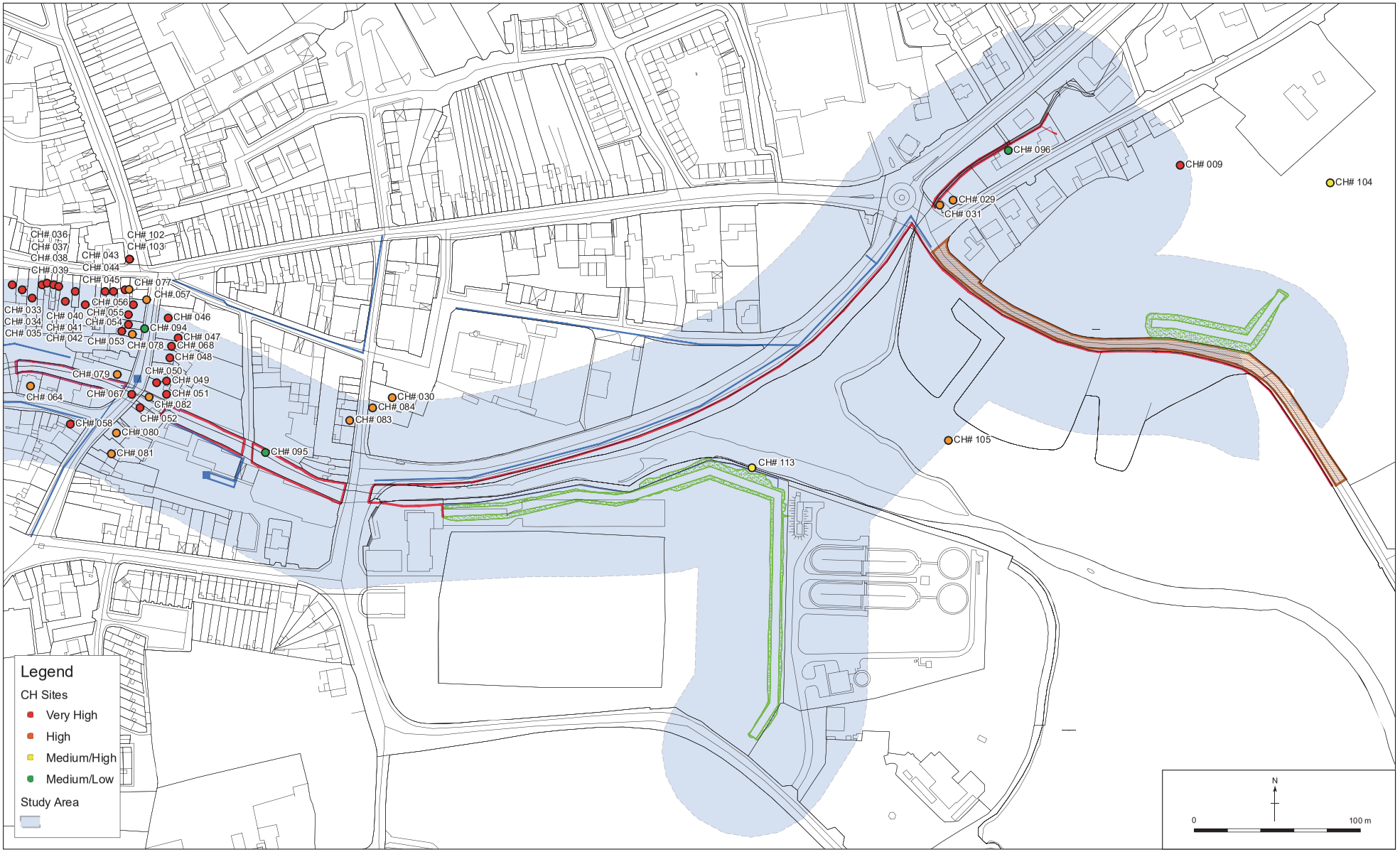
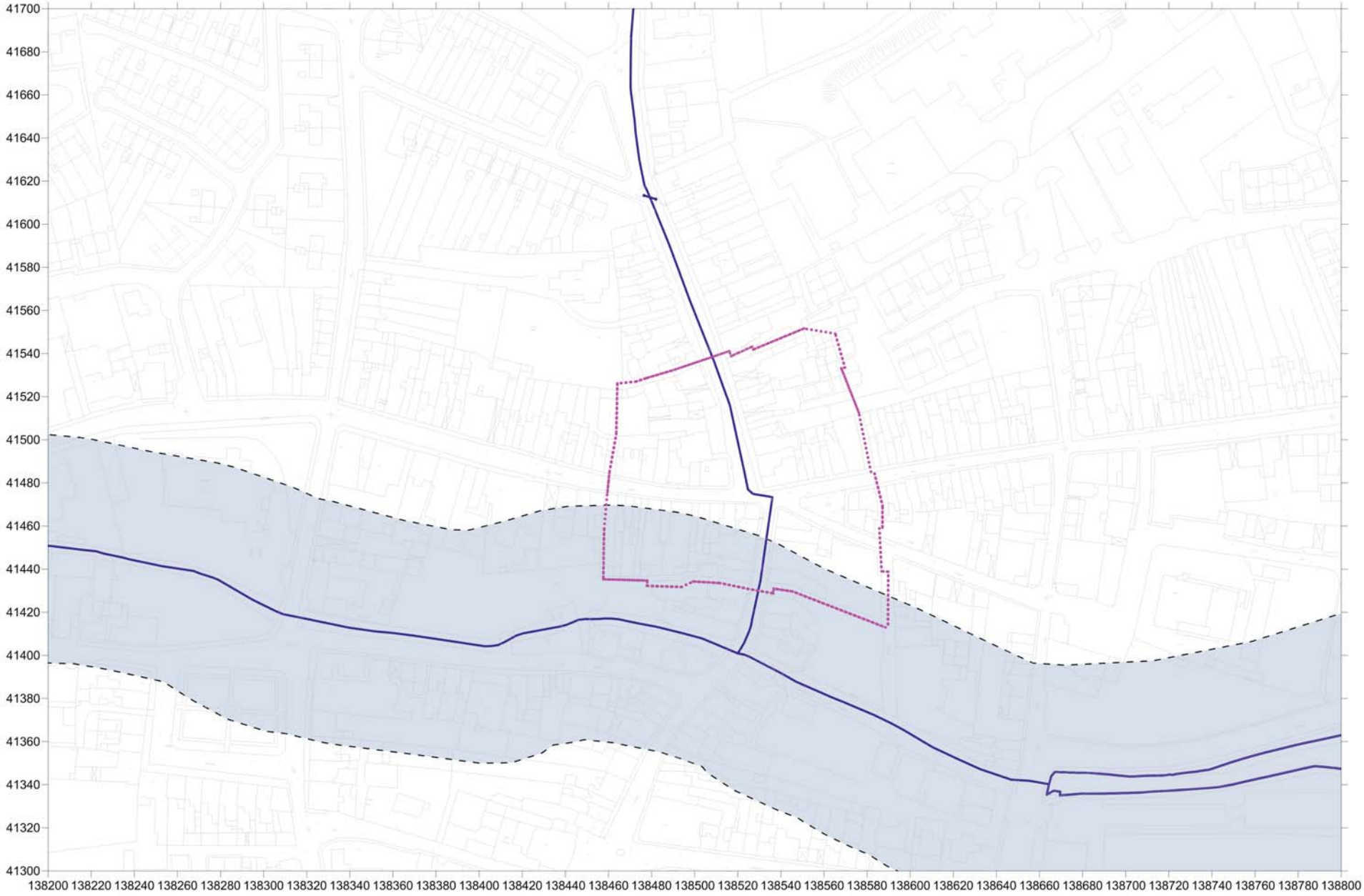


Figure 7 - CH sites impacted on by the development.



Key

Townland Boundary	
Zone of Archaeological Potential	
Cultural Heritage Buffer Zone	

N

Project Name: Clonakilty Flood Relief Scheme EIA

Project Code: CFRI14

RUBICON HERITAGE

0m 50m

Figure 8 - Zone of Archaeological Protection for Clonakilty

Drawn by: EOF	1st edit by:
2nd edit by:	Signed off:

Key

Townland Boundary	
Architectural Conservation Area	
Cultural Heritage Buffer Zone	

N

Project Name: Clonakilty Flood Relief Scheme EIA

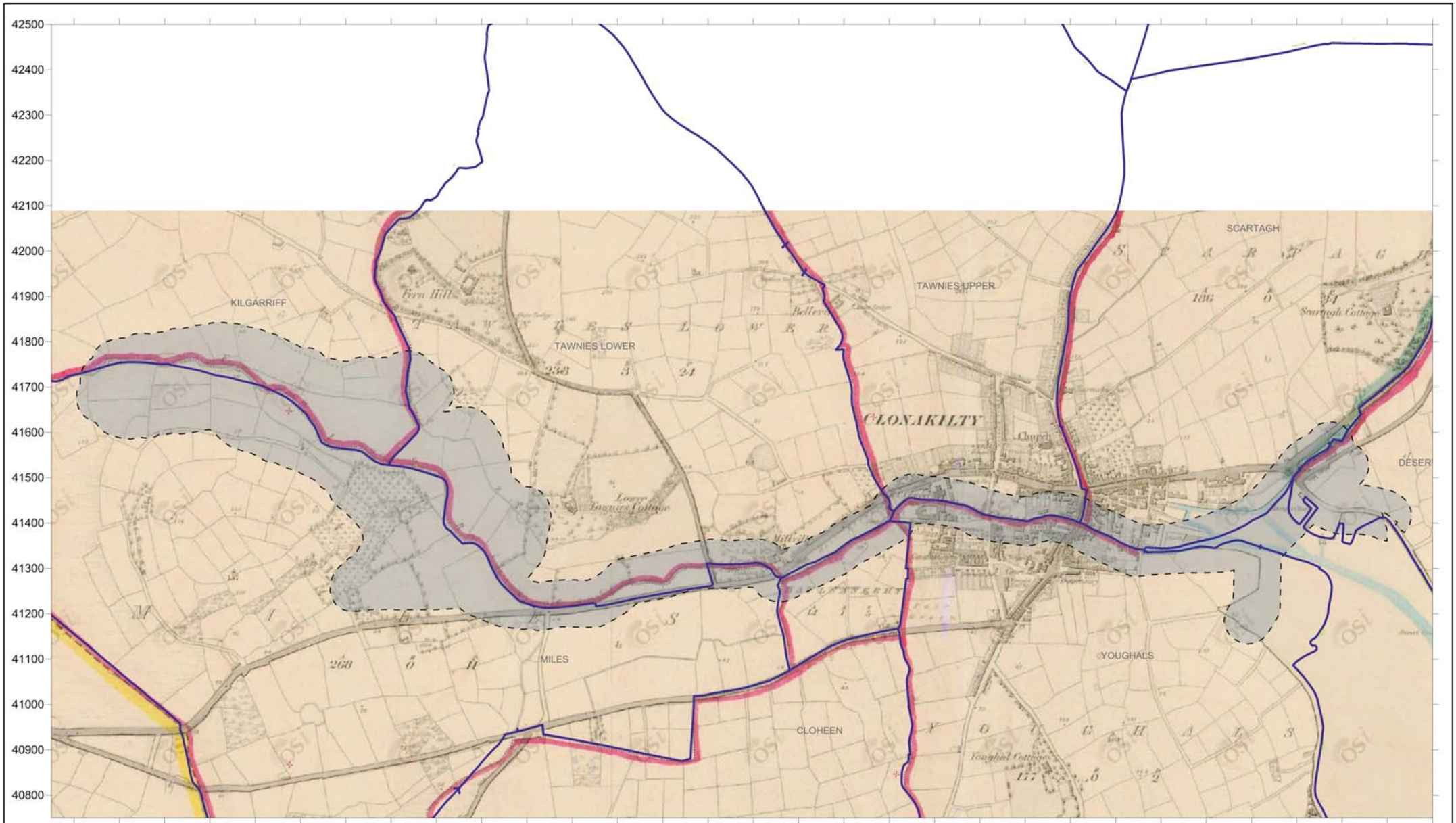
Project Code: CFRI14

RUBICON HERITAGE

0m 50m

Figure 9 - Archaitectural Conservation Area for Clonakilty

Drawn by: EOF	1st edit by:
2nd edit by:	Signed off:



Key

N

Project Name: Clonakilty Flood relief Scheme EIA

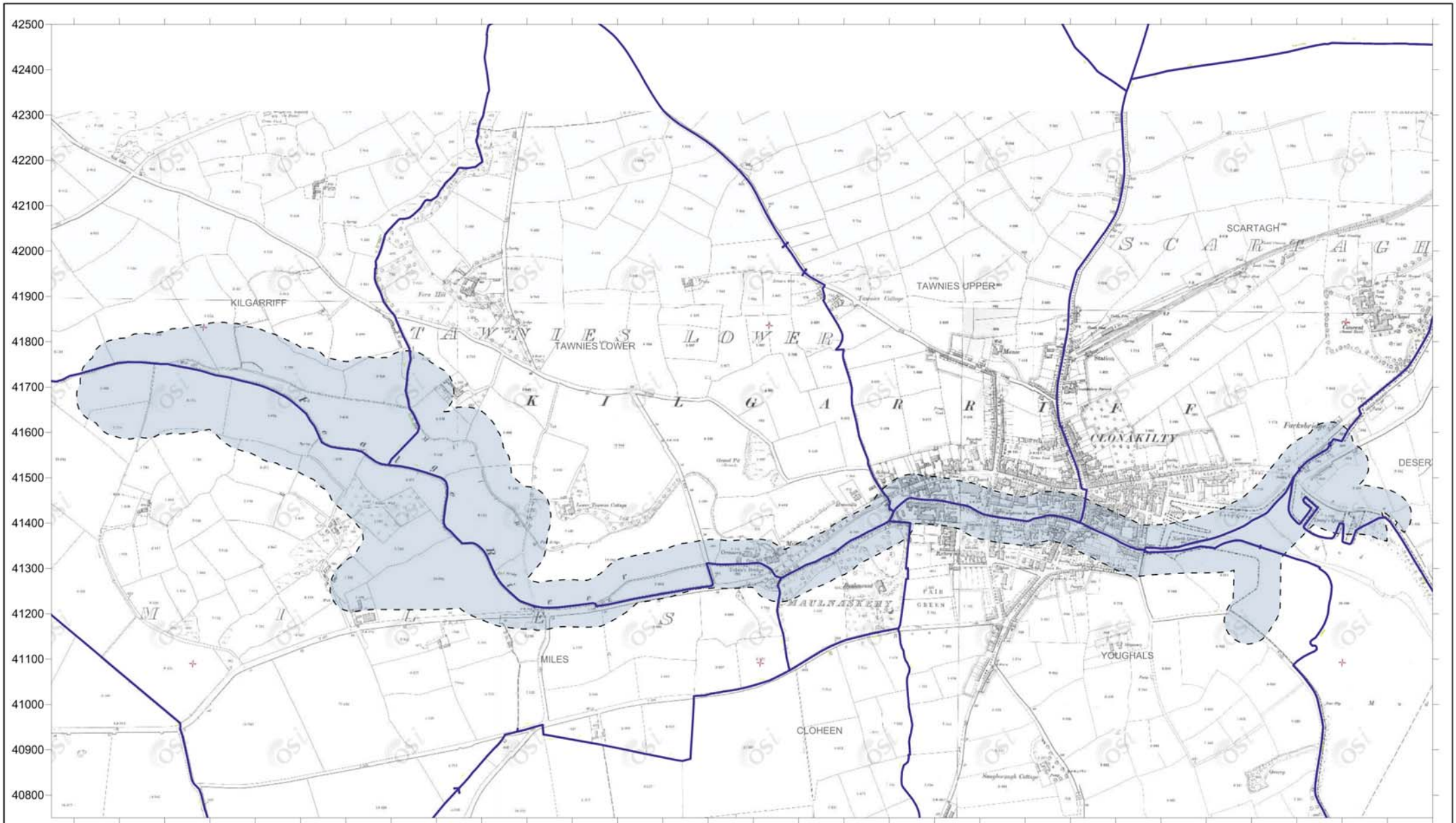
Project Code: CFRI14

RUBICON HERITAGE

0m 100m 200m

Figure 10 - First Edition OS Sheet (1834 - 46) for Clonakilty

Drawn by: EOF	1st edit by:
2nd edit by:	Signed off:



Key

N

Project Name: Clonakilty Flood relief Scheme EIA

Project Code: CFRI14

RUBICON HERITAGE

0m 100m 200m

Figure 10 - Second Edition OS Sheet (1904 - 1905) for Clonakilty

Drawn by: EOF	1st edit by:
2nd edit by:	Signed off:

Appendix 1 – Inventory of identified sites of cultural heritage significance and/or potential within study area

CH No.	Category	Baseline Value	Description	Townland	NGR-E	NGR-N
CH# 001	RMP	Very High	Historic Town		138400	41400
CH# 002	RMP	Very High	Brewery	YOUGHALS	138178.65	41424.01
CH# 003	RMP	Very High	Ritual site - holy well	MILES	136960.4	41440.01
CH# 004	RMP	Very High	Mill - unclassified	MILES	137015.41	41426.01
CH# 005	RMP	Very High	Prison	YOUGHALS	138405.7	41312.99
CH# 006	RMP	Very High	Graveyard	DESERT (Carbery East (E.D.) By.)	140108.06	40335.78
CH# 007	RMP	Very High	Church	DESERT (Carbery East (E.D.) By.)	140090.06	40329.78
CH# 008	RMP	Medium/Low	Redundant Record	DESERT (Carbery East (E.D.) By.)	140033.05	40320.77
CH# 009	RMP	Very High	Enclosure	DESERT (Carbery East (E.D.) By.)	139151.86	41538.04
CH# 010	RMP	Very High	*Fulacht fia*	MILES	137206.45	41308.98
CH# 011	RMP	Very High	*Fulacht fia*	MILES	137142.44	41310.98
CH# 012	RMP	Very High	*Fulacht fia*	MILES	137163.44	41282.98
CH# 013	PS (20000100)	Very High	School	TAWNIES UPPER	138118	41454
CH# 014	NIAH	High	House	TAWNIES UPPER	138131	41490
CH# 015	PS (20000199)	Very High	House	TAWNIES UPPER	138160	41471
CH# 016	NIAH	High	Cobbles/flags/paving/ kerbing	TAWNIES UPPER	138177	41504
CH# 017	PS (20000101)	Very High	Post Box	TAWNIES UPPER	138183	41489
CH# 018	PS (20000076)	Very High	Brewery	YOUGHALS	138186	41430
CH# 019	PS (20000075)	Very High	House	YOUGHALS	138241	41411
CH# 020	PS (20000074)	Very High	House	YOUGHALS	138239	41389
CH# 021	PS (20000092)	Very High	Church/Chapel	TAWNIES UPPER	138278	41473
CH# 022	PS (20000182)	Very High	Bridge	YOUGHALS	138312	41418
CH# 023	PS (20000043)	Very High	Store/Warehouse	TAWNIES UPPER	138346	41448
CH# 024	PS (20000042)	Very High	Church/Chapel	TAWNIES UPPER	138338	41430
CH# 025	PS (20000188)	Very High	Office	YOUGHALS	138335	41395
CH# 026	PS (20000057)	Very High	House	YOUGHALS	138336	41381

CH No.	Category	Baseline Value	Description	Townland	NGR-E	NGR-N
CH# 027	PS (20000058)	Very High	House	YOUGHALS	138328	41368
CH# 028	PS (20000059)	Very High	House	YOUGHALS	138328	41356
CH# 029	NIAH	High	House	DESERT (Carbery East (E.D.) By.)	139015	41517
CH# 030	NIAH	High	Store/warehouse	SCARTAGH	138677	41398
CH# 031	NIAH	High	Water pump	DESERT (Carbery East (E.D.) By.)	139007	41514
CH# 032	PS (20000139)	Very High	Hotel	TAWNIES UPPER	138417	41475
CH# 033	PS (20000140)	Very High	House	TAWNIES UPPER	138448	41466
CH# 034	PS (20000141)	Very High	House	TAWNIES UPPER	138454	41463
CH# 035	PS (20000142)	Very High	House	TAWNIES UPPER	138460	41458
CH# 036	PS (20000143)	Very High	House	TAWNIES UPPER	138466	41466
CH# 037	PS (20000144)	Very High	House	TAWNIES UPPER	138469	41467
CH# 038	PS (20000145)	Very High	House	TAWNIES UPPER	138473	41466
CH# 039	PS (20000146)	Very High	House	TAWNIES UPPER	138476	41465
CH# 040	PS (20000147)	Very High	House	TAWNIES UPPER	138480	41456
CH# 041	PS (20000148)	Very High	House	TAWNIES UPPER	138486	41462
CH# 042	PS (20000149)	Very High	House	TAWNIES UPPER	138492	41454
CH# 043	PS (20000150)	Very High	House	TAWNIES UPPER	138504	41462
CH# 044	PS (20000151)	Very High	House	TAWNIES UPPER	138509	41462
CH# 045	PS (20000152)	Very High	House	TAWNIES UPPER	138516	41463
CH# 046	PS (20000155)	Very High	House	SCARTAGH	138542	41446
CH# 047	PS (20000156)	Very High	House	SCARTAGH	138548	41434
CH# 048	PS (20000157)	Very High	House	SCARTAGH	138543	41422
CH# 049	PS (20000158)	Very High	House	SCARTAGH	138541	41408
CH# 050	PS (20000159)	Very High	House	SCARTAGH	138535	41407
CH# 051	PS (20000160)	Very High	House	SCARTAGH	138541	41400
CH# 052	PS (20000163)	Very High	House	YOUGHALS	138525	41392
CH# 053	PS (20000165)	Very High	House	TAWNIES UPPER	138514	41438
CH# 054	PS (20000166)	Very High	House	TAWNIES UPPER	138518	41442

CH No.	Category	Baseline Value	Description	Townland	NGR-E	NGR-N
CH# 055	PS (20000167)	Very High	House	TAWNIES UPPER	138518	41448
CH# 056	PS (20000168)	Very High	House	TAWNIES UPPER	138521	41454
CH# 057	NIAH	High	Post box	TAWNIES UPPER	138529	41457
CH# 058	PS (20000053)	Very High	House	YOUGHALS	138483	41382
CH# 059	PS (20000078)	Very High	Mill (water)	YOUGHALS	138435	41408
CH# 060	PS (20000079)	Very High	House	YOUGHALS	138426	41385
CH# 061	PS (20000080)	Very High	House	YOUGHALS	138419	41383
CH# 062	PS (20000081)	Very High	Church/chapel	YOUGHALS	138404	41377
CH# 063	PS (20000191)	Very High	Bridge	YOUGHALS	138413	41405
CH# 064	NIAH	High	House	YOUGHALS	138459	41405
CH# 065	PS (20000193)	Very High	House	YOUGHALS	138388	41388
CH# 066	PS (20000194)	Very High	House	YOUGHALS	138380	41390
CH# 067	PS (20000205)	Very High	Bridge	YOUGHALS	138520	41400
CH# 068	PS (20000207)	Very High	House	SCARTAGH	138544	41429
CH# 069	PS	High	School		138295	41560.8
CH# 070	PS	High	Ecclesiastical Building		138291	41554.8
CH# 071	PS	High	House		138300	41554.8
CH# 072	PS	High	National School		138285	41549.8
CH# 073	PS	High	House		138385.5	41482.95
CH# 074	PS	High	House		138394.7	41480.49
CH# 075	PS	High	House		138400.2	41481.04
CH# 076	PS	High	House		138417.4	41473.59
CH# 077	PS	High	House		138518.41	41463.21
CH# 078	PS	High	House		138520.4	41436.18
CH# 079	PS	High	Warehouse		138511.3	41411.96
CH# 080	PS	High	House		138510.8	41376.7
CH# 081	PS	High	House		138507.8	41364.11
CH# 082	PS	High	House		138530.5	41398.36

CH No.	Category	Baseline Value	Description	Townland	NGR-E	NGR-N
CH# 083	PS	High	House		138651.4	41384.27
CH# 084	PS	High	Warehouse		138665.2	41391.85
CH# 085	Boundary	Medium/Low	Killgarriff/Miles Townland Boundary		136704.3	41707.07
CH# 086	Boundary	Medium/Low	Killgarriff/Tawnies Lower Townland Boundary		137042.8	41650.66
CH# 087	Boundary	Medium/Low	Miles/Tawnies Lower Townland Boundary		137206.6	41334
CH# 088	Boundary	Medium/Low	Miles/Maulnaskehy Townland Boundary		137854.5	41246.65
CH# 089	Boundary	Medium/Low	Maulnaskehy/Tawnies Lower Townland Boundary		137987.3	41344.92
CH# 090	Boundary	Medium/Low	Tawnies Lower/Tawnies Upper Townland Boundary		138100.1	41445
CH# 091	Boundary	Medium/Low	Maulnaskehy/Youghals Townland Boundary		138134.7	41403.16
CH# 092	Boundary	Medium/Low	Tawnies Lower/Youghals Townland Boundary		138105.4	41417.72
CH# 093	Boundary	Medium/Low	Tawnies Upper/Youghals Townland Boundary		138311.3	41419.07
CH# 094	Boundary	Medium/Low	Tawnies Upper/Scartagh Townland Boundary		138527.8	41439.55
CH# 095	Boundary	Medium/Low	Youghals/Scartagh Townland Boundary		138600.6	41364.94
CH# 096	Boundary	Medium/Low	Scartagh/Desert Townland Boundary		139048.3	41546.93
CH# 097	Survey	Medium/Low	Metal Detecting License	UNKNOWN	Unknown	Unknown
CH# 098	Test Excavation	Medium/Low	Pre-Development Testing	KILGARIFF	Unknown	Unknown
CH# 099	Test Excavation	Medium/Low	Pre-Development Testing	KILGARIFF	Unknown	Unknown
CH# 100	Test Excavation	Medium/Low	Pre-Development Testing	CARHOO	Unknown	Unknown
CH# 101	Test Excavation	Medium/Low	Pre-Development Testing	CARHOO	Unknown	Unknown
CH# 102	ZAP	Very High	Zone of Archaeological Potential		138518.7	41481.41
CH# 103	ACA	Very High	Architectural Protection Area		138518.7	41481.41
CH# 104	AAP	Medium/High	Discovery of human remains recorded in topographic files	DESERT (Carbery East (E.D.) By.)	139242.3	41527.44
CH# 105	UCH (1)	High	Former Shipyard/Drydock	DESERT (Carbery East (E.D.) By.)	139012.2	41372.23
CH# 106	UCH (1)	Medium/Low	Regulating Weir	TAWNIES LOWER	137835.6	41299.75
CH# 107	UCH (1)	Medium/Low	Culvert	TAWNIES LOWER/MILES	137857.9	41261.73
CH# 108	UCH (1)	Medium/Low	Bridge	TAWNIES LOWER/MILES	137846.5	41286.57
CH# 109	UCH (2)	Medium/Low	Millrace (site of)	TAWNIES LOWER	137198.8	41506.07

CH No.	Category	Baseline Value	Description	Townland	NGR-E	NGR-N
CH# 110	UCH (1)	Medium/High	Walling/revetment	VARIOUS	138323.8	41419.8
CH# 111	UCH (2)	Medium/Low	Footbridge (site of) crossing river Feagle	TAWNIES LOWER/MILES	137283.2	41389.3
CH# 112	UCH (2)	Medium/Low	Footbridge (site of) crossing former millrace	TAWNIES LOWER	137283.2	41389.3
CH# 113	AAP	Medium/High	Fealge River and Estuary	VARIOUS		

Note: The abbreviations that have been used for the 'Category' section are as follows:

RMP: Recorded archaeological monument
PS: Protected Structure
NIAH: Site recorded in NIAH
ACA: Architectural Conservation Area
UBH: Unregistered built heritage site
UCH (1): Unregistered cultural heritage site that comprises extant remains
UCH (2): Unregistered cultural heritage site that does not comprise extant remains
TB: Townland boundary
ZAP: Zone of Archaeological Potential
AAP: Area/feature of archaeological potential

Appendix 2 Previous archaeological investigations

An examination of previous excavations carried out within and around the area proposed for development provides a useful framework for assessment of the study area in terms of its archaeological significance as well as its archaeological potential. The Archaeological Excavations Bulletin is an annual fieldwork gazetteer for Irish Archaeology; it was checked for a record of any licensed archaeological investigations carried out in the vicinity of the development area between 1970 and 2007.

Bulletin No.: 2008:195
Site Location: Clonakilty, Co. Cork
Metal detecting Licence No.: 08R99
Probe Survey Licence No.: 08D35
The proposed development is located in Clonakilty Harbour, Clonakilty, Co. Cork. Clonakilty Town Council is proposing to construct a tidal barrage across the harbour to protect the town from tidal and freshwater flooding. A cultural heritage assessment for the proposal recommended pre-construction metal-detection survey, pre-construction probing survey and monitoring of construction works. A metal-detection and probe survey was undertaken of the foreshore in the area of the proposed car-park area on the east side of Clonakilty Harbour. No finds or features of archaeological significance were noted during the metal detection and probe survey. Testing will take place in advance of further development works.
Sheila Lane, Deanrock Business Park, Togher, Cork

Bulletin No.: 2004:0284
Site Location: Kilgarriff, Co. Cork
Site Type: No archaeological significance
SMR: 135:122
Licence No.: 04E1666
Pre-development testing was carried out on this site at Kilgarriff, Clonakilty, which lies c. 600m east of a ringfort. No finds or features of an archaeological nature were noted.
Sheila Lane, AE House, Monahan Road, Cork

Bulletin No.: 2005:261
Site Location: Kilgarriff, Co. Cork
Site Type: No archaeological significance
Licence No.: 04E1666
Six test-trenches were machine-excavated along the footprint of a proposed development at Kilgarriff, Clonakilty. Topsoil was removed to a depth of c. 0.35–0.4m. Beneath the topsoil, light mid-brown/orange stony clay occurred throughout with occasional large stones. Evidence for former field boundaries was present in the eastern section of Trench 1 and the mid-section of Trench 2. No finds or features of an archaeological nature were noted.
Sheila Lane, Deanrock Business Park, Togher, Cork

Bulletin No.: 2002:0244
Site Location: Carhoo, Cork
Site Type: No archaeological significance
SMR: 135:48
Licence No.: 02E1343
An assessment with testing was undertaken on the site of a house at Carhoo, Clonakilty. The site was to the immediate north of the zone of potential of a *gallán*. Test-trenches were excavated on the footprint

of the proposed development and the percolation area. No archaeological stratigraphy, features or artefacts were recorded.
Jacinta Kiely, Eachtra Archaeological Projects, 3 Canal Place, Tralee, Co. Kerry

Bulletin No.: 2004:0206
Site Location: Carhoo, Co. Cork
Site Type: No archaeological significance
SMR: 136:5
Licence No.: 04E1613
An assessment was undertaken in support of a planning application for permission to construct a private dwelling. The proposed house was near a circular enclosure. Three test-trenches (totalling 120m) were excavated. No features of archaeological significance were identified.
Linda Hegarty, Headland Archaeology Ltd, Unit 4b, Europa Business Park, Midleton, Co. Cork

Appendix 3 Extracts from the Archaeological Survey of Ireland Archive Files

CH No 1
RMP No CO135-052001-
Townland Youghals/Scartagh/Upper Tawnies
Classification Historic Town
NGR-E 13843 **NGR-**N 04140

Description
The town of Clonakilty is located on the Feale River at the head of Clonakilty Bay and first appears in 1378 as *Clogh na Kylte* (Kylte Castle) as a holding of William de Barry (Urban Survey). The generally accepted location for the castle is on the site of the extant Church of Ireland (CO135-019002). The 17th century market town was founded by the Early of Cork and was well-established by 1605. In 1613 the town received a charter from James I. It probably replaced Kilgarriff when 100 English families were settled there by the Earl of Cork. It is recorded as being built in the shape of a cross, the full extent of which is unknown. The intersection of the cross may be represented by Asna Square, where the Kilty Stone stands; the origin of the latter is believed to have been Arundel Castle, to the east of Clonakilty Harbour (Urban Survey). Seventeenth century sites within the town comprise the Church (CO135-019002) and Graveyard (CO135-019001) and the Market House (CO135-133).

The present Church of Ireland is located in the north-western side of Clonakilty and is on a hill overlooking the town. It probably replaced the 17th century church constructed by the Early of Cork. The graveyard is still used and comprises inscribed headstones, chest-tombs and uninscribed markers. The earliest visible headstone dates to the 18th century (Urban Survey).

CH No 2
RMP No CO135-052002-
Townland Youghals
Classification Brewery
NGR-E 13819 **NGR-**N 04142

Description
The brewery is located on level ground to the south of a stream to the west of Clonakilty town. The ground plan at the time of recording was similar to that of the First Edition Ordnance Survey of 1829-41. It comprises fifteen two-storey buildings built around a central courtyard with four associated brick chimneys dating to the late 19th and early 20th centuries. It is likely that the buildings located in the northeast functioned alongside the chimneys as the powerhouses. At the time of recording, Structure 7 in the north was used as a hatchery, while 9, 9a, 9b and 10 were not accessible. The rest of the buildings were used for storage or were simply abandoned.

CH No 3
RMP No CO135-050001-
Townland Miles
Classification Holy Well
NGR-E 13696 **NGR-**N 04145

Description
Situated in a pasture field on a northeast-facing slope, at a height of 50m above sea level. It is known locally as Killeen well and local traditions do not record it as a holy well. It is associated with a mass-rock (CO135-136), which is depicted on the 3rd Edition Ordnance Survey of 1829-41, although not on the 2nd Edition of 1897-1913. Both sites were covered in 2 m high brambles at the time of the visit and no additional information could be gathered.

CH No 4
RMP No CO135-050002-
Townland Miles
Classification Mill
NGR-E 13702 **NGR-**N 04143

Description
Nothing remains of this site. It was depicted on the 1st Edition Ordnance Survey of 1829-41 as lying to the southeast of Killeen well (CO135-050001); however, by the 3rd Edition Ordnance Survey, the site had disappeared.

CH No 5
RMP No CO135-052003-
Townland Youghals
Classification Bridewell prison
NGR-E 13841 **NGR-**N 04132

Description
The Bridewell prison is located in the southern side of Clonakilty and dates to the early/mid 19th century. It is partially destroyed. It was in use at the time of recording as yards and stores for a bakery. The remains comprise a one-storey four-bay section of the east wall which was constructed with random rubble of shelly sandstone. Cut stone was visible. The roof had been removed. The main door survived and consisted of a stone lintelled ope with a relieving arch; a remaining window also consisted of a lintel stone with a relieving arch with large iron bars still present. The high enclosing walls also survived and were connected to the east-enclosing wall of the courtyard. These east-enclosing walls consisted of coarse ashlar with blocked windows and doors. The Bridewell was also formerly used as a power station until the 1930's.

CH No 09
RMP No CO135-132-
Townland Desert
Classification Levelled circular enclosure
NGR-E 13915 **NGR-**N 04144
Description

The enclosure is located on pastureland on the east side of the estuary behind terraced houses outside the town of Clonakilty. It was identified in an aerial survey as an enclosure and is known locally as a 'fort'. It comprises a levelled internal bank and external fosse which may have both been ploughed out. It measures *c.* 76 m from bank top to bank top and is *c.* 3 m high. The fosse measures *c.* 0.40 x 4 m in depth and the north-south diameter is 58 m.

Appendix 4 National Museum of Ireland (NMI) topographical files

The topographical files of the National Museum of Ireland (NMI) contain a record of stray artefacts found in Ireland. Each artefact has an individual file where it gives locational information, description of the artefact and relevant references.

NMI Register No.	Material	Type	Townland	Find Place	Description
N/A	Human bones	Human bones	DESERT	Close to ancient church of Desert	Bones were found during road-widening works on land between Clonakilty and Ring. Noted a few yards from church of Desert. Local tradition maintains that this was a site where lepers visited. The bones were re-buried in the churchyard.

Appendix 5 Legislative Framework

EIA Legislation

EIA Directive 85/337/EEC as amended by 97/11/EC and 2003/35/EC requires that certain developments be assessed for likely environmental effects before planning permission can be granted. The EIA Amendment Regulations, SI 93 OF 1999 specifies in Section 2(b) of the Second Schedule, 'Information to be contained in an Environmental Impact Statement', that among other factors, information is to be provided on:

'Material assets, including the architectural and archaeological heritage, and the cultural heritage'

Each of these assets is addressed within this assessment report.

Cultural Heritage Legislation

Archaeological Monuments/Sites
Archaeological heritage is protected primarily under the National Monuments Acts 1930-2004. Section 2 of the 1930 National Monuments Act defines the word 'monument' as including:

'any artificial or partly artificial building, structure, or erection whether above or below the surface of the ground and whether affixed or not affixed to the ground and any cave, stone, or other natural product whether forming part of or attached to or not attached to the ground which has been artificially carved, sculptured or worked upon or which (where it does not form part of the ground) appears to have been purposely put or arranged in position and any prehistoric or ancient tomb, grave or burial deposit, but does not include any building which is for the time being habitually used for ecclesiastical purposes'

Under the 1994 Act, provision was made for a Record of Monuments & Places (RMP). The RMP is a revised set of SMR (Sites and Monuments Record) maps, on which newly-discovered sites have been added and locations which proved not to be of antiquity have been de-listed by the National Monuments Service.

In effect, the National Monuments Acts 1930-2004 provide a statutory basis for:

- Protection of sites and monuments (RMPs)
- Sites with Preservation Orders
- Ownership and Guardianship of National Monuments
- Register of Historic Monuments (pre-dating 1700AD)
- Licensing of archaeological excavations
- Licensing of Detection Devices
- Protection of archaeological objects
- Protection of wrecks and underwater heritage (more than 100 years old)

In relation to proposed works at or in the vicinity of a recorded archaeological monument, Section 12 (3) of the National Monuments (Amendment) Act 1994 states:

'When the owner or occupier (not being the Commissioners) of a monument or place which has been recorded [in the Record of Monuments and Places] or any person proposes to carry out, or to cause or permit the carrying out of any work at or in relation to such monument or place, he shall give notice in

writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.'

Archaeological artefacts
Section 2 of the 1930 National Monuments Act (amended) defines an archaeological object as (in summary) any chattel in a manufactured or partly manufactured state or an unmanufactured state but with an archaeological or historical association. This includes ancient human, animal or plant remains.

Section 9 (1) of the National Monuments (Amendment) Act 1994 states that any such artefact recovered during archaeological investigations should be taken into possession by the licensed archaeological director and held on behalf of the state until such a time as they are deposited accordingly subsequent to consultation with the National Museum of Ireland.

Architectural Sites
In 1997 Ireland ratified the Granada Convention on architectural heritage. This provided the basis for a national commitment to the protection of the architectural heritage throughout the country. The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999 and Local Government (Planning and Development) Act 2000 made the legislative changes necessary to provide for a strengthening of the protection of architectural heritage. The former Act has helped to provide for a forum for the strengthening of architectural heritage protection as it called for the creation of a National Inventory of Architectural Heritage which is used by local authorities for compiling the Record of Protected Structures (RPS). The Record of Protected Structures (RPS) is set out in each respective county's Development Plan and provides statutory protection for these monuments.

Section 1 (1) of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 states:

'architectural heritage means all—
(a) structures and buildings together with their settings and attendant grounds, fixtures and fittings,
(b) groups of such structures and buildings, and
(c) sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest"

The 1999 Act was replaced by the Local Government (Planning and Development) Act 2000 where the conditions relating to the protection of architectural heritage are set out in Part IV of the Act. Section 57 (1) of the 2000 Act states that:

'…the carrying out of works to a protected structure, or a proposed protected structure, shall be exempted development only if those works would not materially affect the character of –
(a) the structure, or
(b) any element of the structure which contributes to its special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest'

Appendix 6 Glossary and definition of archaeological terms

Barracks A building or group of buildings used to house members of the police or armed forces. These date from the late 17th century AD onwards.

Brewery A commercial complex of buildings for the brewing of beer. These date from the 19th century AD onwards.

Bridge A structure of wood, stone, iron, brick or concrete, etc., built to span a river or ravine in order to facilitate the crossing of pedestrians or vehicles. These date from the medieval period (5th - 12th centuries AD) onwards.

Burial ground An area of ground, set apart for the burial of the dead, not associated with a church. These date from the medieval period (5th - 16th centuries AD) onwards. See also Children's burial ground and Graveyard.

Castle (unclassified) A castle that cannot be more precisely classified. They can date from the late 12th to the 16th century AD. See also Castle - Anglo-Norman masonry castle; Castle - hall-house; Castle - motte; Castle - motte and bailey; Castle - ringwork; Castle - ringwork and bailey; Castle - tower house.

Chapel A free-standing building which is used for private worship. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Church A building used for public Christian worship. These can be of any date from c. 500 AD onwards.

Corn store A large building used for the storage of grain. These date to the 18th and 19th centuries AD.

Country house The rural residence of the landed gentry. These houses date from the late 17th century to the first half of the 19th century AD.

Courthouse A building in which a judicial court is held. These date from the 16th century AD onwards.

Culvery A culvert is a structure that allows water to flow under a road, railroad, trail, or similar obstruction. Typically embedded so as to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete or other material

Drydock A narrow basin or vessel that can be flooded to allow a load to be floated in, then drained to allow that load to come to rest on a dry platform. Dry docks are used for the construction, maintenance, and repair of ships, boats, and other water craft.

Enclosure An area defined by an enclosing element (e.g. bank, wall, fosse, scarp), or indicated as such cartographically, and occurring in a variety of shapes and sizes, possessing no diagnostic features which would allow classification within another monument category. These may date to any period from prehistory onwards.

Fulacht fiadh Prehistoric site potentially used for a variety of purposes such as cooking, brewing, bathing, textile dying etc. Characterised by a crescentic mound of burnt stone; usually located in damp areas, where the trench (trough) for cooking would fill with water; usually found in groups (plural: *fulachta fiadh*).

Graveyard The burial area around a church. These date from the medieval period (5th-16th centuries) onwards.

Headstone An upright stone placed over the head of a grave. These date from 17th century AD onwards.

Hermitage A secluded place, either a man-made structure or a natural feature, such as a cave, where a hermit lived. These date from the medieval period (5th-16th centuries AD).

Historic town A settlement of pre-AD 1700 date that occupied a central position in the communications network, functioned as a market centre and had an organised layout of streets with a significant density of houses and associated land plots. In addition, examples of one of the following monument classes should be present: town defences; castle/tower house; house (which functioned as a manor house); parish church/cathedral; religious house(s); administrative institution (e.g. town hall, market-house); judicial institution (e.g. courthouse, prison); monuments indicating specialised technological production (e.g. mill, kiln, tannery, ironworking site); bridge; hospital; school; quays. Where only documentary evidence survives to suggest a town was present then the term 'Historic town possible' applies.

Holy well A natural spring or well associated with a saint or a tradition of cures.

Hospital A building for the care of the sick, aged, infirm and poor. These day from the medieval period (5th-16th centuries AD) onwards.

House (18th/19th century) A building for human habitation which dates to the 18th/19th century and which is not classifiable as either a country house or a vernacular house.

House (20th century) A building for human habitation which dates to the 20th century and which is not classifiable as either a country house or a vernacular house.

Library A building, room or suite of rooms where books, or other materials, are classified by subject and stored for use by the library's members. These date from the 17th century AD onwards.

Market-house A market building incorporating other function rooms, e.g. theatres, courtrooms, schoolrooms. In Ireland market-houses are sometimes colloquially referred to as tholsels. These date from the later medieval period (12th-16th centuries AD) onwards.

Mass-rock A rock or earthfast boulder used as an altar or a stone-built altar used when Mass was being celebrated during Penal times (1690s to 1750s AD), though there are some examples which appear to have been used during the Cromwellian Period (1650s AD). Some of these rocks/boulders may bear an inscribed cross. See also Penal Mass station.

Milling complex A series of post-1700 AD structures associated with milling, including any of the following: mill, millpond, millrace, engine house, industrial chimney, administrative buildings and workers' factory.

Mill (unclassified) A mill, including where present the millrace and millpond, where corn is ground or where raw material is processed. This classification is used, in the context of this database, when it is unclear whether the mill in question is a water mill or a windmill. These may date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Millrace The the current of water that turns a water wheel, or the channel (sluice) conducting water to or from a water wheel.

Pier/jetty A structure, extending out into the water, built of iron, wood or stone, for docking or accessing ships or boats. They may also serve to protect a harbour, influence the current or tide and are sometimes used as promenades. These may date to any period from prehistory onwards.

Prison An establishment where offenders are confined. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Quay A stone or timber landing-place built parallel to, or projecting out from, the shoreline, to serve in the loading and unloading of vessels. These date from the Iron Age (c. 500 BC - AD 400) onwards.

Redundant record Records classed as 'Redundant record' are those that fulfil one or more of the following criteria: (1) a record identifying a location where, according to documentary sources (e.g., published reference, cartographic sources) or personal communication, a monument might have existed, but which, on inspection, was found not to be an archaeological monument (e.g. a natural feature); (2) a record classified using a term which is now obsolete (e.g. ecclesiastical remains); (3) a record created in error, a duplicate record or one which has no supporting evidence recorded on file or in the database; (4) an archaeological object (i.e. an artefact), e.g. a quernstone; (5) a record entered as a 'Shipwreck'. Shipwrecks are recorded in a separate database.

Ringfort Early medieval Christian (*c*. 500 AD to 1100) defended secular settlement consisting of a bank and external ditch defining a central circular area that contained dwelling structures of occupants; also called fairy fort, rath, lios, or cashel (the latter constructed of stone as opposed to earth).

School An establishment in which people, usually children, are taught. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

Shambles Structure/structures where animals were slaughtered and/or where meat and fish were sold. These date from the medieval period (5th-16th centuries AD) onwards.

Souterrain An underground structure consisting of one or more chambers connected by narrow passages or creepways, usually constructed of drystone-walling with a lintelled roof over the passages and a corbelled roof over the chambers. Most souterrains appear to have been built in the early medieval period by ringfort inhabitants (c. 500 - 1000 AD) as a defensive feature and/or for storage.

Standing Stone A stone which has been deliberately set upright in the ground, usually orientated on a north-east-south-west axis, although other orientations do occur, and varying in height from 0.5m up to 6m. They functioned as prehistoric burial markers, commemorative monuments, indicators of routeways or boundaries and date from the Bronze and Iron Ages (c. 2400 BC - AD 500), with some associated with early medieval ecclesiastical and burial contexts (c. 5th-12th centuries).

Tomb (chest tomb) A free standing, box-like funerary monument. These date from the 13th century AD onwards. Examples that are incorporated in a wall are classified as Wall monument. Examples with an effigy are classified as Tomb – effigial.

Town hall A large building used for the transaction of the public business of a historic town (pre-1700 AD), the holding of courts of justice, entertainments and other activities. In Ireland, town halls are sometimes colloquially referred to as tholsels.

Weir – regulating A dam constructed on the reaches of a canal or navigable river designed to retain the water and to regulate its flow. These date from the late medieval period (c. 1400 to the 16th century AD) onwards.

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