River Suir Sustainable Transport Bridge

Appropriate Assessment
Natura Impact Statement | December 2018

ROD
ROUGHAN & O'DONOVAN

Comhairle Cathrach
& Contae Phort Láirge
Waterford City
& County Council

River Suir Sustainable Transport Bridge

Natura Impact Statement

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

Roughan & O'Donovan (ROD) was appointed by Waterford City & County Council (WCCC) to provide engineering and environmental consultancy services in relation to the proposed River Suir Sustainable Transport Bridge ("the Project") in Waterford City. The Project comprises a new five-span bridge c. 8m wide and c. 200m long. The proposed bridge will facilitate pedestrians, cyclists and an electric shuttle bus service in crossing the River Suir c. 550m downstream of Rice Bridge. It is a critical piece of the enabling infrastructure for the North Quays Strategic Development Zone (SDZ).

In accordance with Article 6(3) of Council Directive 92/43/EEC of 21 August 1992 on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive"), as transposed into Irish law by Part 5 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended) ("the Habitats Regulations") and Part XAB of the Planning and Development Act, 2000 (as amended) ("the Planning and Development Act"), an Appropriate Assessment (AA) Screening Report was prepared to assess whether or not the Project, either individually or in combination with other plans or projects, was likely to have a significant effect on one or more sites of Community importance ("European sites") for nature conservation.

The AA Screening Report, which was prepared by ROD on behalf of WCCC, concluded, in view of best scientific knowledge and the Conservation Objectives of the sites concerned, that, in the absence of appropriate mitigation, the Project was likely to have a significant effect on two European sites, namely the Lower River Suir SAC and the River Barrow and River Suir SAC. On the basis of that conclusion, Waterford City & County Council, in its capacity as the Competent Authority at the screening stage, determined that AA was required in order to assess the implications of the Project for those sites.

In accordance with Section 177AE of the Planning and Development Act and following the determination by Waterford City & County Council that AA was required in respect of the Project, the role of Competent Authority and responsibility for undertaking the AA was assumed by An Bord Pleanála ("the Board"). In order to assist the Board in carrying out its AA, WCCC is required to submit a Natura Impact Statement (NIS) in respect of the Project.

This document comprises the NIS in respect of the Project and has been prepared by ROD on behalf of WCCC. It contains an examination, analysis and evaluation of the likely impacts from the Project, both individually and in combination with other plans and projects, in view of best scientific knowledge and the Conservation Objectives of the European sites concerned. It also prescribes appropriate mitigation to ensure that the Project will not adversely affect the integrity of those sites. Finally, it provides complete, precise and definitive findings which are capable of removing all reasonable scientific doubt as to the absence of adverse effects on the integrity of the European sites concerned.

1.2 Legislative Context

The Habitats Directive and Directive 2009/147/EC of the European Parliament and of the Council of 30th November 2009 on the conservation of wild birds ("the Birds Directive") list habitats and species which are, in a European context, important for conservation and in need of protection. This protection is afforded in part through the designation of sites which support significant examples of habitats or populations of

species ("European sites"). Sites designated for birds are termed "Special Protection Areas" (SPAs) and sites designated for natural habitat types or other species are termed "Special Areas of Conservation" (SACs). The complete network of European sites is referred to as "Natura 2000".

In order to ensure the protection of European sites in the context of land use planning and development, Article 6(3) of the Habitats Directive provides for the assessment of the implications of plans and projects for European sites, as follows:

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

The requirements arising out of Article 6(3) are transposed into Irish law by Part 5 of the Habitats Regulations and Part XAB of the Planning and Development Act, and the assessment is referred to as "Appropriate Assessment" (AA).

The determination of whether or not a plan or project meets the two thresholds for requiring AA is referred to as "Stage 1" or "AA Screening". The first threshold is reached if the plan or project is not directly connected with or necessary to the management of one or more European sites. In its ruling in the Waddenzee case[1], the Court of Justice of the European Union (CJEU) interpreted the second threshold as being reached where "*it cannot be excluded, on the basis of objective information, that* [the plan or project] *will have a significant effect on that site*". Thus, in applying the Precautionary Principle, the CJEU interpreted the word "likely" to mean that, as long as it cannot be demonstrated that an effect will not occur, that effect is considered "likely". A likely effect is considered to be "significant" only if it interrupts or causes a delay in achieving the Conservation Objectives of the site concerned.[2]

Prior to approval of a plan or project which is the subject of AA (also referred to as "Stage 2"), it is necessary to "*ascertain*" that the plan or project will not "*adversely affect the integrity of the site*". In its guidance document (EC, 2001), the European Commission stated that "*the integrity of a site involves its ecological functions*" and that "*the decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives*". Regarding the word "ascertain", the CJEU, also in its ruling in the Waddenzee case, interpreted this as meaning "*where no reasonable scientific doubt remains as to the absence of such effects*". Therefore, the legal test at Stage 2 is satisfied (and the plan or project may be authorised) when it can be demonstrated beyond reasonable scientific doubt that the plan or project will not interrupt or cause delays in the achievement of the Conservation Objectives of the site or sites concerned. AA is informed by a "Natura Impact Report" (NIR) in the case of plans or a "Natura Impact Statement" (NIS) in the case of projects.

---

[1] Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse vereniging tot Bescherming van Vogels *v*. Staatssecretaris van Landbouw, Naturbeheer en Visserij (Waddenzee) [2004] C-127/02 ECR I-7405.

[2] Conservation Objectives are referred to, but not defined, in the Habitats Directive. In Ireland, Conservation Objectives are set for Qualifying Interests (the birds, habitats or other species for which a given European site is selected) and represent the overall target that must be met for that Qualifying Interest to reach or maintain favourable conservation condition in that site and contribute to its favourable conservation status nationally.

The CJEU has made a relevant judgment on what information should be contained within documents supporting AA[3] (in the NIR or NIS):

> "[The AA] *cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the protected site concerned.*"

The Irish High Court has also provided clarity on how competent authorities should undertake valid and lawful AA[4], directing that the AA:

- "*Must identify, in the light of the best scientific knowledge in the field, all aspects of the development project which can, by itself or in combination with other plans or projects, affect the European site in the light of its conservation objectives. This clearly requires both examination and analysis.*"
- *"Must contain complete, precise and definitive findings and conclusions and may not have lacunae or gaps. The requirement for precise and definitive findings and conclusions appears to require examination, analysis, evaluation and decisions. Further, the reference to findings and conclusions in a scientific context requires both findings following analysis and conclusions following an evaluation of each in the light of the best scientific knowledge in the field.*"
- "*May only include a determination that the proposed development will not adversely affect the integrity of any relevant European site where, upon the basis of complete, precise and definitive findings and conclusions made, the consenting authority decides that no reasonable scientific doubt remains as to the absence of the identified potential effects.*"

In accordance with Article 6(3) of the Habitats Directive, the responsibility to screen for and carry out AA lies solely with the "competent national authorities", i.e. those with responsibility for granting or refusing consent for plans and projects. In that respect, an AA Screening Report, NIR or NIS (if not prepared by the competent authority) does not in itself constitute a valid AA Screening or AA; it merely provides the competent authority with the information that it needs in order to screen for and carry out its AA. In Ireland, the competent authority for a given plan or project is the relevant planning authority, e.g. the local authority or An Bord Pleanála.

1.3 Methodology

On the basis of the objective information provided in the AA Screening Report and in view of the Conservation Objectives of the relevant European sites, Waterford City & County Council, as the competent authority at Stage 1, determined that the Project, either individually or in combination with other plans and projects, was likely to have a significant effect on two European sites, namely the Lower River Suir SAC and the River Barrow and River Suir SAC.

In accordance with the requirements for AA, this NIS assesses the likely effects of the Project on the integrity of the European site screened in at Stage 1. This assessment is undertaken in five steps, as follows:

1. Step 1 involves gathering all of the information and data that will be necessary for a full and proper assessment. These include, but are not limited to, the details of all phases of the plan or project, environmental data pertaining to the area in which the plan or project is located, e.g. rare or protected habitats and species

[3] Sweetman *v*. An Bord Pleanála [2013] Case C-258/11.

[4] Kelly *v*. An Bord Pleanála [2014] IEHC 422.

or invasive species present or likely to be present, and the details of the European sites within the likely zone of impact.

2. Step 2 involves examination of the information gathered in the first step and detailed scientific analysis of the effects of the plan or project on the ecological structure and function of the receiving environment, focussing on European sites.
3. Step 3 evaluates the effects analysed in Step 2 against the Conservation Objectives of the relevant European site or sites, thereby determining whether or not they constitute adverse effects on site integrity.
4. Having established that the plan or project will adversely affect the integrity of one or more European sites, Step 4 is the development of appropriate mitigation to avoid or minimise those effects such that they no longer constitute adverse effects on site integrity. It may also necessary at this stage to prescribe monitoring and enforcement programmes (to ensure the efficacy of the mitigation) and to consider the significance of any residual (post-mitigation) effects, in combination with other plans or projects.
5. Step 5 involves the final determination of whether or not the plan or project will have an adverse effect on the integrity of one or more European sites. Notwithstanding the final recommendation made in the NIS, the responsibility for completing this step lies solely with the competent authority.

The following guidance documents informed the assessment methodology:

- EC (2000) *Managing Natura 2000 sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.
- EC (2001) *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.
- DEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin.
- NPWS (2010) *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. Circular Letter NPWS 1/10 & PSSP 2/10. Department of the Environment, Heritage and Local Government, Dublin.
- NPWS (2012) *Marine Natura Impact Statements in Irish Special Areas of Conservation – a working document. April 2012.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

1.4 Ecological Assessment

In order to fully inform this NIS in respect of the Project, it was necessary to establish the baseline ecological conditions in the receiving environment, particularly with regard to European sites. This was achieved by undertaking a number of desktop studies and field surveys and engaging in consultations with the relevant stakeholders, including the Port of Waterford, Waterford City & County Council and Kilkenny County Council, and statutory authorities, namely the National Parks & Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI).

Desk Studies

During the preparation of the AA Screening Report and NIS, the statutory consultee, the NPWS, provided data on designations of sites, habitats and species (including birds) of conservation interest. This included reports pursuant to Article 17 of the

Habitats Directive[5] (NPWS, 2013a,b) and the Site Synopses, Natura 2000 Standard Data Forms and Conservation Objectives (including supporting documents) for the relevant European sites.

The desk studies involved thorough reviews of existing information relating to ecology in the vicinity of the Project. A number of web-based geographic information systems (GISs) were used to obtain information relating to the natural environment surrounding the Project. These included the NPWS *Map Viewer* (NPWS, 2018), which provided information on the locations of protected sites, the National Biodiversity Data Centre's *Biodiversity Maps* (NBDC, 2018), which provided recent and historic records of rare and protected species in the area, and Ordnance Survey Ireland's *GeoHive*, which provided additional information on the wider environment.

Field Surveys

A multidisciplinary ecological walkover survey was conducted by suitably qualified ecologists from ROD on 8th November 2016. In order to update and supplement the results of this survey, which was undertaken during the winter, a follow-up summer survey was undertaken on 6th June 2018. These surveys included habitat/botanical surveys and protected species surveys. Habitats present were classified in accordance with *A Guide to Habitats in Ireland* (Fossitt, 2000) and mapped following *Best Practice Guidance for Habitat Survey and Mapping* (Smith et al., 2011). Notes were recorded on the morphology, physical characteristics and potential of the river habitat to support protected flora and fauna.

The protected species surveys was designed to record evidence of European Otter (*Lutra lutra*) and other protected species, adhering to the methodology outlined in *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (NRA, 2008). The survey also aimed to identify habitats with potential to support important assemblages or significant populations of birds of conservation concern. As part of the multidisciplinary survey, a bat roost suitability assessment was carried out following *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins (ed.), 2016). A bat activity survey was undertaken within the study area on 24th July 2018, also following Collins (ed.) (2016).

Consultations

Throughout both the design and the environmental assessment processes, there were consultations both with the NPWS, as the statutory consultee, and with IFI. These included both written and personal consultations.

Consultations were also carried out with other relevant stakeholders, including the Irish Whale & Dolphin Group (IWDG), who prepared a Marine Mammal Risk Assessment (MMRA) in respect of the Project (see Appendix D to this NIS). The MMRA found that the Project does not pose a significant risk to marine mammals.

Consultation allowed for in-depth discussion of ecological sensitivities at specific locations along the Project and at specific stages in its construction and operation and for discussion as to how any ecological impacts would be best mitigated.

[5] Under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive.

Assessment

Once established, the ecological baseline in the receiving environment was used to inform the assessment of the ecological effects likely to arise from the Project, particularly with regard to European sites. Any assumptions that were made in view of gaps in the ecological data were made in accordance with the Precautionary Principle.

2.0 DESCRIPTION OF THE PROJECT

2.1 Overview

Purpose of the Project

The Project is not directly connected with or necessary to the management of any European site. The proposed bridge is required to stimulate the coherent development of the city's various quarters, in particular integrating the substantial housing areas in Ferrybank and Bellfield and the proposed North Quays redevelopment with the city centre. The bridge will be located in line with Barronstrand Street and the Clock Tower to provide a continuous link connecting the city centre retail spine to the North Quays.

The proposed bridge across the River Suir will be a public amenity offering greater appreciation and enjoyment of the river. In order to develop a transport facility that will permit and encourage sustainable development, a user hierarchy of pedestrians, cyclists and an electric shuttle bus service will be adopted. The proposed bridge will be a sustainable transport bridge that connects into the existing road infrastructure in a logical and safe manner.

Bridge and scheme description

The bridge site location is approximately in line with Barronstrand Street and in front of the existing Clock Tower, as shown in Plate 2.1 below. The bridge is a sustainable transport bridge which accommodates pedestrians, cyclists and an electric bus shuttle service between the north and south quays. The bridge also accommodates an opening section which facilitates navigation of vessels along the River Suir.

The proposed 5-span, 8 m wide bridge (inside of parapet to inside of parapet) will accommodate pedestrians, cyclists and an electric shuttle bus service. The bridge is also locally widened in two locations (approximately located at third points across the bridge) to facilitate repose and look-out areas. Cyclists and the electric shuttle bus will be facilitated through a shared-space lane, whilst pedestrians will be provided with a primarily segregated area of the deck cross-section. There are some locations at the centre of the span and the south plaza where all the spaces are shared spaces between pedestrians, cyclists and the electric bus.

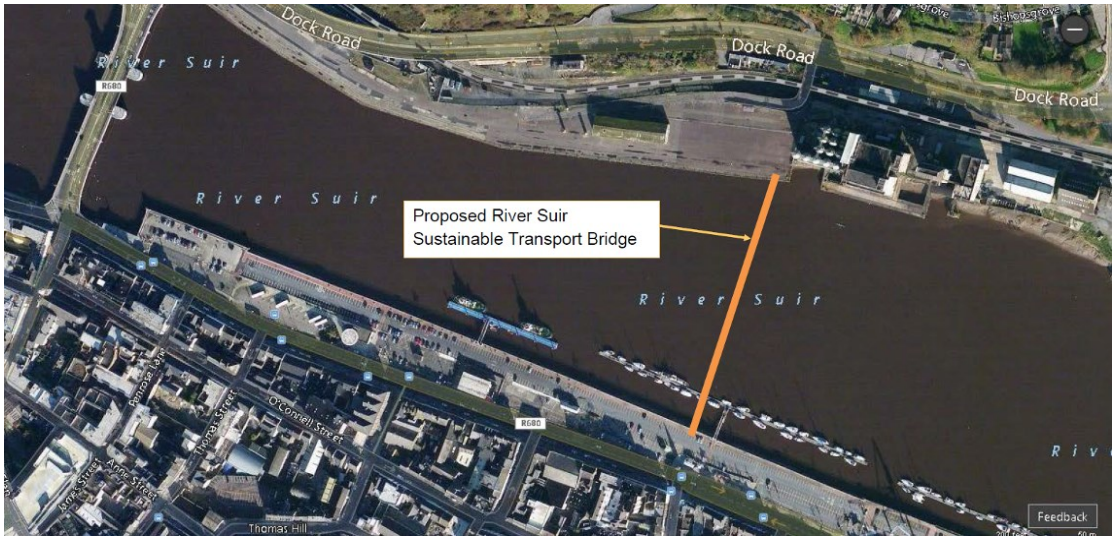


Plate 2.1 Proposed bridge location.

The Project also comprises a plaza at the South Quay landing point. This plaza will be a paved and landscaped space for the streetscape around the Clock Tower. There will also be lighting, flagpoles, street furniture and planting which will be subject to detailed design and is indicatively illustrated in as presented in Plate 2.2 below. Approximately 143 car parking spaces will be removed from the existing car parks along Merchant's Quay for the construction of the South Quay Plaza. An integral part of the development of this South Plaza includes the provision of foundations and utilities for two future buildings on the South Quays.

Plate 2.2 Proposed South Quay Plaza.

The sustainable transport bridge crossing point is approximately 550m downriver of Rice Bridge. The river is c. 207m wide at this location, measured between the edge of the south quay and the shore edge of the north wharf, and forms part of the Lower River Suir SAC. The south quays at the proposed bridge location currently consist of the Clock Tower and car parks, while the North Quays is a brownfield site which will be developed as a Strategic Development Zone (SDZ). There is an existing marina located on the south quays which will be directly impacted by the proposed bridge.

River navigation

A 25 m clear-span navigational channel is provided for vessels. The existing control building for Rice Bridge will also be used for the proposed bridge. The passing of small craft will be feasible without opening the lifting span. The bridge deck at this location will have an underside of deck level of approximately +5.22 mOD which will provide vertical clearances of 7.42m (at -2.2 mOD) and 2.82 m (at +2.4 mOD) at low and high tide respectively. At the navigable channel, the river bed is c. -12 mOD. The typical water depths range from 10m to 14m for low and high-tide respectively.

Effect of the bridge on River Suir

The bridge elevation has been profiled to allow freeboard for the design flood level of +3.47 mOD (combined 1% Annual Exceedance Probability (AEP) fluvial and 0.5% AEP tidal flood level). At the northern approach of the bridge, the deck elevation is flat, and has its highest point at the North Quay abutment (+8.00 mOD measured at the top of the deck). The lowest point of is at the South Quay abutment (+4.42 mOD measured at the top of the deck). The proposed deck elevation over the majority of the 207m span is significantly higher than the calculated extreme flood events.

Marina Impact

An length of c. 70.4m of the existing marina and associated gangways of the current access to the south quays will be removed. This will incorporate the removal of 5 No. piles and the provision of 4 No. new driven piles when reconfiguring the marina. Two new access gangways will be required, one to the east and one to the west of the proposed bridge. These new gangways will require two new openings to be created in the flood wall with the existing opening being closed and made contiguous with the existing flood defence wall. Re-wiring and re-plumbing will be required for boat users during the construction phase in order to maintain their services.

2.2 Detailed Description

General

The proposed bridge is a low level bridge which provides access between the north and south quays and has the following features:

- The bridge is unusual for a bridge of its length (and an opening bridge) in that the levels at the north and south quays are significantly different. The bridge deck level at the north quays is +8.00 mOD, while the level at the south quays is lower at +4.42 mOD.
- An architectural streamlined low-level painted steel deck (superstructure).
- The structural deck cross-section incorporates vertical upstands and parapets/ wind-shielding, providing a comfortable and safe setting for bridge users.
- The bridge piers (substructure) are minimised to four discrete supports within the river channel. These consist of durable concrete marine construction.
- The architectural bridge shape is highlighted by its clear lines which define the deck and the piers.
- Cantilevered platforms will be provided to the east above the northern central pier and to the west on the southern central pier, to improve the bridge viewing experience.

Span Arrangement

The bridge will be a 5-span bridge, laid out symmetrically and comprising a 70m long central span with an opening section, two intermediate spans of 41 m and two end spans of 27.5m length. The 32.5m wide opening section of the central span is a counterweighted, hydraulically-operated double-leaf bascule bridge which provides a 25m wide navigational channel in its open position.

Superstructure

The bridge deck will be of painted steel construction. On the south side, the deck will have a half-through configuration (U-shaped) consisting of a shallow box girder over the 8m wide bridge (depth c. 600mm) connecting to two main edge box girders (varying between 1.6m and 0.9m deep) on either side protruding above the top of deck level. A parapet/wind-shielding of variable depth will satisfy the requirement for a minimum 1.4m high protection parapet throughout.

The deck surfacing will be formed with a thin layer of resins or bituminous material which also acts as a waterproofing membrane, has high resistance to the marine environment and provides the required slip resistance for all bridge users.

At both ends of the bridge, there is a gradual change of the deck cross section to a wider deck over the last 12m of the bridge on both the North and South Quays, as in the drawings in Appendix A to this NIS.

At the central piers location, two V-shaped steel legs (struts), connected over each pier, will support the deck. The legs have a box section to provide adequate stiffness without excessively increasing loads and effects to the foundations.

Substructure

The bridge piers will be of in-situ concrete construction. The main span piers will support the deck by means of inclined steel struts which are integrally connected to the steel deck and converge to a concrete diamond-shaped pier at their base. The intermediate piers will have a slender form of tapering width (c. 1.0m at deck level and 3.0m at pile cap level) and heights of approximately 10.0m and 7.7m for the north and south piers, respectively. Both the central and intermediate piers will be constructed using in-situ concrete. The bridge deck is detailed as integral with these piers and it will be articulated on bearings at the abutments only.

The bridge abutments will slightly differ at the north and south ends. At the southern end, the abutment will be of standard construction with an access gallery to allow for bearing and movement joint inspection. The southern abutment will be included in the end splay structure and will be supported on a sheet-piled structure protruding in plan from the existing south quay. The northern abutment will be an isolated element from the existing north quay and will be supported on piles. It will provide a gallery for bearing replacement and inspection.

Bridge Foundations

The central piers will be supported on pile caps with the upper surface at -3.40mOD, c. 1.2m below the low water mark (-2.2 mOD). Ten 1200 mm dia. raking steel driven tubes with concrete rock sockets and reinforced concrete infill support the bridge at these piers. Intermediate piers will be supported directly on three 1200 mm driven steel tubes with concrete rock sockets and reinforced concrete infill.

The southern abutment will be supported on a concrete plug part of the sheet-piled structure. The northern abutment will be supported on 750mm dia. raking driven steel tubes with concrete rock socket and reinforced concrete infill.

Based on the ground investigation borehole data, pile lengths will vary considerably between the north and south bridge abutments. Pile lengths to rock at the north and south abutments will be c. 12m and 25m, respectively, and socketed c. 1-2m into competent bedrock.

Articulation joints and bearings

The proposed structure is structurally integral at the central and intermediate pier supports and articulated at the north and south abutments. Two mechanical bearings (one guided and one free) will be provided at each abutment support to allow for the expansion and contraction of the deck under various temperatures.

Opening Mechanism

It is proposed to use the existing control tower on Rice Bridge in conjunction with additional plant rooms located on the north and south quays to open the bridge. The existing control tower on Rice Bridge has good visibility of the navigational channel and, when combined with CCTV at the proposed bridge, will provide the optimum location for the control tower without the need for further development of this type of infrastructure.

Proposed mode of operation

The bascule spans will rotate about a pivot or trunnion located in the fixed spans. Each bascule span is counterweighted by a short back-span. Both leaves will be operated using two hydraulic cylinders pinned to the counterweight and the fixed portion of the bridge. The span will be balanced under permanent loads so that the cylinders are used to overcome inertial forces, friction and wind loads in the opening and opened positions.

Span locks are required to lock the two forward leaf spans together when the bridge is in the closed position. A minimum of two span locks are required, consisting of guided lock bars driven into receiver sockets on the adjoining span. The lock bars can be actuated using either electro-mechanical devices or hydraulic cylinders. It is not intended to provide tail locks, however a mechanism for holding the bridge in the open position, should this be required without using the hydraulic cylinders, will be incorporated between the fixed and moveable span.

During operation, the system will continuously monitor position and pressure as well as temperature and incorporate sufficient alarms and shut-downs to prevent damage to the hydraulic system in the event of a malfunction.

Plant rooms/buildings

Two plant rooms will be required within the vicinity of the north and south abutment to house the plant and machinery used to operate the twin-leaf bascule. The operating machinery, with the obvious exception of the hydraulic cylinders, will be located in the plant room on the north and south quays. This machinery will primarily consist of piping arriving from the hydraulic cylinders to a hydraulic power unit (HPU) located in the plant room. However, consideration will also be given to housing the HPUs in the bridge deck, in the vicinity of the central piers, adjacent to the movable span. The electric pump motors and valves for the HPU will be controlled from the electrical control room and operated from the operator station. The plant rooms/buildings which will be of the order of 5m × 10m in plan area.

Electricity supply and distribution

The operating machinery and pumps will be powered by three-phase industrial-duty electric motors. A sub-station will be required if ordinary industrial three-phase power is not available close to the bridge on both quays. The stepped-down industrial-voltage power will be used to directly power the hydraulic cylinders' pump motors and any electro-mechanical devices such as span locks through motor starters and/or electronic controllers. The voltage will further be stepped down using transformers to provide single phase power used for lighting, control and for other uses.

Communications

The bridge operator will typically have a phone line available for communication, as well as an intercom system to communicate between the operator control room and other areas where maintenance personnel may be located, e.g. the plant room. The regular phone line can be used to communicate with emergency personnel as well as marine personnel who can call in to request a bridge opening. In some cases, a loud speaker is provided allowing the operator to give instructions to bridge users. CCTV cameras are also used on many bridges to allow the operator to see all areas of access to the opening span. It is also intended that the control room may also have direct connection with the emergency service providers in Waterford.

Vessel collision protection

The protection system will be primarily steel piles with concrete infill, embedded into rock beneath the river bed. Three 1200mm dia. piles will be installed close to each other near the central piers and 2 No. piles near the intermediate piers. Because of the reduced probability of collision further from the centre of the navigational channel, a larger number of piles is provided in front of the two central piers. The navigational span will be provided with a fender protection system, which prevents vessels from laterally contacting with the bridge while transiting through. The collision protection system will also be designed to reduce its visual impact.

Bridge Approaches

South Plaza

The South Plaza is the entrance to the proposed bridge and includes the following:

- Rearrangement of traffic lanes, cycle lanes, bus parking provisions and set down areas on Meagher's Quay and Coal Quay.
- At the end of Barronstrand Street, footpaths and edge-of-carriageway levels and the existing hard surfacing, including stone paving, will be maintained.
- Pedestrian crossings from Barronstrand Street to the South Plaza, which will incorporate hard surfacing consisting of stone paving suitable for traffic. These pedestrian crossings shall have similar plan geometry to that of the bridge.
- The design of the footpaths, pedestrian crossings, cycle facilities will ensure a seamless priority of these transportation modes from the bridge, across the South Plaza to Barronstrand Street, whilst also allowing existing traffic flows on the south quays.
- The Clock Tower is retained as a central and integral design focus of the South Plaza with its foundation surrounded in a semi-circular array of steps.
- Traffic bollards (demountable) will be provided to restrict vehicular traffic from entering the South Plaza or the proposed bridge.
- The central part of the South Plaza leads to the bridge entrance and consists of stone paving suitable for light traffic, i.e. the electric bus. This is also where the electric bus will depart and arrive and turn to bring pedestrians from the south quays to the north quays and vice versa.
- There is a transition point between the hard landscaping small stone paving to the bridge surfacing at approximately three-quarters distance from the quays to the start of the proposed bridge.
- To the east and west of the "central splayed zone" leading from Barronstrand Street to the bridge are areas of hard landscaping constructed as part of the Project. These will consist of the following:
    - Large-size stone paving and steps to accommodate the level differences between these areas and the transition from the bridge to Barronstrand Street.
    - Large-size stone paving suitable for pedestrians, which will incorporate public realm areas, including seating and public lighting.
    - It is envisaged that there will be two buildings in the zones indicated on the drawings in Appendix A. The provision of these two buildings is not included in the current planning application. However, the provision of the foundations (as part of the foundation design for the South Plaza) is included. It is proposed to connect utilities (water, wastewater, electricity, communications etc.) to both buildings.

- The plant room for the southern bascule will be located in a small building which on the proposed footprint of a future building (west side of plaza).

- Further east and west of the two foundations for future buildings, it is proposed to have two grassed and landscaped areas to complete the South Plaza.
- As the levels for the South Plaza gently rise from the Clock Tower to the south abutment, the existing flood defences will be removed, and new flood defences will be installed. The flood defences will terminate at the intersection with the bridge parapets (top of deck level at this point is at c. +4.20mOD). There is an opportunity to emphasise this intersection, noting the end of the flood defence wall and the commencement of the bridge parapets with an aesthetic feature which symbolises the start of the bridge.

Northern Approach

The northern approach and tie-in of the proposed bridge with the North Quays SDZ is equally important. Similar design principles have been adopted to tie-in with a future north plaza to those adopted for the design of the tie-in with the South Plaza. The North Plaza will be designed by others at a future date.

Lighting

A durable, energy-efficient illumination solution which provides a safe and well-lit environment for pedestrians, cyclists and the electric shuttle bus users has been developed for the bridge and South Plaza conforming to the requirements of British Standard (BS) 5489: Part 6. I t will be ensured that no lighting is focused onto areas of ecological sensitivity including onto the River Suir and that lighting design provides for low levels of lateral light spillage to avoid unwanted areas of illumination.

Integrated rail lighting units are proposed along the bridge which will have high vandal resistance (in accordance with European standard EN62262) and will be finished in stainless steel, which offers exceptional corrosion resistance in a marine environment. In addition, architectural lighting and in-ground up-lighters are proposed at the bridge approaches and South Plaza to complete the lighting solution. All lighting aspects of the bridge will be controlled via a photocell arrangement that offers simplicity in day-to-day management. The final lighting units, beams, colours, dimming protocols etc. will be finalised in consultation with and approval of WCCC's architect's department.

Utilities

No overhead services are present. The following underground services have been identified at the proposed bridge landing area on the South Quays and on the site of the proposed South Plaza:

- Gas Network Ireland;
- ESB Medium Voltage/Low Voltage and lighting;
- Irish Water watermains;
- Local Authority (sewer mains, traffic cables, public lighting); and,
- Telecom/cable TV/broadband (BT, Eir, ENET and Virgin Media).

In addition, there have been some unidentified services.

Future Services Provision

Two service troughs will be detailed along the length of the bridge. These will provide services to the mechanical and electrical equipment that are housed in the bridge deck to facilitate the opening of the bridge. If, in the unlikely event that the river is closed to

larger vessel traffic at a future date and, therefore, no longer requires an opening span, the ends of the opening span bascule sections can be closed and a continuous trough for services over the full length of the bridge can be provided. The bridge abutment structure will provide suitable openings in the ballast wall in line with the bridge deck trough to allow services to pass through the abutment walls to the plant rooms and buildings located on the north and south quays.

Drainage

As private vehicles (cars, trucks, vans etc.) will not be permitted on the proposed bridge, the risk of surface water contamination is minimal. Surface water run-off from the bridge will not be permitted to drain freely from the bridge to the River Suir but will be collected in a closed system and will drain into existing surface water networks on the North Quays and the South Quays.

The bridge falls from the North Quay side to a lower level at the South Quay side. However, as the bridge will have a lifting central span, it is necessary to drain both approaches to the central span separately and provide a drainage tie in connection at both the North and South Quays. On the bridge surface, run-off will be collected in bridge deck drainage units and pipes, where necessary, which will be collected and fed into the surface water drainage network. The bridge and approach splays have been provided with a variable longitudinal profile ranging from 0% on the north side to 3.4% on the south, and a cross-fall of 1.5% either side of the centreline.

On the north quays, a closed system connection from the bridge and the plaza area will be provided which will tie into the future SDZ's drainage network. On the south quays and South Plaza, runoff from the bridge and the new raised plaza areas will be collected and attenuated and will connect to the existing storm water network which then discharges to a combined sewer running from west to east along the R680 Meagher's Quay.

2.3 Construction Methodology

Procurement Method

It is envisaged that the construction of the Project will be tendered under a Public Works Contract for Civil Engineering Works Designed by the Employer. The advantage of this type of contract is that the team which has undertaken the design and environmental assessments continue with the detailed design and supervision, ensuring continuity of knowledge through the remaining phases of the Project and through to completion and handover.

Timescale

It is expected that construction will be progressed as a single contract, potentially lasting c. 18-24 months. If the North Quays SDZ is at construction stage at the time of the construction of the proposed bridge, the bridge will not open until the North Quay SDZ is in operation. If the North Quay SDZ has not begun construction or is constructed at the time of the proposed bridge completion, the bridge could be made operable once constructed.

Construction Arrangements

Site compounds

A temporary construction compound will be required in the vicinity of the Project. Any changes to the location or size of the proposed site compound must comply with all requirements in the Environmental Impact Assessment Report (EIAR) and must have

approval from WCCC. The following areas have been identified as potential locations of site compounds:

- South Quay: The site compound is envisaged to be located on the South Quay, to the west and east of the Clock Tower, where the contractor can have a direct access to the site. This area is envisaged to be c. 4,540m^2.
- North Quay: No site compounds are envisaged to be permitted here in order to avoid interferences with the construction works of the North Quay SDZ.

The proposed main site compound on the South Quay, as shown in the drawings in Appendix A, will include offices, materials storage areas, plant storage and parking for site and staff vehicles. The site is likely to remain in place for the duration of the contract but may be scaled up or down during particular activities on site. The compound(s) may be used in full, in part, not at all, or another location could be selected, in agreement with WCCC, subject to compliance with all environmental, planning and legal requirements. It is envisaged that raw material, particularly steel bridge sections for bridge construction will be brought to the site on barges via the River Suir.

The construction compound(s) will incorporate protection and mitigation measures outlined in the EIAR and will conform to the requirements outlined in the Outline Construction Environmental Management Plan (CEMP), this NIS and any planning conditions. In particular, this will include avoidance of excessive lighting, particularly light spill onto the river. Lighting within 10m from the River Suir will be turned off outside normal working hours.

The contractor will be required to erect opaque hoarding of a minimum 2m in height around the site compound and works area on the South Quays. The hoarding will be a high-gloss printed finish with information and graphics about the Project, or as otherwise agreed with WCCC. The precise hoarding type will be agreed with WCCC prior to works commencing.

Following completion of construction, the selected site compound area will be cleared and incorporated into the landscaped plaza.

Construction Sequence

The indicative construction sequence for the Project is as follows (also see drawings included in Appendix A to this NIS):

<u>Stage 1: Site set-up and clearance</u>

1. Construction compound/site set-up on the south quay to facilitate the bridge and south plaza construction.
2. Implementation of measures to protect against accidental damage to the Clock Tower (RPS No. 392) and memorial statue during the works.
3. Site clearance of the Clock Tower car park, paved pedestrian areas and R680 road (street furniture, minor buildings, trees etc) over the extents of the south plaza works site, as required.
4. Implementation of traffic management at the site and as required on the south quays and approaches.
5. Diversion of utilities affected by the works on the south quays including the relocation of the ESB sub-station located on the south plaza site.

6. Removal of the required sections of the existing floating jetty (deck and ramp) and removal of required existing jetty piles at the bridge location.

Stage 2: Complete south quays excavation and piling

1. Construction of permanent and temporary sheet piling in the river for the south abutment.
2. Installation of temporary flood protection measures.

Stage 3: Installation of cofferdams and temporary/permanent piles

1. Completion of north abutment piling and construction of piled abutment.
2. Construction of temporary works braced sheet pile cofferdams from jack-up pontoon or barge to allow for construction of the two main span piers.
3. Dewatering of cofferdam to allow installation driven steel tubes and concrete rocket sockets within the confines of the cofferdams using a crane mounted drilling rig operating from the jack-up barge/pontoon.
4. Installation of steel driven tubes and concrete rock sockets for intermediate pier locations from a crane-mounted piling rig on jack-up barge/pontoon.
5. Construction of piles for four temporary supports to support the two central deck sections at both ends during construction.
6. Construction of temporary working platforms within cofferdams to allow pilecap construction.
7. The simultaneous presence of four cofferdams in the river represents the worst-case scenario in terms of construction impacts on the river.
8. It is proposed to construct the bridge temporary works within the river and the bridge foundations in two halves. The first half of the bridge which could either be the southern or northern half will be commenced in June. The second half of the bridge will be commenced in November.

Stage 4: Reinforced concrete pier and temporary works

1. Cutting down of steel casings and concrete piles to underside of each pilecap.
2. Construction of main pier in-situ pilecaps and vertical squat piers.
3. Construction of in-situ pilecaps and pier walls.
4. Construction of temporary support concrete pilecaps above the waterline.
5. Construction of north and south abutments.

Stage 5: Land central deck sections

1. Using crane located on pontoon/barge, lifting of each 50 m long central section of deck (comprising of the V-shaped steel struts) onto the supporting jacking points located on the temporary supports and piers.
2. Construction of in-situ connection between steel struts and concrete piers.

Stage 6: Land end and opening spans

1. Land end spans on abutment and intermediate piers.
2. Complete of end span deck site splice connection to central deck sections.
3. Make intermediate concrete pier/steel deck integral connection and install the abutment permanent bearings.

Stage 7: Installation of deck opening sections

1. Installation of two deck opening sections to complete the bridge.
2. Installation of lifting mechanism machinery and counterweight. Testing and commissioning.

Stage 8: Complete deck approaches and finishes

1. Removal of temporary works cofferdams, frames and supports.
2. Installation of driven piles for the vessel collision protection system and fenders.
3. Construction of bridge south approach ramp/steps and reinstatement of glass panel flood wall sections to tie into bridge abutment wall.
4. Completion of bridge finishes: local painting at connections, parapets and glass wind shielding, handrail lighting and feature lighting, deck plate combined waterproofing and surfacing, lifting spans pedestrian barriers and abutment end movement joints.
5. Completion of south plaza approach area.

Working Hours

Normal working hours will apply during the construction phase, as follows:

- Monday to Friday: 7:00 am to 7:00 pm
- Saturday: 8:00 am to 4:30 pm
- Sunday and Bank Holidays: 8:00 am to 4:30 pm

Works on Sundays and Bank Holidays will only be permitted with the approval of WCCC. Similarly, emergency works outside of the normal working hours will only be permitted with the approval of WCCC.

The permitted working hours for piling in the SAC, as agreed with the NPWS and IFI, are as follows:

- Monday to Friday: 8:00 am to 6:00 pm
- Saturday and Sunday: No piling permitted

Environmental Management Plans

Construction Environmental Management Plan

Prior to any demolition, excavation or construction, a Construction Environmental Management Plan (CEMP) will be produced by the successful contractor. The CEMP will set out the Contractor's overall management and administration of the construction project. The CEMP will be prepared by the Contractor during the pre-construction phase to ensure commitments included in the statutory approvals are adhered to, and that it integrates the requirements of the outline CEMP, the outline Environmental Operating Plan (EOP) and the outline Construction and Demolition Waste Management Plan (CDWMP). The Contractor will be required to include details under the following headings:

- Details of working hours and days.
- Details of emergency plans in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services.

- Details of chemical/fuel storage areas (including location and bunding to contain runoff of spillages and leakages).
- Details of construction plant storage, temporary offices.
- Traffic management plan (to be developed in conjunction with the WCCC Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements.
- Truck wheel wash details (including measures to reduce and treat runoff).
- Dust management.
- Site run-off management.
- Noise and vibration management.
- Landscape management.
- Management of demolition of all structures and assessment of risks for same.
- Stockpiles.
- Project procedures and method statements for the following:
    - Demolition and removal of buildings, services, pipelines (including risk assessment and disposal);
    - Diversion of services;
    - Excavation and blasting (through peat, soils and bedrock);
    - Piling;
    - Construction of pipelines;
    - Temporary hoarding and lighting;
    - Borrow pits and location of crushing plant;
    - Storage and treatment of peat and soft soils;
    - Disposal of surplus geological material (peat, soils, rock etc.);
    - Earthworks material improvement; and
    - Protection of watercourses from contamination and sedimentation.
- Site compound(s).

The CEMP will also detail areas of concern with regards to health and safety and any environmental issues that require attention during the construction phase. Adoption of good management practices on site during the construction and operation phases will also contribute to reducing environmental impacts.

Environmental Operating Plan

The EOP is a document that outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments. Essentially the EOP is a project management tool. It is prepared, developed and updated by the Contractor during the project construction stage and will be limited to setting out the detailed procedures by which the mitigation measures proposed as part of the EIAR and NIS and arising out of the Board's decision (if approving the Project) will be achieved. The EOP will not give rise to any reduction of mitigation measures or measures to protect the environment.

Before any works commence on site, the Contractor will be required to prepare an EOP in accordance with the TII/NRA *Guidelines for the Creation and Maintenance of an Environmental Operating Plan*. The EOP will set out the Contractor's approach to managing environmental issues associated with the construction of the scheme and provide a documented account to the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions. Details within the plan will include:

- All environmental commitments and mitigation measures included as part of the planning approval process and any requirements of statutory bodies such as the NPWS and IFI as well as a method documenting compliance with the measures.
- A list of all applicable environmental legislation requirements and a method of documenting compliance with these requirements.
- Outline methods by which construction work will be managed to avoid, reduce or remedy potential adverse impacts on the environment.

To oversee the implementation of the EOP, the Contractor will be required to appoint a suitably competent Site Environmental Manager (SEM) to ensure that the mitigation measures included in the EIAR, the EOP and the statutory approvals are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly.

Construction and Demolition Waste Management Plan (CDWMP)

The CDWMP will be included within the CEMP, clearly setting out the Contractor's proposals regarding the treatment, storage and disposal of waste. An outline CDWMP has been prepared for the Project. The outline CDWMP is a live document that will be amended and updated to reflect current conditions on site as the project progresses. The obligation to develop, maintain and operate a CDWMP will form part of the contract documents for the project. The plan itself will contain, but not be limited to, the following measures:

- Details of waste storage to be provided for different waste.
- Details of where and how materials are to be disposed of, e.g. landfill or other appropriately licensed waste management facility.
- Details of storage areas for waste materials and containers.
- Details of how unsuitable materials will be disposed of, where necessary.
- Details of how and where hazardous wastes such as oils, diesel and other hydrocarbon or other chemical waste are to be stored and disposed of in a suitable manner.

2.4 Receiving Natural Environment

General Description and Context

At present, the North Quays comprise an assembly of wharves consisting of disused open spaces. The disused Rosslare-Waterford railway line crosses the site in an east-west direction and it is proposed that a greenway will be constructed along the old railway line. The South Quay setting currently comprises a car park that is adjacent to the R680, within which a clock tower monument stands. A marina is also located on the river at this point.

The River Suir itself, although highly modified, is the habitat of most biodiversity value in the vicinity of the Project. In Waterford City, the river is designated as part of the

Lower River Suir SAC. The river is of ecological importance as it contains examples of Annex I habitats and supports populations of Annex II species.

Designated sites

Designated sites within the vicinity of the Project and the surrounding area include two nationally designated sites and two European sites.

The two nationally designated sites are the King's Channel proposed Natural Heritage Area (pNHA) [001702] located 3.1km downstream of the Project and the Barrow River Estuary pNHA [000698] located 9.2km downstream. These sites are designated for the important saltmarsh, salt meadow and other estuarine habitats (as well as rare species found therein) which comprise the Suir and Barrow estuaries.

The two European sites are the River Suir SAC [002137] and the River Barrow and River Nore SAC [002162]. The locations of these sites in relation to the Project are shown in Figure 3.1 and the two sites are described in detail in Section 3.2.

Habitats

The area covered by the habitat survey ("the study area") included the Project footprint plus a 100 m buffer. Three habitats were recorded within the study area: tidal rivers (CW2); lower salt marsh (CM1); and, buildings and artificial surfaces (BL3). A habitat map is included in Appendix B to this NIS.

Tidal rivers (CW2)

The Project traverses the River Suir in its tidal reach. The river is designated as the Lower River Suir SAC at the Project location. This habitat has links to the Annex I habitat Estuaries [1130] and the River Suir at this location corresponds to this Annex I habitat.

Lower salt marsh (CM1)

One area of lower salt marsh was identified on the north bank of the River Suir beside the quay wall. This habitat is subject to more prolonged submersion by sea water and is more strongly saline than upper salt marsh (CM2). The species recorded within the habitat during the multidisciplinary walkover survey were Common Cordgrass (*Spartina anglica*), Sea Aster (*Aster tripolium*), Sea Plantain (*Plantago maritima*), Sea Arrowgrass (*Triglochin maritima*) and Sea Purslane (*Halimione portulacoides*).

Buildings and artificial surfaces (BL3)

The North Quays consist of wharves made up of reinforced concrete beam and slabs on reinforced concrete columns. A series of floating jetties are located at the south quays and many boats, barges and cruisers are moored in this area. Further away from the river, the majority of the surrounding area comprises built areas that comprise the urban centre of Waterford city and include hotels, shops, roads, pavements and other urban developments. Generally built habitats are not considered of high ecological significance and do not offer high-quality habitat.

Character of Habitats

The site of the proposed development has been highly modified from its natural state over centuries of urbanisation and navigation. It is urban in its character.

Ecological Corridors

The River Suir is an important ecological corridor and provides a range of habitats and facilitates networks or linkages to the surrounding countryside for biodiversity.

Waterbodies

The Project is located within the Suir Estuary. The Environmental Protection Agency (EPA) has divided the estuary into four transitional waterbodies: the Upper Suir Estuary; the Middle Suir Estuary; the Lower Suir Estuary (Little Island - Cheekpoint); and, finally, the Barrow Nore Suir Estuary. Monitoring by the EPA (Water Framework Directive Transitional Waterbody Status 2010-2015) has determined the water quality in these waterbodies to be Moderate, Poor, Moderate and Good, respectively.

Fisheries and aquatic fauna

The River Suir catchment is internationally important for the presence of fish species including Atlantic Salmon (*Salmo salar*), Twaite Shad (*Alosa fallax*), Lamprey species and European Eel (*Anguilla anguilla*).

Twaite Shad

Adult shad move from the sea into estuaries in spring and spawn just above the top of tidal waters in May and June. During the breeding season, large numbers of adult shad move up and down the estuary with the tide. Most adults return to the lower estuary within days of spawning and to sea by the end of the summer. Juvenile shad spend one or two years in the estuary, moving up and down with the tides and feeding on planktonic crustaceans and other invertebrates. Twaite Shad is classed as vulnerable to extinction in Ireland and anecdotal reports indicate a substantial decline in the River Suir (King et al., 2011). A more detailed description of the ecology and behaviour of Twaite Shad in the River Suir is included in Section 4.2.3 below.

As part of its national monitoring programme for Habitats Directive: Annex II and Red Data Book fish species, IFI has been studying the ecology and behaviour of Twaite Shad in the estuaries of the larger rivers in the South-East of Ireland since 2010. The following reports describe the methods used to survey for shads and their respective degrees of success:

- IFI (2018b) *Juvenile Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/juvenile-shad-monitoring.html> [Accessed 15/10/2018]. Inland Fisheries Ireland, Dublin.
- IFI (2018c) *Adult Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/adult-shad-monitoring.html> [Accessed 15/10/2018]. Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coghlan, B., and King, J.J. (2017) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2016.* Inland Fisheries Ireland, Dublin.
- Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coughlan, B., and King, J.J. (2016) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2015.* Inland Fisheries Ireland, Dublin.
- Rooney, S. and King, J.J. (2015) *A poster on acoustic tracking of twaite shad by the Habitats Directive and Red Data Book Species team presented at the 3rd International Conference on Fish Telemetry (ICFT) in Halifax, Nova Scotia in 2015.* Inland Fisheries Ireland, Dublin.
- IFI (2014) *National Programme: Habitats Directive and Red Data Book Fish Species. Summary Report 2014.* Inland Fisheries Ireland, Dublin.

- IFI (2013) *National Programme: Habitats Directive and Red Data Book Fish Species. Summary Report 2013.* Inland Fisheries Ireland, Dublin.
- IFI (2012) *National Programme: Habitats Directive and Red Data Book Fish species. Executive Report 2011. IFI Report Number: IFI/2012/1-4103.* Inland Fisheries Ireland, Dublin.
- King, J.J. and Linnane, S.M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals* 14. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Monitoring of juvenile Twaite Shad is challenging due to the small size of the fish and large extent of their estuarine habitat, as well as other environmental factors such as flooding and tidal influences. Given these challenges, IFI's monitoring programme has focussed primarily on sampling young-of-the-year fish in Waterford Harbour and the Suir, Barrow and Nore Estuaries. The main survey technique used to target post-larval and young-of-the-year fish is fine-mesh zooplankton or bongo netting. Other techniques include beach seining, fyke netting and beam trawling, though only bongo and seine netting have produced positive results.

Bongo netting

Sampling using bongo nets is carried out 4-8 weeks after spawning, which occurs in June. Samples are collected in a pair of bongo nets mounted at the front of a boat moving against the tide for 10-minute. These trawls are carried out along the margins of depositional banks at 1-2 km intervals along the estuary/harbour. This technique has had mixed success over the years, with the highest numbers of fish (178 young-of-the-year shad) captured in 2011 and only small numbers in later years, with none being recorded using this method in some years. This is despite considerable annual survey effort (70 trawls in 2014). The low catch-per-unit-effort may by accounted for by poor timing, inadequate technique or some other underlying cause. The fact that many of these surveys have formed part of IFI's National Bass Programme may point to suboptimal tidal conditions for surveying.[6]

Beach seining

IFI carries out seine netting surveys in August each year as part of the National Bass Programme and in September-October on a three-year rolling program during Water Framework Directive surveillance monitoring of transitional waters. These surveys have been successful in recording young-of-the-year shads 50-100mm in length and have highlighted the wide distribution of juvenile shads within the Suir, Barrow and Nore Estuaries. In August 2016, sixteen seine net samples were collected from four locations in the Suir and Barrow Estuaries over two days. A total of 90 shads were recorded during this survey. Of the three techniques used in October 2016, juvenile shads were only captured in beach seine nets. A total of 42 shad was recorded in seine net samples from the mouth of Waterford Harbour to the upper tidal limits of the Rivers Suir, Barrow and Nore.

As part of its monitoring of adult shad, IFI has collected data from a wide variety of sources, including surveys and information and samples submitted by third parties. IFI has sampled adult shad via trawling surveys and an acoustic telemetry study. In addition, samples of shad from by-catch in commercial netting and from surveys by

[6] A study in Cornwall (Hillman, 2003) has identified that the optimal time for bass surveys are near high water while the optimal time for surveying shad and other clupeomorphs is near low water.

other agencies, as well as angling log books have also contributed to IFI's monitoring of Twaite Shad.

Trawling surveys

Since 2014, trawling surveys using commercial trawlers with IFI officers on board have been carried out in the Lower Suir and Barrow Estuary and Waterford Harbour as part of the National Bass Programme. Sampling takes place in September and each trawl lasts 10-15 minutes. This technique usually captures larger specimens, in comparison with seine netting. In 2014, a total of 26 shad (61-288mm in length) was recorded in three of the 34 trawls. In 2015, a total of only three shad (215-320mm in length) was recorded in three of the 36 trawls undertaken.

Acoustic telemetry

Since 2012, IFI has been using acoustic telemetry to study the behavioural ecology of spawning and post-spawning Twaite Shad in the Suir, Barrow, Nore and Munster Blackwater Estuaries. Fish are first captured by drift netting or recreational angling and external acoustic transmitters are fitted. The fish's movements are then detected up by acoustic receivers within the estuaries. The telemetry study is ongoing, and future work will examine knowledge gaps regarding residency and behaviour in the outer estuaries, as well as site fidelity in repeated spawning migrations.

Angling surveys and log books

IFI staff conduct angling surveys to determine the distribution of adult shad and also attended shad angling competitions to measure the size distribution of fish caught by anglers. These methods have yielded information regarding the locations and timing of spawning events and the sizes and ages of spawning fish, as well as establishing iteroparity in this species. This data is supplemented by records submitted by third parties, e.g. district fisheries inspectors, and such data has included particularly interesting records, such as a rod-caught shad from Careysville, c. 25km upstream of the tidal limit of the Munster Blackwater.

Commercial netting by-catch

Commercial netsmen using seasonal drift, draft and snap nets in the Suir, Barrow, Nore, Slaney and Muster Blackwater Estuaries (and coastal waters) are the most significant source of information and material for studies of shads. These netsmen operating in the SAC estuaries regularly make records and samples of shad by-catch available to IFI for inclusion in its ongoing monitoring of these species.

Marine fisheries surveys

Fisheries monitoring is also carried out in the marine environment by Bord Iascaigh Mhara and the Marine Institute. As with commercial netsmen, these agencies also make shad records and samples available to IFI for inclusion in its studies.

Notwithstanding the significant ongoing survey effort in IFI's monitoring programme over the last 8 years, gaps remain in the understanding of the ecology and behaviour of Twaite and Allis Shad, particularly in relation to juveniles during their residency in estuaries, and anecdotal records from anglers and commercial netsmen remain the most significant source of information. However, having thoroughly reviewed existing literature relating to this species, it was considered that sufficient information was available to inform this NIS. Furthermore, having examined the survey methods used by IFI and others, it was considered that any additional surveys carried out to inform this NIS would not contribute any significant additional information regarding the

distribution, densities and movement patterns of post-larval and juvenile Twaite Shad in the Lower Suir Estuary.

Salmonids

While the River Suir at the location of the Project does not provide suitable spawning habitat for salmonids, e.g. Atlantic Salmon (*Salmo salar*) and Brown Trout (*S. trutta*), it is an important link between the estuarine, coastal and oceanic feeding grounds for these species and their spawning beds further upstream. Salmonid species may be present at the Project location at any time of year but occur in most significant numbers during their upstream spawning migration (predominantly in autumn and winter) and out-migration of smolts (almost entirely in spring). In addition, sea or slob trout (Brown Trout with a marine or estuarine adult phase) may be present at any time of the year.

Lamprey Species

Sea Lamprey (*Petromyzon marinus*) and River Lamprey (*Lampetra fluviatilis*) are both likely to be present at the Project location in significant numbers during their upstream spawning migrations and downstream migrations following metamorphosis. The major upstream movements of Sea Lamprey occur in April, May and, to a lesser extent, June, while those of River Lamprey occur earlier, beginning in August and continuing over the winter and spring. The downstream migration of Sea Lamprey occurs in September and October, while that of River Lamprey occurs over an extended period from late winter to early summer. Salinity levels measured during the site investigations for the Project varied from 3.1 ppt to 18 ppt across 5 samples, which is not considered suitable for juvenile lampreys.

European Eel

Unlike salmonids and lampreys, European Eel (*Anguilla anguilla*) has a catadromous life history, i.e. spawning occurs at sea and juveniles migrate into fresh waters to feed and mature. The major influx of juvenile eels occurs in early spring. Large numbers of eels are expected to be present at the Project location during this time.

European Smelt

Another species known to use the River Suir in the vicinity of the Project is European Smelt (*Osmerus eperlanus*). This estuarine species is most likely to be present in significant numbers at the Project location during March and April.

Flora

Historical records of rare flora protected under the Flora (Protection) Order, 2015 for hectads in the area of the Project (S51 and S61) include Borrer's Saltmarsh-grass (*Puccinellia fasciculata*), Meadow Barley (*Hordeum secalinum*) and Divided Sedge (*Carex divisa*). No flora listed on the Flora Protection Order were recorded within the study area during the surveys.

Mammals

European Otter

During the multidisciplinary survey, evidence of otter activity was recorded within the study area. This included spraints and prints beneath the North Quay wall. No potential or confirmed holts or couches were recorded within the derogation limit (150 m from Project). The wharves on the North Quays provide important cover for otters. The site also provides a potential commuting link between areas of more suitable habitat upstream and downstream.

Marine Mammals

No sightings or evidence of any marine mammals were recorded during the surveys. However, occasional sightings of cetaceans and pinnipeds, e.g. Harbour Porpoise (*Phocoena phocoena*) and Grey Seal (*Halichoerus grypus*) in Waterford Harbour, have been reported.

Bats

The existing bat records within 10 km of the Project show that seven of the ten known Irish species have been observed locally. These include Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Leisler's Bat (*Nyctalus leisleri*), Brown Long-eared Bat (*Plecotus auritus)*, Daubenton's Bat (*Myotis daubentonii)*, Natterer's Bat (*Myotis nattereri*) and Whiskered Bat (*Myotis mystacinus*). Roosts of some of these species are also known within this radius but none are in the vicinity of the Project.

The Annex II species Lesser Horseshoe Bat (*Rhinolophus hipposideros*) has yet to be recorded in Waterford City or County and, presently, the nearest known Lesser Horseshoe area is located near Cork City. The remaining Irish bat species, Nathusius' Pipistrelle (*Pipistrellus nathusii*) and Brandt's Bat (*Myotis brandtii*), both of which are rare, have not been recorded in the local area to date.

Studies by Kelleher (2014) and Harrington (2017) found that there was no evidence that bats of any species roost on the North Quays site. The bat suitability assessment conducted during the walkover survey did not identify any potential roosts within the study area. During the bat activity survey, activity was low, with only seven calls recorded: four of Common Pipistrelle (*Pipistrellus pipistrellus*) and three of Leisler's Bat (*Nyctalus leisleri*).

Birds

The desk study did not find any evidence that this urbanised stretch of river is important for birds. Correspondence with BirdWatch Ireland and the Heritage Officer at Waterford City & County Council provided no records of bird strike on Rice Bridge. It is considered likely that commuting birds avoid this area or fly at a height such as to avoid the existing bridge and marina. This location is subject to existing anthropogenic disturbance (to which resident birds are habituated) and is likely to be avoided to a large extent by commuting or migrating birds.

Reptiles and Amphibians

The multidisciplinary walkover surveys did not record any evidence of Common Frog (*Rana temporaria*) or Common Lizard (*Zootoca vivipara*) within the study area.

Non-native Invasive Species

One species subject to restrictions under the Habitats Regulations, namely Common Cordgrass (*Spartina anglica*), was recorded on the bank of the River Suir within the study area. A number of examples of non-native invasive species not subject to such restrictions, including Butterfly Bush (*Buddleja davidii*) and Traveller's Joy (*Clematis vitalba*), were recorded within the study area. Chinese Mitten Crab (*Eriocheir sinensis*) has been present in the Suir Estuary since 2005.

2.5 Likley Effects on the Natural Environment

During the construction phase, a number of elements of the Project are considered likely to give rise to environmental and ecological impacts, particularly on the River Suir and its estuary, which it shares with the Rivers Barrow and Nore.

Piling and erection of cofferdams for the construction of the bridge pier foundations in the muddy substrate of the River Suir is likely to cause significant disturbance of the fine sediment, causing it to become temporarily suspended in the water column. This constitutes a physical impact on the river bed itself and could affect habitats or species that are dependent on or sensitive to fine sediments. It also constitutes a temporary water quality impact, which could affect habitats and species that are sensitive to high sediment loads in the water column. Pollutants bound within the substrate may also be released when the sediment is disturbed. Piling and the placement of cofferdams also provide for considerable noise and vibration impacts, which have the potential to affect species that are sensitive to disturbance.

The construction of the bridge piers, deck and landing areas, as well as finishing of the bridge, provide for water quality impacts through the potential input of pollutants, including fine sediments and construction materials, e.g. concrete, into the River Suir. In addition to water quality impacts, these elements of the construction also provide for noise and vibration impacts which could cause disturbance to both aquatic and terrestrial species. Excessive artificial lighting of the construction area also presents the risk of light disturbance for both aquatic and terrestrial species. Prolonged or repetitive disturbances have the potential to cause barriers to connectivity for species moving upstream and downstream past the construction area.

Barges or other vessels used during the construction of the Project have the potential to spread certain aquatic invasive species, particularly Chinese Mitten Crab, within the Suir Estuary and, potentially, the Rivers Barrow and Nore. This could lead to significant detrimental impacts on sensitive marine habitats and species.

Aspects of the operation of the Project with the potential to cause environmental and ecological effects include the presence of the bridge piers and piles in the river channel (leading to potentially significant changes in hydrodynamics, hydrology and sediment transportation patterns), artificial lighting and increased human presence. Owing to the scale of the Project, the impact of shading on the river channel is not considered to have any potential to give rise to significant effects on habitats or species.

3.0 IDENTIFICATION OF ADVERSE EFFECTS

3.1 Establishing the Likely Zone of Impact

Section 3.2.3 of DEHLG (2010) outlines the procedure for selecting the European sites to be considered in AA. It states that European sites potentially affected should be identified and listed, bearing in mind the potential for direct, indirect and cumulative effects. It also states that the specific approach in each case is likely to differ depending on the scale and likely effects of the plan or project. However, it advises that the following sites should generally be included:

- All European sites within or immediately adjacent to the plan or project area;
- All European sites within the likely zone of impact of the plan or project; and,
- In accordance with the Precautionary Principle, all European sites for which there is doubt as to whether or not they might be significantly affected.

The "likely zone of impact" of a plan or project is the geographic extent over which significant ecological effects are likely to occur. In the case of plans, this zone should extend to a distance of 15km in all directions from the boundary of the plan area. In the case of projects, however, the guidance recognises that the likely zone of impact must be established on a case-by-case basis, with reference to the following key variables:

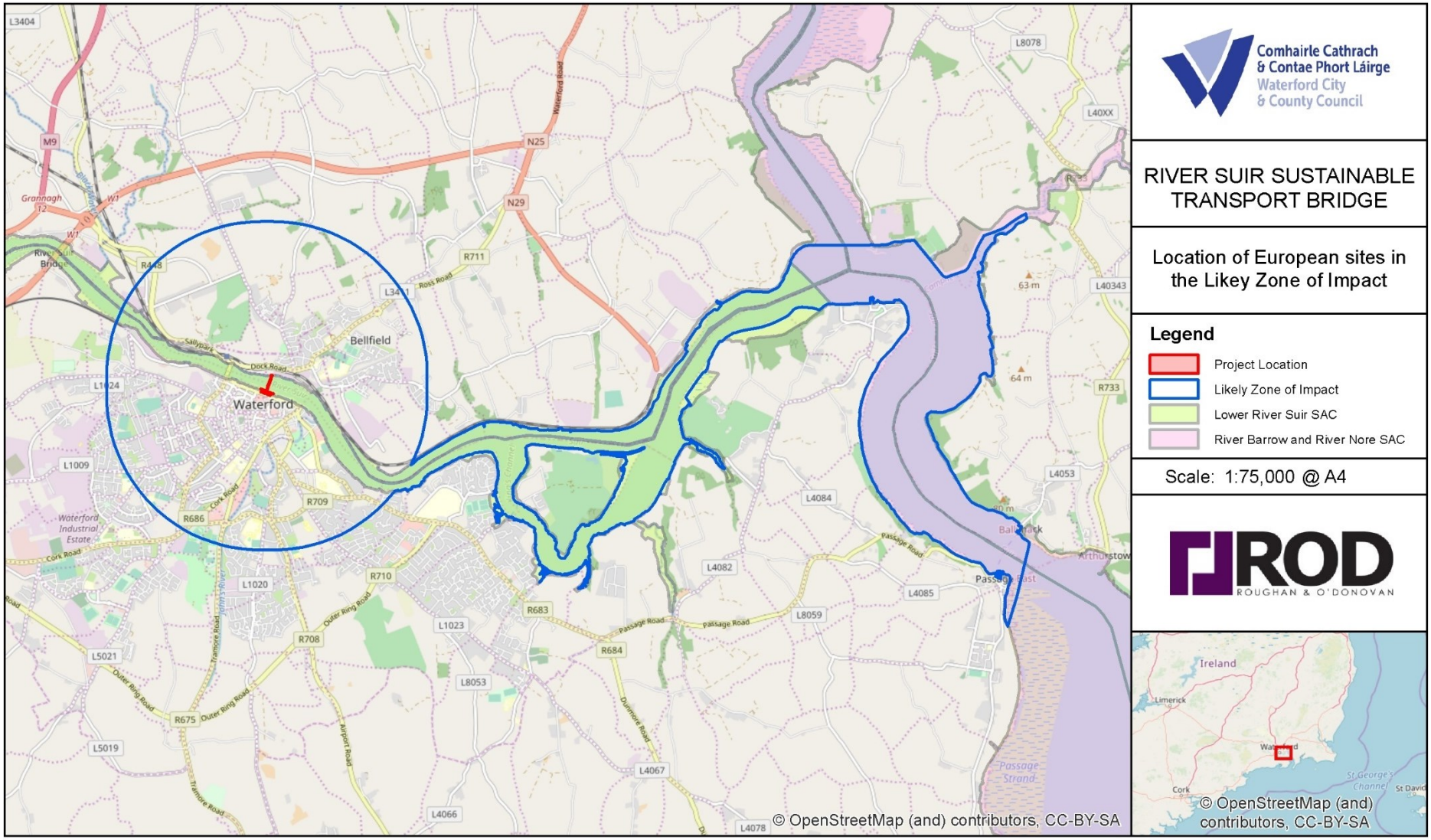
- The nature, size and location of the project;
- The sensitivities of the ecological receptors; and,
- The potential for cumulative effects.

For example, in the case of a project that could affect a watercourse, it may be necessary to include the entire upstream and/or downstream catchment in order to capture all European sites with water-dependent features of interest.

Having regard to the above key variables, the likely zone of impact was defined as:

- The entire area within 2km of the Project; and,
- The area of the Middle Suir Estuary, the Lower Suir Estuary (Little Island - Cheekpoint) and the Barrow Suir Nore Estuary transitional waterbodies as far as 10 km downstream of the Project.

A geographical representation of the likely zone of impact was produced in ArcGIS 10.5 using the Project boundary and publicly available Ordnance Survey Ireland maps. This was used in combination with NPWS shapefiles to identify the boundaries of European sites in relation to the likely zone of impact (Figure 3.1). It was determined that two European sites occur within or adjacent to the likely zone of impact. Table 3.1 assesses whether or not there are pathways for impacts from the Project to each of these sites. Detailed descriptions of the European sites for which there are pathways for impacts are given in Section 3.2.



FilePath: J:\2016\16169\06 GIS\MXD\NIS.mxd [Saved: 13:41:54, 15/12/2018]

Figure 3.1 The boundaries of European sites relative to the location of the Project.

Table 3.1 European sites located within and adjacent to the likely zone of impact.

European site [site code]	Are there potential pathways for impacts from the Project to this site? Explain.
Lower River Suir SAC [002137]	**Yes.** The Project is located within this European site and provides for direct impacts on the estuarine environment during both construction and operation. Therefore, there are considered to be pathways for impacts from the Project to the sensitivities of this European site.
River Barrow and River Nore SAC [002162]	**Yes.** The Project is located on the Lower River Suir, c. 6 km upstream of where the river flows into this European site. Owing to the nature and scale of the Project, it is considered likely to impact on the estuarine environment for 10 km downstream. Therefore, there are considered to be pathways for impacts from the Project to the sensitivities of this European site.

3.2 Site Descriptions

3.2.1 Lower River Suir SAC

Site Overview

The Lower River Suir SAC consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flow through the counties of Tipperary, Kilkenny and Waterford.

The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitats alluvial forest and Yew woodland. The site also supports populations of several important animal species, some listed on Annex II of the Habitats Directive or listed in the Irish Red Data Book. The presence of two plant species protected under the Flora (Protection) Order, 2015 and the ornithological importance of the site adds further to the ecological interest and importance.

Qualifying Interests of the Site

[1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

[1410] Mediterranean salt meadows (*Juncetalia maritimi*)

[3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

[91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

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

[91J0] **Taxus baccata* woods of the British Isles

[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)

[1092] White-clawed Crayfish (*Austropotamobius pallipes*)

[1095] Sea Lamprey (*Petromyzon marinus*)

[1096] Brook Lamprey (*Lampetra planeri*)

[1099] River Lamprey (*Lampetra fluviatilis*)

[1103] Twaite Shad (*Alosa fallax*)

[1106] Atlantic Salmon (*Salmo salar*)

[1355] European Otter (*Lutra lutra*)

Alluvial wet woodland [91E0] is a declining habitat type in Europe as a result of drainage and reclamation. The best examples of this type of woodland in the site are found on the islands just below Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Osier (*S. viminalis*), Yellow Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Pendulous Sedge (*Carex pendula*), Meadowsweet (*Filipendula ulmaria*) and Common Valerian (*Valeriana officinalis*). The terrain is littered with dead trunks and branches and intersected with small channels that carry small streams to the river. The bryophyte and lichen floras appear to be rich. A small plot is currently being coppiced and managed by the National Parks & Wildlife Service. In the drier areas, species such as Ash (*Fraxinus excelsior*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*) occur.

Eutrophic tall herb vegetation [6430] occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*).

Old oak woodlands [91A0] are also of importance at the site. The best examples are seen in Portlaw Wood on both sides of the Clodiagh River. On the south side, the stand is more open and the oaks (mainly Pedunculate Oak, *Quercus robur*) are well grown and spreading. Ivy (*Hedera helix*) and Bramble (*Rubus fruticosus* agg.) are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years, and Holly (*Ilex aquifolium*) is common but mostly young. Across the valley, the trees are more closely spaced and poorly grown. There are no clearings; large oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are few natural clearings. The shallowness of the soil on the north-facing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a mountain-type oakwood community to develop. The site is quite species-rich, including an abundance of mosses, liverworts and lichens. The rare lichen *Lobaria pulmonaria*, an indicator of ancient woodlands, is found here.

Inchinsquillib Wood consists of three separate small sloping woodlands in a valley cut by the Multeen River and its tributaries. Two woodlands, both with an eastern aspect, are predominantly of Sessile Oak (*Quercus petraea*) and Hazel, with Downy Birch (*Betula pubescens*), Ash and Holly. The ground flora is quite mixed, with Wood-sedge (*Carex sylvatica*), Bluebell (*Hyacinthoides non-scripta*), Primrose (*Primula vulgaris*), Wood-sorrel (*Oxalis acetosella*), Pignut (*Conopodium majus*), Hard Fern (*Blechnum spicant*) and others. The base-poor nature of the underlying rock is masked to some extent by the overlying drift. The third woodlands, with a northern aspect, is a similar (although less mature) mixture of Sessile Oak, Birch and Holly. Here, the influence of the drift is marked, with the occurrence of Wood Anemone (*Anemone nemorosa*) amongst the ground flora.

Two stands of Yew (*Taxus baccata*) woods [91J0], a rare habitat in Ireland and the EU, occur within the site. These are on limestone ridges at Shanbally and Cahir Park. Both are in woods planted with non-native species, including conifers. However, the

area at Cahir Park is substantial in size and includes some relatively undisturbed patches of wood and some very old trees. Regeneration of the Yew trees is mostly poor, due to competition from species such as Sycamore (*Acer pseudoplatanus*) and, at Shanbally, due to heavy grazing by goats. Other native species which occur with the Yew trees include Ash, Pedunculate Oak, Hazel and Spindle (*Euonymus europaeus*). Future prospects for these Yew woods are good as the sites are proposed for restoration under a Coillte EU LIFE programme.

Floating river vegetation [3260] is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian Pondweed (*Elodea canadensis*), water-milfoils (*Myriophyllum* spp.), Fennel Pondweed (*Potamogeton pectinatus*), Curled Pondweed (*P. crispus*), Perfoliate Pondweed (*P. perfoliatus*), Pond Water-crowfoot (*Ranunculus peltatus*), other crowfoots (*Ranunculus* spp.) and the moss *Fontinalis antipyretica.* At a couple of locations along the river Opposite-leaved Pondweed (*Groenlandia densa*) occurs. This species is protected under the Flora (Protection) Order, 2015.

The Aherlow River is fast-flowing and mostly follows a natural unmodified river channel. Submerged vegetation includes the aquatic moss *Fontinalis antipyretica* and Stream Water-crowfoot (*R. pencillatus*), while shallow areas support species such as Reed Canary-grass (*Phalaris arundinacea*), Brooklime (*Veronica beccabunga*) and Water Mint (*Mentha aquatica*). The river bank is fringed in places with Alder (*Alnus glutinosa*) and willows (*Salix* spp.).

The Multeen River is fast-flowing, mostly gravel-bottomed and appears to follow a natural, unmodified river channel. Water-crowfoots occur in abundance and the aquatic moss *Fontinalis antipyretica* is also common. In sheltered shallows, species such as Water-cress (*Nasturtium officinale*) and water-starworts (*Callitriche* spp.) occur. The river channel is fringed for most of its length with Alder, Willow and a narrow strip of marshy vegetation.

Salt meadows [1330/1410] occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballinakill, the east side of Little Island, and in three large salt meadows between Ballinakill and Cheekpoint. The Atlantic and Mediterranean sub-types are generally intermixed. The species list is extensive and includes Red Fescue (*Festuca rubra*), oraches (*Atriplex* spp.), Sea Aster (*Aster tripolium*), Sea Couch (*Elymus pycnanthus*), frequent Sea Milkwort (*Glaux maritima*), occasional Wild Celery (*Apium graveolens*), Parsley Water-dropwort (*Oenanthe lachenalii*), English Scurvygrass (*Cochlearia anglica*) and Sea Arrowgrass (*Triglochin maritima*). These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass (*Spartina anglica*) is frequent along the main channel edge and up the internal channels. The legally protected (Flora (Protection) Order, 2015) Meadow Barley (*Hordeum secalinum*) grows at the landward transition of the saltmarsh. Sea Rush (*Juncus maritimus*), an indicator of the Mediterranean salt meadows, also occurs.

Other habitats at the site include wet and dry grassland, marsh, reedswamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Iris, Meadowsweet, rushes (*Juncus* spp.), Meadow Buttercup (*Ranunculus acris*) and Cuckooflower (*Cardamine pratensis*).

Cabragh marshes, just below Thurles, lie in a low-lying tributary valley into which the main river floods in winter. Here there is an extensive area of Common Reed (*Phragmites australis*) with associated marshland and peaty fen. The transition between vegetation types is often well displayed. A number of wetland plants of interest occur, in particular the Narrow-leaved Bulrush (*Typha angustifolia*), Bottle Sedge (*Carex rostrata*) and Blunt-flowered Rush (*Juncus subnodulosus*). The marsh is naturally eutrophic but it has also the nutritional legacy of the former sugar factory, which discharged into it through a number of holding lagoons (since removed). Production is high, which is seen in the size of such species as Celery-leaved Buttercup (*Ranunculus sceleratus*), as well as in the reeds themselves.

The site is of particular conservation interest for the presence of a number of Annex II species, including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. durrovensis*), White-clawed Crayfish, Salmon, Twaite Shad (*Alosa fallax fallax*), Sea Lamprey, Brook Lamprey and River Lamprey and Otter. This is one of only three known spawning grounds in the country for Twaite Shad.

Parts of the site have been identified as of ornithological importance for a number of Annex I (Birds Directive) species, including Greenland White-fronted Goose, Golden Plover, Whooper Swan and Kingfisher. Flocks are seen in Coolfinn Marsh and along the reedbeds and saltmarsh areas of the Suir. Coolfinn supports nationally important numbers of Greylag Goose on a regular basis, with numbers between 600 and 700 recorded. Other species occurring include Mallard, Teal, Wigeon, Tufted Duck, Pintail, Pochard, Little Grebe, Black-tailed Godwit, Oystercatcher, Lapwing, Dunlin, Curlew, Redshank, Greenshank and Green Sandpiper. Nationally important numbers of Lapwing were recorded at Faithlegg in the winter of 1996-1997. In Cabragh marshes, there is abundant food for surface feeding wildfowl. Widgeon, Teal and Mallard are numerous, and the latter has a large breeding population. In addition, less frequent species like Shoveler and Pintail occur and there are records for both Whooper and Bewick's swans. Kingfisher, a species listed on Annex I of the Birds Directive, occurs along some of the many tributaries throughout the site.

Sensitivities of the Site and its Qualifying Interests

Land use at the site consists mainly of agricultural activities including grazing, silage production, fertilising and land reclamation. The grassland is intensively managed and the rivers are, therefore, vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is a main tourist attraction on stretches of the River Suir and some of its tributaries, and there are a number of angling clubs, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. The Aherlow River is a designated Salmonid Water under Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (the Freshwater Fish Directive). Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments, which discharge into the river, border the site, including three dairy-related operations and a tannery.

3.2.2 River Barrow and River Nore SAC

Site Overview

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties: Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Towns along the edge of the site include Mountmellick, Portarlington,

Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II to the Habitats Directive. Furthermore, it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.

Qualifying Interests of the Site

[1130] Estuaries

[1140] Mudflats and sandflats not covered by seawater at low tide

[1170] Reefs

[1310] *Salicornia* and other annuals colonising mud and sand

[1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

[1410] Mediterranean salt meadows (*Juncetalia maritimi*)

[3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

[4030] European dry heaths

[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

[7220] *Petrifying springs with tufa formation (*Cratoneurion*)

[91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

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

[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)

[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)

[1092] White-clawed Crayfish (*Austropotamobius pallipes*)

[1095] Sea Lamprey (*Petromyzon marinus*)

[1096] Brook Lamprey (*Lampetra planeri*)

[1099] River Lamprey (*Lampetra fluviatilis*)

[1103] Twaite Shad (*Alosa fallax*)

[1106] Atlantic Salmon (*Salmo salar*)

[1355] European Otter (*Lutra lutra*)

[1421] Killarney Fern (*Trichomanes speciosum*)

[1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)

Good examples of alluvial forest (a priority habitat) occur at Rathsnagadan, Murphy's of the River, Abbeyleix Estate and along other shorter stretches of both the tidal and

freshwater elements of the site. Typical species seen include Almond Willow, White Willow, Rusty Willow, Crack Willow (*Salix fragilis*) and Osier, along with Yellow Iris, Hemlock Water-dropwort, Wild Angelica, Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge, Meadowsweet, Common Valerian and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the River Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the Habitats Directive. These hard-water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

The best examples of old oak woodlands are seen in the ancient Park Hill woodland in Abbeyleix Estate, at Kyleadohir on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods along the River Nore, and at Cloghristic Wood, Drummond Wood and Borris Demesne along the River Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th Century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides.* The rare myxomycete, *Licea minima* has been recorded from the woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford, where the River Nore takes several sharp bends. The steep valley side is covered by oaks, Holly, Hazel and Downy Birch, with some Beech (*Fagus sylvatica*) and Ash. All the trees are regenerating through a cover of Bramble, Foxglove (*Digitalis purpurea*), Great Wood-rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steep banks of the River Nore, about 5km west of New Ross, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is damp and there is a rich and varied ground flora. At Brownstown a small mature oak-dominated woodland occurs on a steep slope. There is younger woodland to the north and east of it and regeneration is evident throughout t. The understorey is similar to the woods at Brownsford. The ground flora is developed on acidic, brown earth soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern, Common Cow-wheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is a high degree of natural re generation of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also along the River Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understorey of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam *Sorbus devoniensis* has also been recorded here.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife, Marsh Ragwort, Ground Ivy and Hedge Bindweed. Himalayan Balsam (*Impatiens glandulifera*), an alien invasive species, is abundant in places.

Floating river vegetation is well represented in the River Barrow and in the many tributaries of the site. In the River Barrow, the species found include water-starworts, Canadian Pondweed, Bulbous Rush (*Juncus bulbosus*), water-milfoils, the pondweed *Potamogeton* × *nitens,* Broad-leaved Pondweed (*P. natans*), Fennel Pondweed, Perfoliated Pondweed and crowfoots. The water quality of the River Barrow has improved since the vegetation survey was carried out in 1996.

Dry heath occurs in pockets along the steep valley sides of the rivers, especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (*Ulex europaeus*), with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove, Common Sorrel (*Rumex acetosa*) and Creeping Bent (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. On rocky outcrops, Bilberry and Great Wood-rush are present. At Ballyhack, a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (*Trifolium glomeratum*), a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers, there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather, Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank, and Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub-types are generally intermixed. At the upper edge of the salt meadow, in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley are found. The very rare and also legally protected Divided Sedge (*Carex divisa*) is also found. Sea Rush is also present. Other plants recorded and associated with salt meadows include Sea Aster, Thrift (*Armeria maritima*), Sea Couch, Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass and Sea Plantain.

Glassworts (*Salicornia* spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at their seaward edges. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6km from north to south between Passage East and Creadan Head and are over 1km wide in places. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, on the eastern shore of the estuary. It is formed by the polychaete worm *Sabellaria alveolata.* This intertidal *Sabellaria alveolata* reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This species constructs tubes composed of aggregated sand grains in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs, including: *Enteromorpha* sp.; *Ulva* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Polysiphonia* sp.; *Chondrus crispus*; *Palmaria palmate*; *Coralinus officialis*; *Nemertea* sp.; *Actinia equine*; *Patella vulgate*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown, there is a sandy beach, now much influenced by commercial and recreation pressure and erosion. Behind it, a lagoonal marsh has been impounded and runs westwards from Gaultier Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, willowherbs (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs.

The dunes fringing the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other species present include Wild Clary/Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats found throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site: Killarney Fern, Divided Sedge, Clustered Clover, Basil Thyme (*Acinos arvensis*), Red Hemp-nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed, Meadow Saffron/Autumn Crocus (*Colchicum autumnale*), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Ivy Broomrape (*Orobanche hederae*) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Other plants that do not have a wide distribution in the country are found in the site, including Thin-spiked Wood-sedge, Field Garlic (*Allium oleraceum*) and Summer Snowflake. Six rare lichens,

indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria.* The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of Annex II species, including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. durrovensis*), White-clawed Crayfish, Atlantic Salmon, Twaite Shad, Sea Lamprey, Brook Lamprey, River Lamprey, Desmoulin's Whorl Snail and European Otter. This is the only site in the world for the hard-water margaritiferid, the Nore Freshwater Pearl Mussel, and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore (main channel) is a designated salmonid river. The River Barrow/ River Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the River Nore. The upper stretches of the River Barrow and River Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*. Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River: *Neoascia obliqua* (Diptera: Syrphidae), *Tetanocera freyi* (Diptera: Sciomyzidae) and *Dictya umbrarum* (Diptera: Sciomyzidae). The rare arachnid *Mitostoma chrysomelas* occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies *Chrysogaster virescens* and *Hybomitra muhlfeldi* (both Diptera) also occur at this woodland.

The site is of ornithological importance for a number of Annex I (Birds Directive) species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Sensitivities of the Site and its Qualifying Interests

Land use at the site consists mainly of agricultural activities, mostly intensive and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to water quality and populations of Annex II (Habitats Directive) species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of angling clubs, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing and a mussel bed in the estuary. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the River Nore at Mount Juliet and sports pitches at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river,

border the site. New Ross is an important shipping port and shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing in the woodland areas, and invasion by non-native species, e.g. Cherry Laurel (*Prunus laurocerasus*) and Rhododendron (*Rhododendron ponticum*). Water quality remains vulnerable. Good quality water is necessary to maintain the populations of Annex II species and is dependent on controlling fertilisation of the grasslands, particularly along the River Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as Lamprey and Shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

3.3 Evaluation against Conservation Objectives

As highlighted in Section 1.2, guidance from the European Commission (EC, 2001) explains that "*the integrity of a site involves its ecological functions*" and that "*the decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives*". Following this guidance, the identification of adverse effects potentially arising from the Project on the integrity of the European sites identified in Section 3.1 and described in Section 3.2 focusses on and is limited to the Conservation Objectives of those sites.

Tables 3.2 and 3.3 below detail the identification of potential adverse effects on the sites concerned. In considering the potential for adverse effects on the Conservation Objectives for each Qualifying Interest in each European site, regard was had to the Attributes and Targets which define each site-specific Conservation Objective.

Table 3.2 Evaluation of the likely effects of the Project in view of the Conservation Objectives of the Lower River Suir SAC [002137].

Qualifying Interest	Conservation Objective as per NPWS (2017a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	"*To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in Lower River Suir SAC*"	Atlantic and Mediterranean salt meadows occur on the banks of the River Suir within the likely zone of impact. These habitat types are sensitive to changes in sediment supply and hydrological regime. The presence of permanent structures, i.e. bridge piles, vessel collision protection piles and southern abutment, provides for potentially significant changes in sediment transportation and tidal patterns within the Suir Estuary. Therefore, adverse effects on the Conservation Objectives for these Qualifying Interests cannot be ruled out at this stage.	Yes
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	"*To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in Lower River Suir SAC*"		
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	"*To maintain the favourable conservation condition of Water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion *vegetation in Lower River Suir SAC*"	This habitat type is found throughout the freshwater stretches of rivers in Ireland and also occurs in the upper part of river estuaries. The salinity levels in the River Suir within the likely zone of impact of the Project are considered too high for this habitat to occur and no evidence of this habitat type was observed during the surveys. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	"*To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in Lower River Suir SAC*"	While this habitat type was not observed during any of the surveys and no previous records of this habitat occurring within the likely zone of impact of the Project were found, its presence within or adjacent to the likely zone of impact cannot be ruled out. Owing to the nature of the Project, there is potential for hydrological impacts on any examples of this habitat type which may be present. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	"*To restore the favourable conservation condition of Old sessile oak woods with* Ilex *and* Blechnum *in the British Isles in Lower River Suir SAC*"	Old sessile oak woods, alluvial forests and Yew woods do not occur within the likely zone of impact of the Project. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objectives for these Qualifying Interests.	No

Qualifying Interest	Conservation Objective as per NPWS (2017a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
***Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]**	"*To restore the favourable conservation condition of Alluvial forests with* Alnus glutinosa *and* Fraxinus excelsior *(*Alno-Padion*,* Alnion incanae*,* Salicion albae*)* in Lower River Suir SAC*"		
****Taxus baccata* woods of the British Isles [91J0]**	"*To restore the favourable conservation condition of* Taxus baccata *woods of the British Isles* in Lower River Suir SAC*"		
Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	"*To restore the favourable conservation condition of Freshwater Pearl Mussel in Lower River Suir SAC*"	Freshwater Pearl Mussel and White-clawed Crayfish do not occur within the likely zone of impact of the Project. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objectives for these Qualifying Interests.	No
White-clawed Crayfish (*Austropotamobius pallipes*) [1092]	"*To maintain the favourable conservation condition of White-clawed Crayfish in Lower River Suir SAC*"		
Sea Lamprey (*Petromyzon marinus*) [1095]	"*To restore the favourable conservation condition of Sea Lamprey in Lower River Suir SAC*"	Lamprey species, Twaite Shad and Atlantic Salmon are known to migrate through the Project area during their migrations. All of these species are sensitive to water quality and lighting impacts. As the Project provides for such impacts, adverse effects on the Conservation Objectives for these Qualifying Interests cannot be ruled out at this stage.	Yes
Brook Lamprey (*Lampetra planeri*) [1096]	"*To restore the favourable conservation condition of Brook Lamprey in Lower River Suir SAC*"		

Qualifying Interest	Conservation Objective as per NPWS (2017a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
River Lamprey (*Lampetra fluviatilis*) [1099]	"*To restore the favourable conservation condition of River Lamprey in Lower River Suir SAC*"		
Twaite Shad (*Alosa fallax*) [1103]	"*To restore the favourable conservation condition of Twaite Shad in Lower River Suir SAC*"		
Atlantic Salmon (*Salmo salar*) [1106]	"*To restore the favourable conservation condition of Atlantic Salmon in Lower River Suir SAC*"		
European Otter (*Lutra lutra*) [1355]	"*To maintain the favourable conservation condition of Otter in Lower River Suir SAC*"	European Otter is known to occur in the immediate vicinity of the Project. As the Project provides for significant noise and visual disturbance during the construction phase and potential impacts on prey species for otters, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes

Table 3.3 Evaluation of the likely effects of the Project in view of the Conservation Objectives of the River Barrow and River Nore SAC [002162].

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Estuaries [1130]	"*To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC*"	Estuaries and mudflats occur within the River Barrow and River Nore SAC c. 6 km downstream of the Project. Hydrodynamic, hydrological, sedimentation and water quality impacts arising from the Project have the potential to adversely affect the Conservation Objectives for these Qualifying Interests.	Yes
Mudflats and sandflats not covered by seawater at low tide [1140]	"*To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC*"		
Reefs [1170]	NPWS (2011a) does not contain a site-specific Conservation Objective for Reefs. Therefore, as per advice from the NPWS, the Conservation Objective for Reefs in another European site, in this case the Hook Head SAC [000764], was used: "*To maintain the favourable conservation condition of Reefs*" (NPWS, 2011b).	Reefs are present in the River Barrow and River Nore SAC downstream of the Project. Changes in sediment transportation patterns arising from the Project have the potential to impact on reef communities. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes
***Salicornia* and other annuals colonising mud and sand [1310]**	"*To maintain the favourable conservation condition of* Salicornia *and other annuals colonizing mud and sand in the River Barrow and River Nore SAC*"	The habitat type *Salicornia* and other annuals colonising mud and sand occurs within the River Barrow and River Nore SAC c. 6km downstream of the Project. Hydrodynamic, hydrological, sedimentation and water quality impacts arising from the Project have the potential to adversely affect the Conservation Objective for this Qualifying Interest.	Yes

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	"*To restore the favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC*"	Atlantic and Mediterranean salt meadows are considered likely to occur within the River Barrow and River Nore SAC downstream of the Project. Hydrodynamic, hydrological , sedimentation and water quality impacts arising from the Project have the potential to adversely affect the Conservation Objectives for these Qualifying Interests.	Yes
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	"*To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC*"		
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	"*To maintain the favourable conservation condition of Water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion *vegetation in the River Barrow and River Nore SAC*"	This habitat type is found throughout the freshwater stretches of rivers in Ireland and also occurs in the upper part of river estuaries. The salinity levels in the River Suir within the likely zone of impact of the Project are considered too high for this habitat to occur and no evidence of this habitat type was observed during the surveys. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No
European dry heaths [4030]	"*To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC*"	European dry heaths are not known to occur within the likely zone of impact of the Project and are not sensitive to the types of remote or indirect impacts likely to arise from the Project. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	"*To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC*"	While this habitat type was not observed during any of the surveys and no previous records of this habitat occurring within the likely zone of impact of the Project were found, its presence within or adjacent to the likely zone of impact cannot be ruled out. Owing to the nature of the Project, there is potential for hydrological impacts on any examples of this habitat type which may be present. Therefore, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
***Petrifying springs with tufa formation (*Cratoneurion*) [7220]**	"*To maintain the favourable conservation condition of Petrifying springs with tufa formation (*Cratoneurion*) in the River Barrow and River Nore SAC*"	Petrifying springs are not known to occur within the likely zone of impact of the Project and are not sensitive to the types of remote or indirect impacts likely to arise from the Project. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	"*To restore the favourable conservation condition of Old oak woodland with* Ilex *and* Blechnum *in the River Barrow and River Nore SAC*"	Old sessile oak woods and alluvial forests do not occur within the likely zone of impact of the Project. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objectives for these Qualifying Interests.	No
***Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]**	"*To restore the favourable conservation condition of Alluvial forests with* Alnus glutinosa *and* Fraxinus excelsior *(*Alno-Padion*,* Alnion incanae*,* Salicion albae*) in the River Barrow and River Nore SAC*"		
Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016]	"*To maintain the favourable conservation condition of Desmoulin's whorl snail in the River Barrow and River Nore SAC*"	Desmoulin's Whorl Snail may occur in the tall herb swamps and saltmarshes fringing the estuary downstream of the Project. Potential impacts on these habitats arising from the Project, e.g. changes in hydrodynamics, hydrology or sediment transportation patterns, may give rise to adverse effects on the Conservation Objective for this Qualifying Interest.	Yes
Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	"*The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species.*"	Freshwater Pearl Mussel does not occur within the likely zone of impact for the Project. Thus, there are no pathways for impacts from the Project to this species. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
White-clawed Crayfish (*Austropotamobius pallipes*) [1092]	"*To maintain the favourable conservation condition of White-clawed crayfish in the River Barrow and River Nore SAC*"	White-clawed Crayfish does not occur within the likely zone of impact for the Project. Thus, there are no pathways for impacts from the Project to this species. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Sea Lamprey (*Petromyzon marinus*) [1095]	"*To restore the favourable conservation condition of Sea lamprey in the River Barrow and River Nore SAC*"	Lamprey species, Twaite Shad and Atlantic Salmon are known to migrate through the Project area during their migrations. All of these species are sensitive to water quality and lighting impacts. As the Project provides for such impacts, adverse effects on the Conservation Objectives for these Qualifying Interests cannot be ruled out at this stage.	Yes
Brook Lamprey (*Lampetra planeri*) [1096]	"*To restore the favourable conservation condition of Brook lamprey in the River Barrow and River Nore SAC*"		
River Lamprey (*Lampetra fluviatilis*) [1099]	"*To restore the favourable conservation condition of River lamprey in the River Barrow and River Nore SAC*"		
Twaite Shad (*Alosa fallax*) [1103]	"*To restore the favourable conservation condition of Twaite shad in the River Barrow and River Nore SAC*"		
Atlantic Salmon (*Salmo salar*) [1106]	"*To restore the favourable conservation condition of Salmon in the River Barrow and River Nore SAC*"		
European Otter (*Lutra lutra*) [1355]	"*To restore the favourable conservation condition of Otter in the River Barrow and River Nore SAC*"	European Otter is known to occur in the immediate vicinity of the Project. As the Project provides for significant noise and visual disturbance during the construction phase and potential impacts on prey species for otters, adverse effects on the Conservation Objective for this Qualifying Interest cannot be ruled out at this stage.	Yes

Qualifying Interest	Conservation Objective as per NPWS (2011a)	Does the Project provide for any potential delay or interruption in the achievement of this Conservation Objective, as defined by its Attributes and Targets?	Adverse Effect
Killarney Fern (*Trichomanes speciosum*) [1421]	"*To maintain the favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC*"	Killarney Fern is not known to occur in the likely zone of impact for the Project and suitable habitat for this species is not found in the vicinity of the Project. Thus, there are no pathways for impacts from the Project to Killarney Fern. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No
Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) [1990]	"*To restore the favourable conservation condition of the Nore freshwater pearl mussel in the River Barrow and River Nore SAC*"	Nore Freshwater Pearl Mussel is found only in the River Nore near Durrow. It does not occur in the likely zone of impact of the Project. Thus, there are no pathways for impacts from the Project to this species. Therefore, it can be concluded beyond reasonable scientific doubt that the Project will not adversely affect the Conservation Objective for this Qualifying Interest.	No

3.4 Summary of Adverse Effects

In Section 3.1, it was established that two European sites, namely the Lower River Suir SAC and the River Barrow and River Nore SAC, occur within or adjacent to the likely zone of impact of the Project and that there are no pathways for effects between the Project and any other European sites.

In Section 3.3, it was established that, in the absence of appropriate mitigation, interruptions or delays in achieving certain Conservation Objectives for those sites, i.e. adverse effects on the integrity of those sites, as a result of the Project, cannot be ruled out. A summary of the adverse effects identified is given in Table 3.4 below.

Table 3.4 Summary of the European sites likely to be affected by the Project and the Qualifying Interests likely to be affected in each site.

European site	Qualifying Interest
Lower River Suir SAC [002137]	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Sea Lamprey (*Petromyzon marinus*) [1095] Brook Lamprey (*Lampetra planeri*) [1096] River Lamprey (*Lampetra fluviatilis*) [1099] Twaite Shad (*Alosa fallax*) [1103] Atlantic Salmon (*Salmo salar*) [1106] European Otter (*Lutra lutra*) [1355]
River Barrow and River Nore SAC [002162]	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1016] Sea Lamprey (*Petromyzon marinus*) [1095] Brook Lamprey (*Lampetra planeri*) [1096] River Lamprey (*Lampetra fluviatilis*) [1099] Twaite Shad (*Alosa fallax*) [1103] Atlantic Salmon (*Salmo salar*) [1106] European Otter (*Lutra lutra*) [1355]

4.0 ASSESSMENT OF ADVERSE EFFECTS

4.1 Attributes and Targets

In Section 3.0 of this NIS, potential adverse effects on the integrity of the Lower River Suir SAC and the River Barrow and River Nore SAC were identified. In accordance with European Commission guidance (EC, 2001), the identification of these effects was focussed on and limited to the Conservation Objectives of the sites concerned.

Section 4.0 provides a detailed analysis and evaluation of the adverse effects identified in Section 3.0 (as summarised in Section 3.4). In order to fully assess the implications of the Project for the European sites concerned, each of the potential adverse effects is evaluated with reference to the Attributes and Targets which define the Conservation Objectives of those sites.

4.2 Lower River Suir SAC

4.2.1 Salt Meadows

The two types of salt meadows listed as Qualifying Interests of the Lower River Suir SAC and potentially adversely affected by the Project are "Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)" and "Mediterranean salt meadows (*Juncetalia maritimi*)". The Conservation Objectives for these Qualifying Interests are stated in Table 3.2 above. The Attributes of these Conservation Objectives are summarised as follows:

- Habitat area and distribution;
- Physical structure (sediment supply; creeks and pans; flooding regime);
- Vegetation structure (zonation; sward height; vegetation cover); and,
- Vegetation composition (typical species and subcommunities; negative indicator species, i.e. *Spartina anglica*).

Habitat area and distribution

As there are no examples of these Annex I habitat types occurring in close proximity to the Project, there will be no reduction in the area of these habitats in the River Suir SAC or any change in the distribution of these habitat types in the River Suir SAC as a result of the Project.

Physical structure

The impact of the construction and operation of the Project on sediment transport in the Suir Estuary were assessed in a *Hydraulic Modelling Report*, which was prepared by Hydro Environmental Ltd (2018) and which is included as Appendix C to this NIS. This report found that:

> "*The construction case looks at worst case scenario with all cofferdams in place around the bridge piles and also the fender piles in place.* […] *The predicted scour depth in the channel between the cofferdams is 4 to 4.5m after a 24 day simulation with the sediment deposited locally in the channel within 150m upstream and 300m downstream* […]."

As the nearest occurrence of either of these two Annex I salt meadow habitat types to the Project is c. 1 km downstream of the Project, on the southern bank of the Suir Estuary, it is concluded on the basis of best scientific knowledge that the Project will not adversely affect sediment supply to salt meadow habitats.

The potential for the Project to give rise to hydrological impacts on the River Suir are discussed in detail in Chapter 10 (Hydrology) of the EIAR for the Project. The assessment of the hydrological impacts during the construction phase considered a worst-case scenario where all abutments, piles and cofferdams are in place simultaneously. This assessment found the following:

> "*The volumes displaced by the proposed bridge piers, abutments and cofferdams during construction phase is extremely small relative to the volumes of the receiving waterbodies and will result in a slight to imperceptible impact.*"

The Strategic Flood Risk Assessment (SFRA) for the North Quays SDZ included the proposed River Suir Sustainable Transport Bridge in its modelling of flood events with and without the proposed developments. The SFRA concluded the following:

> "*For all simulations the impact on flood levels both locally upstream and downstream were found to be miniscule and less than the modelling tolerance of 4mm.*"

Therefore, it can be concluded on the basis of best scientific knowledge that neither the construction nor the operation of the Project will lead to a significant change in the hydrological regime in the likely zone of impact and, as such, there will be no adverse effect on the flooding regime in any example of these habitat types.

As the Project is not located within any salt meadow habitat and does not provide for any change to the hydrological regime at or sediment supply to any salt meadows, it can be concluded on the basis of best scientific knowledge that the Project will not adversely affect the creek-and-pan morphology of any Annex I salt meadow habitat.

Vegetation Structure and Composition

Owing to the nature of the Project and its distance from any salt meadows, the Project will not cause any direct change in the structure or composition of any such habitats, e.g. by clearing vegetation, encouraging grazing, removing characteristic species or introducing invasive species. However, there is considered to be a risk of pollution to this habitat, which could adversely affect these Attributes, in the event that potential impacts from the Project on water quality are conveyed to these habitats by inundation or interaction with ground water. Potential impacts of the construction and operation of the Project on water quality, insofar as they are relevant for salt meadow habitats, are discussed below.

<u>Construction Phase</u>

Construction activities within and adjacent to surface waters, e.g. rivers, can negatively impact water quality. In the case of the proposed River Suir Sustainable Transport Bridge, the construction of the Project, if not properly managed, has the potential to impact on water quality as follows:

- Sedimentation – In the absence of appropriate mitigation, the construction of the Project provides for sedimentation impacts as follows:
    - During the erection or removal of the cofferdams within which the bridge piers will be constructed and during the driving of piles for the abutments and collision protection system, the estuarine silts on the riverbed will be disturbed, causing sediment to become suspended in the water column. However, given the naturally high sediment load in the River Suir in the vicinity of the Project, this will not lead to significant impacts.
    - The presence of the cofferdams and piles will give rise to scouring of silt from the riverbed (Hydro Environmental Ltd, 2018). However, ecological

effects of suspended sediments resulting from this level of scouring will be imperceptible.

- Surface water run-off from adjacent construction areas may contain high levels of suspended sediments (and contaminants). Such run-off, if not attenuated and treated prior to discharge to the River Suir, has the potential to cause significant ecological impacts. High deposition can lead to smothering of the habitat, which may alter the vegetation composition; notably, this may increase the occurrence of the negative indicator species Common Cord-grass (*Spartina anglica*). Deposition of fine sediments can also increase the amounts and persistence of chemical contaminants in the receiving habitat, leading to further changes in the vegetation structure and composition.
- Suspended sediments can also exacerbate other water quality impacts by providing chemical contaminants with a surface on which to bind, thereby increasing the bioavailability of these contaminants, eventually leading to ecological effects.

- Spillage of cementitious materials – During bridge construction, particularly when pouring concrete for the support piles of the northern abutment, concrete or other cementitious materials may spill directly into the River Suir or be washed into the river in construction site run-off. Cementitious materials are highly alkaline and, consequently, can drastically alter the pH of the receiving watercourse. This can lead to profound ecological impacts on the affected watercourse and any habitats connected to it. Changes in the alkalinity of surface waters can affect the pH of connected ground waters and soils. This can affect the vegetation composition by causing damage to pH-sensitive species. As the pH impact is greater near the affected watercourse, vegetation here is disproportionately affected, leading to changes in zonation.
- Spillage of hydrocarbons – Vehicles, plant and equipment which will be used during the construction of the bridge rely on hydrocarbons such as diesel, petrol and lubricating oils. Leaks from poorly maintained vehicles, plant, equipment or storage tanks provide for a risk of input of hydrocarbons into the environment. In the absence of appropriate mitigation, hydrocarbons from the construction site may spill directly into the River Suir or be washed into the river in construction site run-off. This has the potential to cause negative ecological impacts on the River Suir and any habitats connected to it. Hydrocarbons can have direct phytotoxic effects, including reducing the ability of plants to absorb water and nutrients from their environment. These compounds can also alter the nutrient balance and microbiota in soil and water, which can benefit some plant species while detrimentally affecting others. Such changes have the potential to alter the vegetation structure and composition of the habitat.
- Painting – Most commonly used paints are not toxic to marine ecosystems and, therefore, do not pose a risk to water quality, particularly in the relatively small quantities that will be used. However, there is a significant risk to water quality if the paints used contain organotin compounds, e.g. tributyltin (TBT), which are used as anti-fouling agents and are known to have detrimental effects on the endocrine function of animals, including causing imposex in marine molluscs.
- Cutting of cofferdams – Sections of the sheet piling used to form the temporary cofferdams will have to be cut using an abrasive water jetting (high-pressure stream of fresh water with "garnet", i.e. an inert abrasive mineral additive). This system requires a maximum of 20,000 litres of potable water per shift. Thus, the rate of injection of fresh water will be < 0.05% of the discharge of the River Suir (50^{th} percentile discharge over the full length of the river taken as $4.8m^3/s$) and, therefore, any effect on salinity will be imperceptible against the background

(natural) variation at this location. Any effect of the garnet additive will be of a small magnitude owing to the tiny amounts used and will be very localised (only perceptible within 5-10m of the cutting locations. Any effects on benthic habitats and species will be fully reversible within one year, in the absence of any mitigation.

- Resuspension of contaminants in the sediment – Chapter 9 (Hydrogeology) of the EIAR states that there are "[some] *localised elevated levels of hydrocarbons (PAH) and heavy metals (Arsenic) were recorded, specifically in locations along the River Suir riverbed*". Piling and scour during the construction stage has the potential to cause temporary resuspension and, consequently, bioavailability of these compounds. However, owing to the low concentrations present, any effect on water quality will be of low magnitude and localised to within c. 300 m of the Project. Any effects on benthic communities will be fully reversible within one year, in the absence of any mitigation.
- Faecal contamination – Inadequate treatment of wastewater from on-site toilets and washing facilities also provides for potential water quality impacts which could lead to ecological effects in the River Suir and any habitats connected to it. Faecal contamination can alter the nutrient balance in soils and water, causing significant changes in microbial communities and reductions in oxygen levels. This can have significant effects on vegetation structure and composition in receiving habitats.

Owing to the scales of both the Project and the River Suir and the distance (c. 1km) from the Project to the nearest examples of Annex I salt meadow habitats, both the risk and the magnitude of any effects on these habitats arising from impacts on water quality are considered to be low. However, as such effects cannot be quantified, they are assumed to be significant and, therefore, require the implementation of avoidance measures.

Operational Phase

The south quays plaza and the southern half of the bridge will drain to the existing surface water drainage system. This is treated at the Waterford City Water Treatment Plant before discharge to the River Suir. Prior to the development of the North Quays SDZ, the northern half of the bridge will drain to the River Suir as per the existing situation. However, the bridge will not be in use prior to the development of the North Quays SDZ. Consequently, there will be no deposition of pollutants occurring and, therefore, any impact will be imperceptible.

Once the North Quays SDZ is developed, the northern section of the bridge will discharge to the new North Quays surface water drainage network. In addition, the bridge traffic is limited to pedestrians and an electric shuttle bus and it is not anticipated that any chemicals or hydrocarbons will be transported across the bridge. Thus, the risk of spillage is considered to be extremely low. Salting and gritting of trafficked surfaces during icy conditions will result in increased salinity, pH, conductivity and total-dissolved-solids concentrations in the run-off from the bridge. However, it is anticipated that the use of salt and grit will be minimal due to the light trafficking of the bridge. The new North Quays drainage network will incorporate pollution controls, including silt traps, petrol interceptors and sustainable urban drainage systems (SUDS) features treating all run-off prior to discharge to the River Suir.

The permanent presence of the bridge abutments and support piles and the piles for the vessel collision protection system provide for hydraulic effects such as increased flow velocities leading to scour of the riverbed, which will cause the suspension of fine sediments in the water column. However, this will occur at a lower magnitude than

during the worst-case scenario considered for the construction stage and, therefore, there will be no significant water quality effect in this regard.

The bridge will require repainting during its life cycle. As discussed for the construction stage, while most paints do not pose a risk to water quality, paints containing organotin compounds such as TBT do provide for significant water quality impacts.

The opening mechanism for the bridge may be either electromechanical, i.e. an electric motor, or hydraulic, i.e. a hydraulic ram. The use of a hydraulic ram poses a risk that hydraulic fluid may enter the River Suir in the event of a leak. However, the probability of such a leak occurring is very low and the amounts of any oil that might enter the river are also very low. Therefore, this would result in a localised, temporary, slight to imperceptible impact on water quality. Therefore, the risk to water quality from the use of a hydraulic ram is negligible.

Taking all of the above into consideration, it is concluded that any water quality impacts which might arise during the operation of the Project will be slight to imperceptible and, therefore, the operation of the Project will not adversely affect the vegetation structure or composition in any Annex I salt meadow habitat. Repainting of the bridge must, however, avoid the use of paints containing organotin compounds such as TBT.

Conclusion

In the absence of appropriate mitigation, the construction of the Project has the potential to adversely affect the Conservation Objectives for "Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)" and "Mediterranean salt meadows (*Juncetalia maritimi*)" in the Lower River Suir SAC through impacts on water quality which may affect the vegetation structure and composition of these Qualifying Interests. If paints containing organotin compounds such as TBT are used to repaint the bridge during its operation, this also poses a risk to water quality. Therefore, mitigation is required to avoid this adverse effect.

The Project does not provide for any other adverse effects on the Conservation Objectives for these Qualifying Interests during either the construction phase or the operational phase.

4.2.2 Hydrophilous Tall Herb Communities

The Annex I habitat "Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels" does not occur within the study area and is considered unlikely to be present in the likely zone of impact. However, it may occur in freshwater marshes or bordering freshwater streams in close proximity to the River Suir. The Conservation Objective for this Qualifying Interest is stated in Table 3.2 above. The Attributes of this Conservation Objective are summarised as follows:

- Habitat area and distribution;
- Hydrological regime (flooding depth/height of water table);
- Vegetation composition (positive indicator species; non-native species; negative indicator species; scrub, bracken and heath);
- Vegetation structure (height); and,
- Physical structure (bare soil; grazing and disturbance).

Habitat area and distribution

As there are no examples of this Annex I habitat type occurring in close proximity to the Project, there will be no reduction in the area of this habitat in the River Suir SAC

or any change in the distribution of this habitat type in the River Suir SAC as a result of the Project.

Hydrological regime

As detailed in Section 4.2.1, the potential for the Project to give rise to hydrological impacts on the River Suir are discussed in detail in Chapter 10 (Hydrology) of the EIAR for the Project and in the SFRA for the North Quays SDZ, both of which concluded that the construction and operation of the River Suir Sustainable Transport Bridge will lead to only slight or imperceptible impacts on the local hydrology. Therefore, it can be concluded on the basis of best scientific knowledge that neither the construction nor the operation of the Project will lead to a significant change in the hydrological regime in the likely zone of impact and, as such, there will be no adverse effect on the hydrological conditions in any example of this habitat type.

Vegetation structure and composition

The potential adverse effects of the Project on vegetation structure and composition in hydrophilous tall herb communities are considered to be the same as those for salt meadow habitats, as per Section 4.2.1. Thus, it is concluded that there is a risk that these Attributes may be adversely affected as a result of water quality impacts arising from the Project.

Physical structure

Owing to the nature of the Project and as there are no examples of this Annex I habitat type occurring in close proximity to the Project, it does not have any potential to change the cover of bare soil or levels of grazing or disturbance in any example of this habitat type. Therefore, it is can be concluded that the Project will not adversely affect this Attribute of any Annex I hydrophilous tall herb community.

Conclusion

In the absence of appropriate mitigation, the construction of the Project has the potential to adversely affect the Conservation Objective for "Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels" in the Lower River Suir SAC through impacts on water quality which may affect the vegetation structure and composition of this Qualifying Interest. Therefore, mitigation is required to avoid this adverse effect.

The Project does not provide for any other adverse effects on this Conservation Objective during either the construction phase or the operational phase.

4.2.3 Migratory Fishes

The migratory fish species listed as Qualifying Interests of the Lower River Suir SAC and potentially adversely affected by the Project are Sea Lamprey, Brook Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon. The Conservation Objectives for each of these Qualifying Interests are stated in Table 3.2 above. The Attributes of these Conservation Objectives can be summarised as follows:

- Extent of anadromy/barriers to migration;
- Distribution, quantity and quality of spawning habitat;
- Number and distribution of redds;
- Availability of juvenile habitat;
- Abundance of individuals at different life stages/population structure; and,
- Water quality.

Anadromy and barriers to migration

The presence of structures within the River Suir represents a partial obstruction of the channel. This reduces the cross-sectional area open for passage by fish and constricts the flow of water, thereby increasing flow velocities. The partial obstruction and higher flow velocities have the potential to form a barrier to migratory fish species, including anadromous lampreys, Twaite Shad, Atlantic Salmon and Sea Trout (*Salmo trutta*), as well as catadromous European Eel (*Anguilla anguilla*). Other effective barriers to fish migration may arise from acoustic or lighting impacts. These impacts are discussed in detail in the following paragraphs.

Physical obstruction

Table 4.1 below shows the gross cross-sectional area of the river channel, cross-sectional area of existing obstructions and the net existing cross-sectional area of the river channel for water levels of - 2.2 mOD, + 0.0 mOD and + 2.4 mOD at the location of the Project. During construction of the bridge, a portion of this area will be obstructed by the north and south abutments, cofferdams, temporary support piles and the vessel collision protection system. In accordance with the Precautionary Approach, this assessment considered the worst-case scenario of all temporary and permanent structures in place. A maximum 40.88% of the net existing cross-sectional area of the river channel will be obstructed in this scenario, leaving a minimum of 59.12% free from any physical impediment to the movements of lampreys, shad or salmon. During the operation of the bridge, a maximum 14.37% of the channel will be obstructed, leaving a minimum of 85.63% open. As no less 59.12% of the net cross-sectional area of the river channel remain unobstructed at all times during the construction and operation of the Project, there will be no physical barrier to the movement of fish past the Project. Table 4.1 below provides further detail on the areas of the channel which will be obstructed.

Table 4.1 Calculated cross-sectional areas of the river channel, occupied by the Project and remaining unobstructed, during the construction phase and the operational phase, at - 2.2 mOD, at + 0.00 mOD and at + 2.40 mOD, where "mOD" = metres relative to Ordnance Datum (Malin Head) and all percentages are relative to the "net channel area".

Description	Area for - 2.2 mOD	Area for + 0.00 mOD	Area for + 2.40 mOD
Existing situation			
Gross channel area	1,574.78 m^2	2,044.20 m^2	2,560.63 m^2
Existing obstructions	2.25 m^2	6.66 m^2	14.48 m^2
Net channel area	1,572.52 m^2	2,037.54 m^2	2,546.15 m^2
Construction phase			
Occupied by the Project	642.90 m^2 (40.88%)	817.85 m^2 (40.14%)	1,014.68 m^2 (39.85%)
Unobstructed	929.62 m^2 (59.12%)	1,219.69 m^2 (59.86%)	1,531.47 m^2 (60.15%)
Operational phase			
Occupied by the Project	226.00 m^2 (14.37%)	285.79 m^2 (14.03%)	352.88 m^2 (13.86%)
Unobstructed	1,346.52 m^2 (85.63%)	1,751.75 m^2 (85.97%)	2,193.27 m^2 (86.14%)

Hydraulic changes

Russon & Kemp (2011) studied the swimming performance and behaviour of spawning run European Eel and River Lamprey. They found that all individuals of both species were able to move upstream against flow velocities of 1.75 m/s. The authors also found that swimming speed generally increased with body size. Based on these

findings, it is estimated that Sea Lamprey, which has a very similar morphology as River Lamprey and which also utilises the same anguilliform locomotion, can swim upstream against flows of at least 1.75 m/s. Hoover & Murphy (2018) found that Sea Lamprey can achieve speeds in excess of 4 m/s for short periods. In a technical paper published by the Environment Agency, Clough et al. (2004) studied the swimming speeds of Twaite Shad. The authors found that the average critical burst swimming speed for adults of this species is just over 1.7 m/s, meaning that most individuals of this species can maintain swimming at this speed without having to resort to burst swimming. In 2005, the then Central and Regional Fisheries Boards and the Department of Communications, Marine and Natural Resources jointly published *Guidelines on the Construction & Operation of Small Scale Hydro-Electric Schemes and Fisheries* (CRFB & DCMNR, 2005). These guidelines provide indicative swimming speeds of 2 m/s for Atlantic Salmon and 1.5 m/s Brown Trout (*Salmo trutta*).

The increase in flow velocities resulting from the constriction of the river flow during the construction and operation of the Project were modelled in a hydraulic study. The *Hydraulic Modelling Report* (Hydro Environmental Ltd, 2018) in Appendix C stated that the maximum flow velocity, which was calculated for the mid-ebb of an average spring tide assuming the worst-case scenario outlined above, was 1.4 m/s (depth-averaged). This is below the critical velocity for adults of all of the fish species of interest at this location. In addition, as shown in Figure 4.1 below, this flow velocity is not reached at all locations across the channel and there are areas of the channel where the maximum flow velocity will not exceed 1.1 m/s. Furthermore, flow velocities will be lower still close to the riverbed where the flow is subject to friction. Therefore, it can be concluded on the basis of best scientific knowledge that increased flow velocities resulting from the constriction of the flow by the Project will not impede the movements of adult migratory fish even during peak flow conditions.

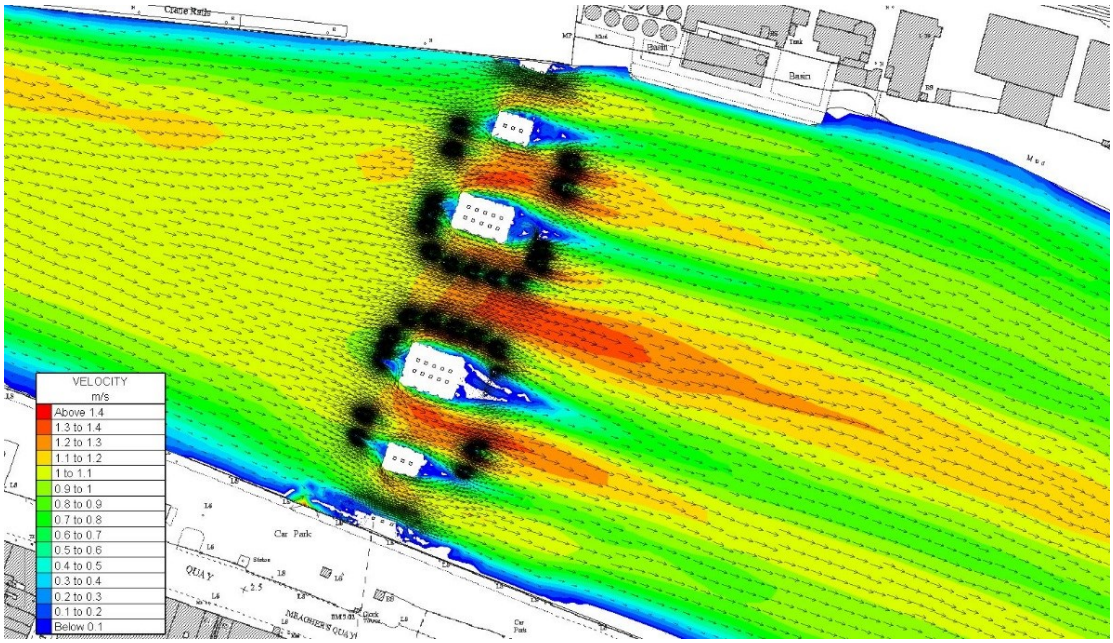


Figure 4.1 **Modelled depth-averaged flow velocities during the mid-ebb of an average spring tide for the worst-case scenario (all temporary and permanent structures in place). Source: Figure 39 of the *Hydraulic Modelling Report* (Hydro Environmental Ltd, 2018).**

The passage of juvenile fish past the Project must also be considered. In the case of juveniles, particularly Twaite Shad, it is known that these fish move up and down the estuary with the tides. Therefore, the movements of juvenile fish will not be affected by the increased flow velocities resulting from the constriction of the flow by the Project as they will continue to move through the area in the direction of the flow.

Noise and vibration

The effects of noise on fish species include, in order of increasing severity: behavioural change, auditory tissue damage, which can be temporary, i.e. temporary threshold shift (TTS), or permanent, i.e. permanent threshold shift (PTS), non-auditory tissue damage and death. Effects vary greatly between individuals of different sizes or life stages, with smaller/younger individuals being more vulnerable to injury and death, and between different species, i.e. between species classed as "hearing generalists", e.g. salmonids, and those classed as "hearing specialists", e.g. clupeids, including the shads. The effects of noise on a wide range of fish species have not been studied extensively and so any predictive assessment of such noise impacts on fish must rely on extrapolations from what studies have been carried out and thereafter follow the Precautionary Approach when making any necessary assumptions.

It is considered that the elements of the construction of the Project which present the highest risk of significant noise and vibration impacts on migratory fish species are piling operations, including the driving of the support piles for the bridge piers and abutments and, to a lesser extent, the sheet piles for the new south quay wall and temporary cofferdams. The assessment of the effects of piling noise on migratory fish species in the Lower River Suir SAC during the construction of the Project drew upon the following documents:

- California Department of Transport's *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (Caltrans, 2015).
- *Environmental Impact Report* (MOR, 2010) for the Grattan Quay, Bilberry Road and Quarry Road Improvement Works in Waterford City, which specifically addressed the effects of piling noise in the River Suir.

During the construction of the Project, tubular steel piles such as the permanent pier support piles will generally be driven into the substrate by impact hammer. The sound produced by each pile strike is of a high amplitude and short duration (in the order of milliseconds), and covers a broad range of frequencies, from several Hz to several kHz. An average strike rate of c. 40 per minute can be expected during piling, with frequent breaks to ensure correct angles etc. Sheet piles will generally by vibrated into the substrate. While the amplitude of the sound produced by vibration is lower than that of impact piling, the effectively continuous (rather than pulsed) output means that the overall energy level is comparable to that of impact piling. Vibrated sheet piles may require a few strikes of an impact hammer to drive them to refusal.

Sound intensity level (SIL) or "loudness" is usually expressed in decibels (dB), which is a logarithmic scale of the ratio of the measured pressure to a reference pressure. In water, this reference pressure is 1 µPa. There are two main metrics of SIL which are used to assess the impacts of noise on fish: peak sound pressure level (SPL_{peak}), which is expressed in dB re 1 µPa, and sound exposure level (SEL), which is expressed in dB re 1 μPa^2 s. Both SPL_{peak} and SEL are usually given for a distance (D_1) of 10 m from the pile being driven. SPL_{peak} is the maximum SIL produced by a single pile strike or vibration, whereas SEL is the energy of the sound output averaged over 1 second. In addition, for a sound that is repeated or continuous, e.g. multiple pile strikes or vibration for more than 1 second, the cumulative SEL (SEL_{cum}) is also used and this is

calculated as SEL_{cum} = SEL + 10 log(n), where n = the number of pile strikes or duration of vibration in seconds.

Based on the size of the piles to be used in the construction of the Project, the methods of driving and nature and depth of the sediment, among other variables, the maximum SPL_{peak} was estimated as c. 210 dB (for 1,220 mm dia. tubular steel piles; SPL_{peak} for smaller tubular piles and sheet piles will be lower). The maximum SEL for those same piles was estimated as c. 183 dB. As explained in the previous paragraph, SEL_{cum} will depend on the total number of hammer strikes in a given driving period. In the worst-case scenario, the driving of a 1,220 mm dia. tubular steel pile for 25 minutes, given an average strike rate of 40 per minute, would take c. 1,000 strikes to complete, giving rise to an SEL_{cum} of 213 dB.

Owing to the high degree of variability in terms of sensitivity to sound impacts between different individuals and species of fish, precautionary impact thresholds for SPL_{peak} and SEL_{cum} were adopted based on information from the literature concerning TTS in hearing specialist fishes. The thresholds adopted were an SPL_{peak} of 205 dB and an SEL_{cum} of 183 dB. The worst-case sound levels predicted in the last paragraph exceed both of these thresholds at 10 m from piles. Therefore, it is necessary to calculate the distance from piling operations at which these thresholds are no longer exceeded.

The rate at which sound attenuates in water is dependent on a number of variables, including the nature of the substrate and ambient noise levels. Based on information from similar situations elsewhere, the ambient noise level in the River Suir at Waterford was estimated as c. 125 dB. Following this, the attenuation coefficient (F) was calculated as 15 (equivalent to a reduction of c. 4.5 dB per doubling in distance). This figure can be used to calculate the distance (D_2) at which a target reduction in sound level or "transmission loss" (TL) is achieved. In this case, TL is the difference between the predicted output and the threshold value and should have a negative value. The formula for this calculation is $D_2 = D_1 \div 10^{TL \div F}$. Using this formula, an SPL_{peak} of 210 dB (predicted output) will attenuate to 205 dB (threshold level) at c. 21.5 m from the pile being driven. An SEL_{cum} of 213 dB (output level) will attenuate to 205 dB (threshold level) at c. 1 km.

The affected area in terms of SPL_{peak} is a circle c. 43 m in diameter, which represents c. 20% of the channel width at the location of the proposed bridge. Therefore, driving of one pile at this location will not lead to a significant barrier to the movement of fish. However, in the absence of mitigation, the affected area in terms of SEL_{cum} for that same activity spans the full width of the river channel up to a distance of c. 1 km upstream and downstream of the Project. This represents a significant barrier to the movement of fish, as well as a risk of both auditory and non-auditory injury, or mortality, to fish present within the affected area. Therefore, further assessment is required with regard to the potential for such effects, in view of the proposed works schedule and movement patterns of the fish species concerned.

The assessment of noise arising from pile driving in the following paragraphs applies only to piles driven without any acoustic protection. The cofferdams created by sheet piling will provide a high level of attenuation. Therefore, any pile driving taking place within these cofferdams will not give rise to significant noise impacts.

The operation of the Project does not provide for any noise or vibration impacts which would be perceptible by any of the migratory fish species listed as Qualifying Interests of the Lower River Suir SAC.

Lamprey species

Only two lamprey species, namely Sea Lamprey and River Lamprey, migrate past the Project location. Brook Lamprey is restricted to the freshwater stretches of the River Suir and, therefore, will not be affected by the Project. Sea Lamprey is present at the Project location at two key phases in its life cycle: 1) adults migrate upstream past the Project en route from the sea to their spawning grounds in the freshwater stretches of the river; and, 2) newly-metamorphosed adults migrate downstream past the Project en route from their juvenile habitats to the sea to feed as adults. River Lamprey is also present at the Project location during its migrations between its spawning and juvenile habitats in the freshwater reaches and its adult habitats in the estuary, as well as during its adult phase, when it resides in the estuary. All lamprey species are semelparous (Maitland, 2003), i.e. adults undergo a single spawning event and then die. Thus, no spent adults occur in the vicinity of the Project.

The upstream migration of adult Sea Lamprey is concentrated in the months of April, May and June (Maitland, 2003; King et al., 2008). The upstream migration period of River Lamprey is less well-known and may occur over a long period beginning in August and continuing throughout autumn and winter, until the spawning season in spring (King et al., 2008). Peak migration periods have been proposed as being from October to December (Maitland, 2003) or August to November followed by a second peak in March and April (MOR, 2010). In the case of both Sea Lamprey and River Lamprey, upstream migration is almost exclusively nocturnal (Maitland, 2003; Andrade et al., 2007; Quintella et al., 2009; Vrieze et al., 2011).

Lamprey larvae, known as "ammocoetes", burrow into fine sediments at the bottom of fresh waters and live as filter-feeders. Metamorphosis occurs after c. 5 years in Sea Lamprey and after 3-5 years in River Lamprey (Maitland, 2003). The downstream migration of recently-metamorphosed lampreys, known as "macrophthalmia", is not well-studied, but it appears to vary between years and river systems. MOR (2010) stated that Sea Lamprey begin their downstream migration once metamorphosis is complete (usually by September) and most arrive in the estuary in October. MOR (2010) also suggested that newly-metamorphosed River Lamprey "*begin their downstream migration over an extended period from late winter to early summer*". Downstream migration by both Sea Lamprey and River Lamprey is predominantly nocturnal (Maitland, 2003; Potter, 1980; Lucas & Bracken, 2010; Silva et al., 2013; Moser et al., 2014; Dawson et al., 2015).

The levels of noise and vibration predicted to arise from the construction of the Project, particularly the driving of the permanent bridge support piles, have the potential to form a complete barrier to the migration of Sea Lamprey and River Lamprey. However, as both upstream and downstream migration of lampreys is almost entirely nocturnal, the vast majority of individuals will be migrating through the works area outside of the hours in which piling works will be taking place and, therefore, will not be affected by noise and vibration from the construction works. Similarly, owing to the nocturnal habitat of Sea Lamprey and River Lamprey and the scheduling of construction works, the risk of significant numbers of individuals being present in the affected area[7] during piling operations is very low. Furthermore, of those which may be present, the majority will be able to leave the affected area unharmed and resume their migrations when works

[7] It should be noted that the affected area mentioned earlier in this section is a very conservative estimated based on the TTS for hearing specialist species and individuals of < 2 g body mass. As lamprey species are not considered to be hearing specialists and as all of the individuals present at the Project location will be adults of a much greater body mass than 2 g, the affected area in this case will be significantly smaller.

have ceased at night and on Sundays and public holidays. Therefore, any effect in this regard will be slight to imperceptible.

In summary, owing to the proposed working hours and the nocturnal migration patterns observed in lamprey species, noise and vibration impacts arising from the construction of the Project are not likely to lead to a significant barrier to the migration of either Sea Lamprey or River Lamprey through the construction area. However, mitigation will be prescribed to ensure that any such effects are not significant.

Twaite Shad

Adult Twaite Shad gather outside estuaries in April and enter rivers in May and June (Maitland & Hatton-Ellis, 2003; Freyhof & Kottelat, 2008; Rooney & King, 2015). This can vary with water temperature, tides and fluvial conditions (Doherty et al., 2004). Twaite Shad are commonly recorded congregating in Waterford Harbour in March and occasionally in February (Doherty et al., 2004; Gallagher et al., 2016). Upstream migration from the estuaries peaks at water temperatures of 10-14°C (IFI, 2018a). Acoustic telemetry studies by IFI (Rooney & King, 2015; IFI, 2018c) have found that shads are highly mobile during their spawning migration, moving up to 35 km upstream and downstream with the tides.

Spawning occurs over gravel (IFI, 2018a) at the top of tidal waters (King et al., 2011). Once the adults reach the spawning grounds in late May and early June, they remain there for between one and two weeks, when there is a steady rise in water temperatures from 13°C to 19°C (Rooney & King, 2015; IFI, 2018c). Fish move onto the breeding area at dusk (IFI, 2018a) and spawning takes place throughout the night in large, noisy schools (Maitland & Hatton-Ellis, 2003; Doherty et al., 2004; Freyhof & Kottelat, 2008; King et al., 2011). The eggs sink into the gravel or float downstream, hatching 4-8 days later (Maitland & Hatton-Ellis, 2003; Doherty et al., 2004). Most juveniles move to the lower estuary during their first summer and migrate to sea at end of their second year (Freyhof & Kottelat, 2008). Once in brackish water, these fish feed primarily mysids and copepods (Maitland & Hatton-Ellis, 2003). The movements and ecology of Twaite Shad during their residency in estuaries are not fully understood (IFI, 2018a) and are the subject of ongoing research (IFI, 2018c).

Twaite Shad is an iteroparous species, i.e. individuals can spawn multiple times over their lifespan (Rooney & King, 2015, IFI, 2018a). Examination of scales by King & Roche (2008) showed that repeat spawning is the norm and angling returns from the River Barrow also reveal a relatively well-established population of repeat-spawners there (King et al., 2011). After spawning, spent fish migrate back to sea (Freyhof & Kottelat, 2008) and most surviving adults return to sea almost immediately (Doherty et al., 2004; IFI, 2018a). As part of IFI's acoustic telemetry studies, Rooney & King (2015) found that, following presumed spawning, tagged shad returned to the lower part of Suir Estuary within 1-3 days (IFI, 2018c).

Apart from the nocturnal spawning habit, the diel activity patters of Twaite Shad are not well defined/studied. However, it appears that, with the exception of the spawning period, Twaite Shad is a mainly diurnal species. Gregory & Clabburn (2003) found that the numbers of adult shad migrating upstream and downstream were much reduced between 9:00 pm and 3:00 am and that a peak in activity occurred around dawn. Esteves & Andrade (2008) found that shad larvae were more common during daylight hours, particularly in the afternoon, than they were at night.

In short, upstream-migrating adult Twaite Shad are likely to be present at the location of the Project in significant numbers during the months of March, April and May, while

out-migrating spent fish are likely to be present in significant numbers during the month of June. While the timing of the arrival of young-of-the-year Twaite Shad at the Project location and the seaward departure of older juveniles is not known precisely, juveniles of either the 0+ or 1+ year class are considered likely to be present in the vicinity of the Project year-round.

Twaite Shad, like all members of the herring family, is considered a "hearing specialist" as it has a much greater auditory range than other fishes (Teague & Clough, 2011). As Twaite Shad is a hearing specialist and predominantly diurnal and as both adults and juveniles are likely to be present at the Project location in significant numbers, this species is considered to be the most sensitive receptor in terms of noise impacts.

During the period from March to May, inclusive, adult Twaite Shad are expected to migrate upstream through the works area in significant numbers during daylight hours, i.e. during the hours when piling driving is scheduled to be carried out. Therefore, there is a significant risk that adult fish will be halted in their migration or injured/killed due to piling noise. Most individuals will likely be able to escape the area and avoid injury, but the effect of interruption of migration remains. This represents a significant effect on Twaite Shad in terms of barriers to migration.

Later in the summer, i.e. in June and July, spent adult shad are likely to be present in significant numbers on their return from their spawning grounds to the lower estuary and, eventually, the sea. Piling noise also poses a risk to these individuals. However, most will be able to escape the area to avoid injury and continue their migration to the lower estuary and the sea during breaks in piling. As these individuals are not on their critical spawning migration and are likely to be present only for a very short time (only a few days), the effects on spent Twaite Shad are not considered to be significant.

The timing of the arrival of young-of-the-year (0+) shad at the location of the Project is not known, but it is thought that they gradually move down the tidal reaches of the river from June to August/September. Similarly, little is known of the behaviour and ecology of juvenile Twaite Shad during their residency in the estuary. Therefore, following the Precautionary Approach, juveniles are assumed to move upstream and downstream through the works area at all times of the year and to be most active during daylight. Owing to their sensitive auditory systems, diurnal habit and year-round presence, as well as their small body size, juvenile Twaite Shad are considered highly vulnerable to noise impacts arising from pile driving and significant impacts are considered likely.

Atlantic Salmon

Like lampreys and shads, Atlantic Salmon is an anadromous species, i.e. the adult life stage is marine, with mature fish returning to their natal freshwater streams to spawn. Adults can begin their spawning migration at any time of year, but there are two main migration periods: fish who have spent one winter at sea, known as "grilse", ascend rivers in late winter, while fish who have spent more than one winter at sea, known as "multi-sea-winter (MSW)" (or "spring" salmon, if the enter fresh water before 1st June), generally enter rivers earlier in the year. In the River Suir, the main grilse run occurs in December and spring salmon run mostly in the period from July to October (MOR, 2010). Movement of spawning salmon upstream through the estuary is predominantly nocturnal and usually occurs on the ebb tide (Smith & Smith, 1997). Once spawning has occurred, most adults die, though as many as 36% may survive and return to sea as kelts (Hendry & Cragg-Hine, 2003). Only 3-6% survive to spawn in subsequent years (Mills, 1989; Hubley et al., 2008).

The eggs hatch in spring and the young, known as "alevins", remain within the gravel interstitia until the yolk-sac is depleted, which takes a number of weeks, at which point the rise to the surface and begin their free-swimming phase. At this point the juvenile fish are known as "fry". At the end of their first summer these fish develop parr marks on their sides and are thereafter known as "parr". Juveniles spend 2-4 years in fresh waters (Hendry & Cragg-Hine, 2003), normally undergoing smoltification (a series of physiological changes or metamorphosis which prepares the young salmon for life in the marine environment) and migrating to sea in the spring (April-June) of their third year (King et al., 2011). MOR (2010) stated that the main smolt movement in the Suir Estuary is from March to mid-June. Out-migrating smolts are predominantly nocturnal (Moore et al., 1995). However, they become increasingly active during daylight hours with increasing water temperatures (Thorpe et al., 1994; Ibbotson et al., 2006, 2011; Haraldstad et al., 2017). Smolts do not require a period of acclimation to saline conditions and so tend not to delay in the estuary, preferring to move directly to sea (Moore et al., 1995; MOR, 2010).

As the up-estuary section of the migration of adult Atlantic Salmon is predominantly nocturnal, the vast majority of individuals will migrate past the Project location during the hours of darkness, i.e. while works are suspended each night. During the winter, works may impede the salmon spawning migration during the first and last 1-2 hours of darkness, but not during the middle 12 hours. Therefore, piling noise is not likely to create a significant barrier to the spawning migration. Any adult salmon which may be present within the affected area during pile driving are considered likely to escape and avoid injury/death. Owing to the large body mass of adult salmon and the fact that they are hearing generalists, individuals are considered to be significantly less vulnerable to injury from sound than Twaite Shad or younger fish of any species.

Similarly, any out-migrating kelts are likely to migrate at night and are not considered to be particularly vulnerable to injury/death from noise impacts. In addition, these fish are likely to spend only a very short time in the estuary, instead migrating directly from the river to the sea.[8] Furthermore, as such a small portion of kelts contribute to future spawning, any such effects will be imperceptible at the population scale. Therefore, any effects of piling activities on these individuals are both unlikely and insignificant.

Smolts are likely to pass through the construction area in significant numbers on their migration from the river to the sea in the period from March to May, inclusive. As with adult salmon, smolts migrate mostly at night, outside of the period when pile driving is scheduled to be carried out. Any individuals which may be present within the affected area are likely to escape to avoid injury/death and continue their migration when works cease at night. As smolts are significantly larger than juvenile Twaite Shad and are not hearing specialists, the affected area is significantly smaller and, thus, the risk to individuals is less. As with kelts, smolts do not tend to delay in the estuary, preferring to migrate directly to sea. Therefore, owing to the predominantly nocturnal migration of smolts and the scheduling of the works, piling noise during construction is not likely to give rise to any significant barrier to out-migrating Atlantic Salmon smolts.

In summary, owing to the proposed working hours and the nocturnal migration patterns observed in Atlantic Salmon, noise and vibration impacts arising from the construction of the Project are not likely to lead to a significant barrier to the spawning migration of adult fish or the seaward migration of smolts or kelts. Notwithstanding this, mitigation will be prescribed to ensure that any such effects are not significant.

[8] Atlantic Salmon kelts occasionally spend longer periods (up to several weeks) in estuaries on their post-spawning migration to the sea (Lindberg, 2011).

The operational phase of the Project does not provide for any measurable increase in noise or vibration in the aquatic environment. Therefore, there will be no effect on the migratory behaviours of fish as a result of noise and vibration impacts arising from the operation of the Project.

Artificial lighting and shade

Construction

Inappropriate lighting during construction can cause disturbance to or form a barrier to connectivity for nocturnal species. Specifically, light spill onto the water during hours of darkness may cause migrating Sea Lamprey, River Lamprey and Atlantic Salmon to avoid the area in the vicinity of the bridge, effectively preventing these species from moving past the construction area. This may also affect the movements of adult River Lamprey resident in the estuary. Mitigation is, therefore, required to ensure that lighting associated with the construction of the Project does not affect the movements, particularly the spawning migrations, of these Sea Lamprey, River Lamprey and Atlantic Salmon in the Suir Estuary. As Twaite Shad is predominantly a diurnal species, excess lighting will not halt migrating fish.

Owing to the scale of the Project, shading of the river channel during the construction stage will be minimal and, therefore, will not give rise to any effect on the movements of Sea Lamprey, River Lamprey, Twaite Shad or Atlantic Salmon.

Operation

Inappropriate lighting designs or regimes can cause disturbance to or form a barrier to connectivity for nocturnal species. In the case of the proposed River Suir Sustainable Transport Bridge, an inappropriate lighting design or operating regime has the potential to affect the migration or activity pattern of migratory fishes. Specifically, light spill onto the water during hours of darkness may cause migrating Sea Lamprey, River Lamprey and Atlantic Salmon to avoid the area in the vicinity of the bridge, effectively preventing these species from moving past the structure. This may also affect the movements of adult River Lamprey resident in the estuary. Mitigation will be required to ensure that the final lighting design and operating regime for the Project does not adversely affect the movements of these nocturnal species. It is considered that this mitigation, which will provide for near-natural light levels during both day and night, will ensure that there are no adverse effects on Twaite Shad.

Owing to the narrow width of the bridge (8.8m across most of the structure, 12m at the two viewpoints and 15.66m at the abutments) relative to that of the river channel (c. 207m) and the freeboard of c. 6m (at the centrepoint at + 0.0 mOD) beneath the bridge soffit, the bridge will not cause significant shading of the channel and, therefore, there will be no effect of shading on the movements of Sea Lamprey, River Lamprey, Twaite Shad or Atlantic Salmon.

Spawning habitat and redds

There are no suitable spawning habitats for lampreys, shad or salmon within the likely zone of impact of the Project. Thus, there are no pathways for impacts from the Project to such habitats. I t can be concluded, therefore, that the Project will not have any effect on the distribution, quantity or quality of spawning habitats for these species. Nor will it cause any change the number and distribution of redds.

Juvenile habitat

Juveniles (ammocoetes) of the three lamprey species are restricted to fresh waters. As no habitat for lamprey ammocoetes is present within the likely zone of impact of the Project, the availability of this habitat will not be affected.

Owing to scale of the Project, it will not significantly reduce the quantity of juvenile habitat available to Twaite Shad in the Lower River Suir SAC. However, owing to the nature of the Project, construction activities and maintenance of the bridge have the potential to affect the quality of habitat for juvenile shad in the lower estuary through water quality impacts (detailed in Section 4.2.1). In particular, water quality impacts may affect the availability of the mysids and other zooplankton on which juvenile shad prey. Therefore, appropriate mitigation will be required to prevent water quality impacts and, by extension, effects on the quality of juvenile habitat for Twaite Shad.

The early juvenile life stages of Atlantic Salmon, i.e. alevin, fry and parr, occur only in fresh water, generally higher up in the catchment. As no habitat suitable for these life stages occurs within the likely zone of impact of the Project, the availability of the same will not be affected by the Project. The final juvenile life stage of Atlantic Salmon, i.e. smolts, are present within the vicinity of the Project during their migration from fresh water to the sea. As for Twaite Shad, the Project does not provide for a significant reduction in the quantity of habitat available for salmon smolts in the Lower River Suir SAC but does provide for a potential reduction in habitat quality, particularly in terms of the availability of prey species, through water quality impacts. Therefore, the same requirement for mitigation applies in the case of Atlantic Salmon.

Population Structure

Water quality

Water quality impacts likely to arise from the construction of the Project are detailed in Section 4.2.1 above. These impacts are of short duration and restricted extent and are considered to have potential to affect the population structure of species which have prolonged residence times in the estuary, namely River Lamprey and Twaite Shad. Water quality impacts may have direct effects on these species or indirect effects via food availability. Ultimately, this may result in lower survival rates among adult River Lamprey and juvenile Twaite Shad, reducing the proportion of individuals of those life stages in the populations of those species. Therefore, mitigation is required to avoid significant water quality impacts.

Sea Lamprey and Atlantic Salmon, however, spend only a short time in the estuary (during migrations) and generally do not feed there.[9] Therefore, these species will not be affected by the water quality impacts predicted to arise from the Project.

The types of water quality impacts likely to arise from the operation of the Project are detailed in Section 4.2.1 above. As these impacts have been assessed as being slight to imperceptible, it is concluded that the operation of the Project will not give rise to adverse effects on the population structures of any of the migratory fish species which are listed as Qualifying Interests of the Lower River Suir SAC.

[9] Atlantic Salmon kelts occasionally spend longer periods (up to several weeks) in estuaries on their post-spawning migration to the sea (Lindberg, 2011). However, as these individuals are very unlikely to contribute to future spawning, any effects of water quality impacts on kelts will be imperceptible in terms of the overall population structure of salmon in the Lower River Suir SAC.

Noise and vibration

The effects of noise and vibration on Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon are discussed in relation to barriers to migration (above). Owing to the migration patterns and predominantly nocturnal nature of lamprey species and Atlantic Salmon and the proposed scheduling of construction works, any effects of noise and vibration on these species will be slight to imperceptible and not significant in terms of population structure.

In the case of Twaite Shad, however, the diurnal nature of this species, its auditory sensitivity and the fact that juveniles are present in the estuary year-round mean that the project has the potential to negatively impact both upstream-migrating adults and resident juveniles. Owing to the potential for impacts at these critical life-stages, piling noise and vibration may give rise to significant effects on the survival of juvenile shad and, consequently, the overall population structure of this species in the Lower River Suir SAC. Therefore, mitigation is required to minimise the effects of piling on juvenile and migrating Twaite Shad.

The operational phase of the Project does not provide for any measurable increase in noise or vibration in the aquatic environment. Therefore, there will be no effect on the population structure of fish species as a result of noise and vibration impacts arising from the operation of the Project.

Artificial lighting and shade

Inappropriate artificial lighting of the construction area during hours of darkness has the potential to spill onto the river channel, causing elevated light levels in the water column. Any effect of lighting on the survival rates of Sea Lamprey, River Lamprey and Atlantic Salmon are considered to be imperceptible. However, lighting of the river channel has the potential to negatively affect the survival rate of juvenile Twaite Shad by causing these fish to become more active at night and, consequently, subject to higher predation pressure by nocturnal predators. This may result in an adverse effect on the population structure of this species, as the proportion of 0+ and 1+ fish in the population would be reduced. The operation of the Project also has the potential to give rise to such effects. Therefore, mitigation is required during both construction and operation to eliminate adverse effects of artificial lighting on the river channel.

Owing to the scale of the Project, neither its construction nor its operation has the potential to give rise to significant shading impacts on the River Suir and the migratory fish species present. Therefore, no mitigation is required with respect to shading.

Water quality

All of the water quality impacts potentially arising from both the construction and the operation of the Project have been assessed and evaluated in terms of their effects on the relevant Attributes of the Conservation Objectives for the migratory fish species listed as Qualifying Interests of the Lower River Suir SAC (see the discussion under the preceding sub-headings). There are not considered to be any other water quality impacts with potential to adversely affect those Conservation Objectives.

Conclusion

In the absence of appropriate mitigation, the Project has the potential to adversely affect the Conservation Objective for Twaite Shad in the Lower River Suir SAC through noise and vibration impacts arising from construction activities, particularly pile driving. Therefore, mitigation is required to eliminate or minimise these impacts such that they no longer constitute adverse effects on this Conservation Objective.

In relation to Sea Lamprey, River Lamprey and Atlantic Salmon, as demonstrated in the above sub-sections, it can be concluded beyond reasonable scientific doubt that the Project, owing to the biology and ecology of these species and the proposed works schedule, will not give rise to adverse effects on the Conservation Objectives for these Qualifying Interest.

4.2.4 European Otter

The Conservation Objective for European Otter in the Lower River Suir SAC is shown in Table 3.2 above. The Attributes of this Conservation Objective are summarised as follows:

- Distribution;
- Extent of terrestrial, marine and freshwater habitats;
- Couching sites and holts;
- Fish biomass available; and,
- Barriers to connectivity.

Distribution, habitats and breeding and resting places

Owing to the location and scale of the Project, neither its construction nor its operation have the potential to cause a significant decline in the distribution of otters or the extent of terrestrial, marine and freshwater habitats for this species across the Lower River Suir SAC. Similarly, no potential or confirmed couching sites and holts were recorded during the surveys carried out to inform the assessments of the Project and the habitats in the vicinity of the Project are not considered to provide good opportunities for couching or holting. Therefore, it can be concluded that the Project will not significantly affect the Conservation Objective for European Otter in the Lower River Suir SAC in terms of these Attributes.

Fish biomass available

Fish species, particularly salmonids and eels, form the majority of the diet of European Otter in Ireland (Chanin, 2003; Bailey & Rochford, 2006; Reid et al., 2013). The diet of otters is, however, highly adaptable and varies considerably between habitats (Reid et al., 2013). The diets of otters in both freshwater and coastal habitats have been studied extensively (Chanin, 2003). While the feeding habits of otters in estuaries are less well-known, the importance of salmonids, eels and crustaceans, e.g. White-clawed Crayfish (*Austropotamobius pallipes*), in freshwater habitats suggests that migratory fishes, i.e. Atlantic Salmon, European Eel, Sea Lamprey, River Lamprey and Twaite Shad, when available, are important for otters in estuarine habitats. Other fish species found in estuaries, e.g. European Smelt (*Osmerus eperlanus*), rocklings (Lotidae) and wrasses (*Lubrus* spp.), and invertebrates, e.g. Shore Crab (*Carcinus maenas*), are likely to be of importance outside of these periods.

The effects of the Project on migratory fishes are assessed in Section 4.2.3 above and the effects on other fish species which form part of the diet of European Otter, e.g. European Smelt (*Osmerus eperlanus*), rocklings (Lotidae) and wrasses (*Lubrus* spp.), are similar in nature and scale. While the effects of the Project are considered unlikely to significantly reduce the total fish biomass available to otters, the scale of this effect cannot be quantified and, thus, in accordance with the Precautionary Principle, it is considered to be potentially significant. Mitigation is, therefore, required to prevent any adverse effect on prey availability for European Otter.

Barriers to connectivity

During the surveys carried out to inform this assessment, spraints and prints beneath the North Quay wall indicated that European Otter uses the intertidal habitats in the vicinity of the Project. Otters may use this habitat for foraging or resting or as a commuting link. The Project has the potential to form a barrier to connectivity between different areas of otter habitat by creating a physical obstruction to otter movements or by disturbance, i.e. by emitting noise and light such as to deter otters from passing the Project area. Potential barriers to connectivity for otters arising from the Project are assessed in the following paragraphs.

Physical barriers

As shown in Table 4.1 (Section 4.2.3) above, neither the construction nor the operation of the Project will lead to a significant obstruction to the passage of aquatic species either upstream or downstream past the Project area. As shown in Appendix A to this NIS, the majority of the surface of the river will also remain unobstructed for otters moving at this level. The increased flow velocities described in the *Hydraulic Modelling Report* (Hydro Environmental Ltd, 2018) in Appendix C and summarised in Section 4.2.3 above will not pose any challenge to otters as this species can achieve speeds of well over 2 m/s and up to 4.8 m/s (Garcia de Leaniz et al., 2006). Therefore, neither the construction nor the operation of the Project will result in any new physical barrier to aquatic connectivity for European Otter.

In the existing situation, there is no exposed riverbed on the northern bank of the River Suir at the Project location for a water level of + 2.4 mOD (the level exceeded twice per year for the last 17 years) or for + 0.0 mOD. Therefore, neither the construction nor the operation of the Project represents a loss of terrestrial connectivity for otters at this location for these water levels. For a water level of - 2.2 mOD, there is an exposed mud corridor c. 7m wide on the northern bank at this location. Neither the construction nor the operation of the Project provides for any obstruction to this corridor. However, as shown in the *Hydraulic Modelling Report* (Hydro Environmental Ltd, 2018) in Appendix C, it is likely that this area will be subject to significant scouring, particularly during the construction phase, thereby significantly reducing the width of this corridor and, potentially, eroding it completely. Notwithstanding this, given the predicted flow velocities illustrated in Figure 4.1 above and the swimming speeds of European Otter stated in the previous paragraph, it is concluded that otters will continue to be able to move past this area unimpeded, even in the worst-case scenario.

In the existing situation, there is no exposed riverbed on the southern bank of the River Suir at the Project location for a water level of + 2.4 mOD. Therefore, neither the construction nor the operation of the Project represents a loss of terrestrial connectivity for otters at this location for this water level. For a water level of + 0.0 mOD, there is an exposed mud corridor c. 2.4m wide on the southern bank at this location. For a water level of - 2.2 mOD, the width of this corridor increases to c. 11m. During the construction of the Project, the corridor present for a water level of + 0.0 mOD will be lost entirely and the width of the corridor for a level of - 2.2 mOD will be reduced to c. 3.6m. However, as shown in the *Hydraulic Modelling Report* (Hydro Environmental Ltd, 2018) in Appendix C, it is likely that this area will be subject to significant scouring, particularly during the construction phase, thereby further reducing the width of this corridor and, potentially, eroding it completely. Notwithstanding this, given the flow velocities illustrated in Figure 4.1 and the swimming speeds of European Otter stated above, it is concluded that otters will continue to be able to move past this area unimpeded, even in the worst-case scenario. During construction, an opening will be made behind the southern abutment to allow for the continued connectivity both for intertidal mudflats and for otters at this location (see drawings in Appendix A). The

permanent width of this corridor will be c. 1m. Therefore, connectivity for European Otter at this location will be maintained during the operation of the Project.

Disturbance

European Otter is generally considered to be a nocturnal or crepuscular species, i.e. individuals are predominantly active at night, with peaks in activity shortly after dusk at just before dawn (Chanin, 2003; OPW, 2006; Garcia de Leaniz, 2006). Therefore, apart from at their breeding and resting sites, otters are not considered to be sensitive to noise and light impacts during daylight hours. Furthermore, the occurrence of otters in towns and cities suggests that this species is able to habituate to human activities.

Both noise/vibration and light arising from construction activities, especially pile driving and floodlighting, have the potential to cause disturbance to otters, leading to reduced connectivity between areas upstream and downstream of the Project for the duration of the construction phase. Given the nocturnal or crepuscular nature of this species, the significance of any effects resulting from noise and lighting impacts depends on the daily programming and total duration of the construction activities and lighting of the construction area. Therefore, mitigation is required to ensure that noise/vibration and lighting during the construction of the Project will not lead to significant effects in terms of barriers to connectivity for European Otter.

During its operation, the Project provides for noise and lighting impacts of a smaller magnitude but a much longer duration. Given that the bridge crossing will primarily be a pedestrian and cyclist facility, with an electric shuttle bus, the worst-case noise levels resulting from the operation of the Project, including all maintenance activities, are within the limits of urban/human activity to which otters have habituated in cities such as Limerick, Cork and Galway. Therefore, the operation of the Project does not provide for any adverse effects on European Otter in terms of noise. However, in terms of artificial lighting, inappropriate lighting of the bridge during its operation does have the potential to deter otters from moving past the bridge. Therefore, mitigation is required to ensure that the final lighting design does not provide for barriers to connectivity for European Otter.

Conclusion

In the absence of appropriate mitigation, the Project has the potential to adversely affect the Conservation Objective for European Otter in the Lower River Suir SAC. Specifically, effects on fish species during construction have the potential to reduce the total biomass available to otters as food and an inappropriate lighting design may cause an effective barrier to connectivity. Therefore, appropriate mitigation is required to prevent such adverse effects.

4.3 River Barrow and River Nore SAC

4.3.1 Annex I Habitats

The seven Annex I habitats for which potential adverse effects were identified in Section 3 were "Estuaries", "Mudflats and sandflats not covered by seawater at low tide", "Reefs", "*Salicornia* and other annuals colonising mud and sand", "Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)", "Mediterranean salt meadows (*Juncetalia maritimi*)" and "Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels". The Conservation Objectives for these Qualifying Interests are stated in Table 3.3 above.

The effects of the Project on salt meadows and hydrophilous tall herb communities in the Lower River Suir SAC are analysed and evaluated in Sections 4.2.1 and 4.2.2,

respectively. The effects on these Qualifying Interests in the River Barrow and River Nore SAC are considered to be of the same nature as those for the Lower River Suir SAC, except that they will be of a lower magnitude owing to the distance between the Project and this site.

This section assess the likely effects of the construction and operation of the Project on the Annex I habitats "Estuaries", "Mudflats and sandflats not covered by seawater at low tide", "Reefs" and "*Salicornia* and other annuals colonising mud and sand" in the River Barrow and River Nore SAC, which have not previously been dealt with in this NIS. The Conservation Objectives for these Qualifying Interests are stated in Table 3.3 above. The Attributes of the Conservation Objectives for "Estuaries" and "Mudflats and sandflats not covered by seawater at low tide" are summarised as follows:

- Habitat area; and
- Community extent and distribution.

The Attributes of the Conservation Objective for "Reefs" (taken from the Hook Head SAC, as explained in Table 3.3) are summarised as follows:

- Distribution;
- Habitat area; and
- Community structure (biological composition) and extent.

The Attributes of the Conservation Objective for "*Salicornia* and other annuals colonising mud and sand" are summarised as follows:

- Habitat area and distribution;
- Physical structure (sediment supply; flooding regime; creeks and pans);
- Vegetation structure (zonation; height; cover); and,
- Vegetation composition (typical species and subcommunities; negative indicator species, i.e. *Spartina anglica*).

Owing to the distance of c. 6 km between the Project and any of these habitats within the River Barrow and River Nore SAC, the only impacts arising from the Project with potential to affect these Conservation Objectives are hydrological, hydraulic/sediment transport and water quality impacts, as well as invasive alien species.

Hydrology

As detailed in Section 4.2.1, the potential for the Project to give rise to hydrological impacts on the River Suir are discussed in detail in Chapter 10 (Hydrology) of the EIAR for the Project and in the SFRA for the North Quays SDZ, both of which concluded that the construction and operation of the River Suir Sustainable Transport Bridge will lead to only slight or imperceptible impacts on the local hydrology. Therefore, it can be concluded on the basis of best scientific knowledge that neither the construction nor the operation of the Project will lead to any adverse effect on the hydrological regime associated with any of these habitats within the River Barrow and River Nore SAC.

Hydraulics and sediment transport

As outlined in Sections 4.2.1 and 4.2.3 above, the *Hydraulic Modelling Report* (Hydro Environmental Ltd, 2018), which is included in Appendix C to this NIS, found that any hydraulic impacts, including any significant scouring and redeposition of sediment from the riverbed during either construction or operation of the Project is limited to within 150m upstream and 300m downstream of the Project. Therefore, it can be concluded

on the basis of best scientific knowledge that there will be no adverse effect on the physical structure of any of these habitats within the River Barrow and River Nore SAC.

Water quality

The effects of water quality impacts associated with the construction and operation of the Project on habitats is discussed in relation to salt meadows in Section 4.2.1 above. In the case of "Estuaries", "Mudflats and sandflats not covered by seawater at low tide", "Reefs" and "*Salicornia* and other annuals colonising mud and sand" in the River Barrow and River Nore SAC, the types/nature of the water quality impacts which may arise from the Project on these habitats is considered to be the same as those discussed (in Section 4.2.1) with regard to salt meadows in the Lower River Suir SAC. However, the probability of such effects occurring is higher with regard to the habitats under consideration in this section due to the greater connectivity between the Project and these habitats (they are submerged at least twice daily). The significance of any such effects is limited, however, due to the greater distance between the Project and the River Barrow and River Nore SAC and the high dilution factor provided by the volume of the estuary between the Project location and this site. Therefore, appropriate mitigation will be required to manage the risk of water quality impacts so as to eliminate any potential for adverse impacts on the Conservation Objectives for these Qualifying Interests.

Invasive species

There is a risk that aquatic invasive species such as Chinese Mitten Crab could be spread within the estuary by barges and other vessels during the construction of the Project. If this were to occur it would constitute a significant reduction in the quality and a threat to the integrity of the aquatic Annex I habitats for which this SAC is selected. Therefore, mitigation is required to prevent the import or spread of invasive species.

Conclusion

The only impacts likely to arise from the Project which have any potential to adversely affect the Conservation Objectives for the Annex I habitats for which the River Barrow and River Nore SAC is selected are water quality impacts and the spread of invasive species. Appropriate mitigation is, therefore, required to eliminate, beyond reasonable scientific doubt, the risk of such effects occurring.

4.3.2 Desmoulin's Whorl Snail

There is currently no information available in relation to the presence or absence of Desmoulin's Whorl Snail in the likely zone of impact of the Project. While there is no suitable habitat for this species within the study area, the presence of such habitat adjoining the Lower River Suir SAC or the River Barrow and River Nore SAC in the wider area upstream or downstream cannot be ruled out. Therefore, in accordance with the Precautionary Principle, it is assumed that this species occurs in natural and semi-natural wet grassland and marsh habitats within the likely zone of impact.

The Conservation Objective for Desmoulin's Whorl Snail in the River Barrow and River Nore SAC is shown in Table 3.3 above. The Attributes of this Conservation Objective are summarised as follows:

- Distribution (occupied sites);
- Population size (adults) and density;
- Area of occupancy; and,
- Habitat quality (vegetation and soil moisture levels).

As there is no suitable habitat for Desmoulin's Whorl Snail in close proximity to the Project, there will be no direct impacts on this species or its habitats. However, there is potential for the Project to cause a reduction in the quality of habitats occupied by this species in the wider area through impacts on water quality. The effects of water quality impacts associated with the Project on salt meadows bordering the River Suir and other connected water bodies are assessed in Section 4.2.1. Due to the similar pathways for impacts and degree of connectivity between the Project and salt meadow habitats and the Project and habitats for Desmoulin's Whorl Snail, it is considered that effects on any habitats for this species which may be present within the likely zone of impact are the same as those discussed in Section 4.2.1.

Therefore, the only impact from the Project with the potential to give rise to an adverse effect on the Conservation Objective for Desmoulin's Whorl Snail in the River Barrow and River Nore SAC is an impact on water quality affecting the vegetation composition in this species' habitats (if present within the likely zone of impact). As mitigation will be necessary to manage the risk of water quality impacts in any case, no additional or specific mitigation is required in respect of Desmoulin's Whorl Snail.

4.3.3 Migratory Fishes

The only migratory fish species listed as Qualifying Interests of the River Barrow and River Nore SAC which are potentially present within the likely zone of impact of the Project are Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon. The effects of the Project on individuals and populations of these species in the vicinity of the Project are assessed and evaluated, in view of the Conservation Objectives of the Lower River Suir SAC, in Section 4.2.2 above.

The River Barrow and River Nore SAC is located c. 6km downstream of the Project and the Project does not provide for any barrier to migratory fish moving between the sea and the freshwater stretches of the Rivers Barrow and Nore. Furthermore, noise and vibration or artificial lighting from the Project will not affect directly affect fish in the River Barrow and River Nore SAC. Therefore, the only impacts from the Project with potential to affect migratory fish species in this European site are water quality impacts.

Owing to the distance between the Project and the River Barrow and River Nore SAC, any water quality impacts from the Project will be of a significantly lower magnitude at this site than in the immediate vicinity of the Project. Therefore, any mitigation which is effective in terms of avoiding adverse effects on migratory fish species in the Lower River Suir SAC will be more than adequate to eliminate such effects in the River Barrow and River Nore SAC.

4.3.4 European Otter

The effects of the Project on European Otter in the Lower River Suir SAC are analysed and evaluated in Section 4.2.4 of this NIS. The effects on this Qualifying Interest in the River Barrow and River Nore SAC are considered to be the same as those for the Lower River Suir SAC, except that there will be no barrier to connectivity and no direct impacts on individuals. Therefore, any mitigation which is effective in terms of avoiding adverse effects on European Otter in the Lower River Suir SAC will be more than adequate to eliminate such effects in the River Barrow and River Nore SAC.

5.0 MITIGATION

5.1 Principles and Approach

Section 4.0 of this NIS identified adverse effects likely to arise from the Project on the specific Attributes and Targets which define the Conservation Objectives for a number of Qualifying Interests of the Lower River Suir SAC and the River Barrow and River Nore SAC. This section (Section 5.0) prescribes measures and a protocol to ensure their full and proper implementation aimed at mitigating these adverse effects, thereby protecting the integrity of these European sites during the construction and operation of the Project.

The mitigation measures prescribed in this NIS have been designed according to the principle of a mitigation hierarchy, as outlined in the European Commission's guidance document *Assessment of plans and projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC, 2001). According to this hierarchy, the following mitigation approaches were adopted, in order of decreasing preference:

1. Avoiding impacts at their source;
2. Reducing impacts at their source;
3. Abating impacts on site; and,
4. Abating impacts at their receptor.

As mitigation measures are related directly to impacts and only indirectly to receptors and as, in this case, all of the affected receptors have been identified as being affected the same set of impacts, to describe mitigation measures under the headings of the relevant receptors would lead to undue repetition. Therefore, the measures prescribed in this NIS are described under the headings of the types of impacts which they are intended to mitigate.

The mitigation measures are prescribed in Section 5.2 and a protocol to ensure their full and proper implementation is prescribed in Section 5.3. The significance of any residual effects following the inclusion of mitigation measures is evaluated in Section 5.4. As per the assessment of adverse effects in Section 4.0, this evaluation is made in view of the relevant Conservation Objectives.

5.2 Mitigation Measures

5.2.1 Water Quality

Construction Phase

The following mitigation measures relating to the protection of water quality shall apply during the construction of the Project:

<u>Sedimentation and surface water run-off</u>

- In order to attenuate flows and minimise sediment input into the River Suir from site run-off, all surface water run-off from the construction site shall be directed to a temporary attenuation facility, where the flow rate will be attenuated and sediment allowed to settle out, before passing through a hydrocarbon interceptor and being discharged to the existing South Quays sewer network.
- Sheet piling or combi-wall piling for the new quay wall either side of the southern bridge abutment shall be installed prior to excavation on the south quays and

demolition of the existing reinforced earth wall. This will form an effective barrier to run-off from the south quays during construction.

- The removal of cofferdams and temporary support piles will be undertaken at or near high water to maximise the dilution factor for any disturbed sediments and minimise the time during which any contaminants bound to disturbed sediment is suspended in the water column.
- Owing to the nature and scale of the Project, there will be minimal stockpiling of materials on site. However, any material stockpiled shall be located as far from the riverbank as practicable, covered and remain stockpiled for as short a time as possible.
- The Contractor shall provide method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in the River Suir and Waterford Harbour and the removal of site materials, fuels, tools, vehicles and persons from flood zones in order to minimise the risk of input of sediment or construction materials into the river during flood events.
- Prior to the Construction Environmental Management Plan being accepted and implemented, it shall be submitted to both the NPWS and IFI to ensure that all requirements of those bodies are satisfied.

Cementitious materials

- The measures prescribed with regard to sedimentation and surface water run-off will also minimise the risk of any input of cementitious material into the River Suir from the landside elements of the construction.
- In addition, all shuttering shall be securely installed and inspected for leaks prior to cement being poured and all pouring operations shall be supervised monitored for spills and leaks at all times.
- In order to eliminate any remaining risk of input of cementitious material into the River Suir from the landside elements of the construction, all pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents etc. for outfalls shall be completed in dry weather.
- In order to prevent input of cementitious materials into the River Suir from the in-stream elements of the construction, concrete structural elements shall be pre-cast, wherever possible.
- In addition, at all locations where concrete or other wet materials are to be used, bunded steel decks will be used to capture any spilled concrete, alkaline water displaced from inside tubular steel piles or spilled sealants or other materials.
- Any such materials collected on these platforms shall be transferred to the landside construction areas and disposed of in accordance with the Construction and Demolition Waste Management Plan.

Hydrocarbons and other chemicals

- The measures prescribed with regard to surface water run-off will also minimise the risk of any input of hydrocarbons and other chemicals into the River Suir from the landside elements of the construction. However, the following additional measures shall also apply.
- Vehicles and plant shall be refuelled off-site where possible and all fuelling of machinery shall be undertaken at least 10 m from the River Suir.
- All fuelling of vessels shall be undertaken on an impervious base in bunded areas and all fuelling equipment shall be regularly inspected and serviced.

- Standing plant and machinery shall be placed on drip-trays.
- All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. shall be stored in the construction site compound, on an impervious base which shall be bunded to 110% capacity and appropriately secured.
- All plant and construction vehicles shall be inspected daily for oil leaks and a full service record shall be kept for all plant and machinery.
- Spill kits shall be available on site during construction, including on the jack-up barge during pile driving.

Painting of the bridge

- Paints containing organotin compounds, e.g. TBT, shall not be permitted for use.
- In order to minimise the risk of paint spillage into the River Suir, the majority of the bridge deck shall be painted over land, i.e. prior to be lifted into position over the river, and painting of the remaining sections (mostly at joining points) shall be carried out above bunded steel decks which will capture any spilled paint.

Any construction-phase water quality impacts remaining following the inclusion of the above mitigation are considered to be slight to imperceptible and the risk of such impacts occurring is negligible. Therefore, given the full and proper implementation of these mitigation measures, the construction of the Project will not give rise to any adverse effects on the Conservation Objectives of either the Lower River Suir SAC or the River Barrow and River Nore SAC.

Operational Phase

As discussed in Section 4.2.1, the south quays plaza and southern half of the bridge will drain to the existing surface water drainage system, which provides adequate treatment before discharge to the River Suir and which has capacity to receive the bridge drainage, and the northern half of the bridge will drain to the River Suir as per the existing situation, but will not be in use prior to the development of the North Quays SDZ, after which it will drain into the new North Quays surface water drainage network, which will incorporate pollution controls and SUDS features treating all run-off prior to discharge. Furthermore, the use and regular maintenance of the bridge also pose almost no risk to water quality. Therefore, any water quality impacts from the day-to-day operation of the bridge will be slight to imperceptible and no mitigation is required.

The only element of the operation/maintenance of the Project with the potential to give rise to significant water quality impacts is repainting of the bridge. In order to avoid such impacts, the following mitigation shall apply:

- Paints containing organotin compounds, e.g. TBT, shall not be permitted for use.
- In order to minimise the risk of paint spillage into the River Suir, a platform shall be provided to form an effective barrier between the repainting works and the River Suir, capturing any spilled paint or other chemical.

Given the full and proper implementation of these water quality protection measures, the operation and maintenance of the Project will not give rise to any adverse effects on the Conservation Objectives of either the Lower River Suir SAC or the River Barrow and River Nore SAC.

5.2.2 Noise and Vibration

Migratory fish species

Seasonal restriction of pile driving

In accordance with the mitigation hierarchy, it is considered that the primary method of mitigating adverse effects on migratory fish species arising from noise and vibration impacts during the construction of the Project is to schedule construction activities with potential to give rise to such impacts in the periods of least sensitivity for these species. The life and diel cycles of the migratory fish species listed as Qualifying Interests of the Lower River Suir SAC and the River Barrow and River Nore SAC are described in Section 4.2.3 above and presented graphically in Table 5.1 below.

Table 5.1 Indicative migration periods for Sea Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon species in the Suir Estuary, based on Section 4.2.3 above. Blue shading indicates predominantly nocturnal activity, orange indicates predominantly diurnal activity, shade indicates relative abundance of fish.

Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sea Lamprey												
Upstream												
Downstream												
River Lamprey												
Upstream												
Downstream												
Twaite Shad												
Upstream												
Downstream (spent)												
Downstream (0+)												
Atlantic Salmon												
Upstream												
Downstream (kelts)												
Downstream (smolts)												

As illustrated in Table 5.1 above, every month of the year is a sensitive period for at least two of the migratory fish species concerned. However, there are two separate periods which are considered to be particularly sensitive, one running from February to May, inclusive, and a second from September to October, inclusive.

The February-May period covers the following:

- Most of the upstream migration of Sea Lamprey;
- A significant portion of the upstream migration of River Lamprey and the majority of the downstream migration of that species;
- Almost the entire upstream migration of Twaite Shad, which is particularly sensitive as it is a predominantly diurnal species; and,
- Almost the entire seaward migration of Atlantic Salmon smolts, as well as part of the upstream migration of spawning adults and the seaward migration of kelts.

The September-October period covers the following:

- Most of the seaward migration of Sea Lamprey;
- A potentially significant portion of the upstream migration of River Lamprey;
- Potentially significant presence of 0+ Twaite Shad in the estuary; and,
- A potentially significant portion of the upstream migration of Atlantic Salmon.

By avoiding pile driving in these periods, noise and vibration impacts on the following can be eliminated:

- Almost all upstream- and downstream-migrating Sea Lamprey;
- A significant portion of upstream-migrating River Lamprey and the vast majority of downstream-migrating individuals of this species;
- Almost all upstream-migrating Twaite Shad; and,
- Almost all seaward-migrating Atlantic Salmon smolts, as well as some of the upstream-migrating adults and seaward-migrating kelts.

Having considered the migration patterns of the species concerned, it is recommended that all pile driving be restricted to the following periods:

- 1st June to 31st August, inclusive; and,
- 1st November to 31st January, inclusive.

The June-August period is not of major importance to Sea Lamprey, River Lamprey and Atlantic Salmon, though it does cover part of the extended upstream migration of adult salmon. However, these adult salmon will be migrating almost entirely at night, when there will be no pile driving taking place. Any individuals present within the affected area are likely to escape and avoid injury and any individuals halted in their migration during the day will continue at night. Therefore, there will be no adverse effects on adult salmon migrating during this period. Very few upstream-migrating Twaite Shad are likely to be present during this period. However, spent fish are likely to return to sea via the Project location in these months and juveniles are also likely to arrive in the estuary. Therefore, further mitigation is required to minimise impacts and prevent adverse effects on this species.

The November-January period is of little importance to Sea Lamprey and this species is unlikely to be present in the estuary during this period. River Lamprey, however, are likely to migrate upstream past the Project location in significant numbers during this time. Some downstream-migrating River Lamprey may also be present in the vicinity of the Project in January. Similarly, adult Atlantic Salmon are likely to be present in significant numbers, particularly in December, and a few kelts may also be present on their seaward migration. As the working hours extend into darkness during the winter, additional mitigation is required to minimise impacts and prevent adverse effects on these nocturnal species. Juvenile Twaite Shad will also be present (as residents in the estuary) in this period. Therefore, further mitigation is also required for this species.

In summary, during the June-August period, potential remains for significant impacts on spent Twaite Shad returning to sea post-spawning and on juveniles of the same species arriving and resident in the estuary. During the November-January period, potential remains for significant impacts on upstream-migrating River Lamprey (and potentially some downstream-migrating individuals), upstream-migrating adult Atlantic Salmon (and potentially a small number of kelts) and juvenile Twaite Shad resident in the estuary.

Restriction of pile driving hours

Given the restriction of pile driving to the June-August and November-January periods and the proposed working hours of 7:00 am to 7:00 pm on weekdays and 8:00 am to 4:30 pm on Saturdays, any remaining impacts on River Lamprey and Atlantic Salmon are restricted to the winter period and are unlikely to be significant. However, owing to the importance of these months for the spawning migrations of these species, all pile driving shall be restricted to between 8:00 am and 6:00 pm and to weekdays only. This will ensure that almost no individuals of these species are halted in their migration for any period of time. Given this restriction and the low sensitivity of these individuals to noise impacts (owing to their relatively large body mass and the fact that they are hearing generalists), any remaining impacts arising from pile driving are extremely unlikely to have an adverse effect on these species.

Given the restriction of pile driving to the periods June-August and November-January, to between 8:00 am and 6:00 pm and to weekdays only, Twaite Shad is the only species for which noise impacts arising from pile driving have the potential to have an adverse effect.

Breaks between pile drives

During the summer period, Twaite Shad will be free to move past the construction area unimpeded by acoustic impacts between sunrise (latest c. 6:30 am) and 8:00 am and between 6:00 pm and sunset (earliest c. 8:30 pm), though fish are also likely to move in twilight hours also. Therefore, throughout this period, shad will have a minimum of 1.5 hours in the morning and 2.5 hours in the evening during which their movements will not be impeded by piling noise. Furthermore, there will be a complete break in piling at weekends. During the winter period, however, piling will commence before sunrise and end after sunset. Therefore, only weekends will be available as a window for upstream and downstream movements by shad. Further mitigation is, therefore, required to facilitate the movement of Twaite Shad through the construction area during the hours in which piling will take place.

There is a considerable amount of preparation required to ensure that piles are in the correct position etc. before driving begins. Therefore, once one pile is complete, a gap of c. 1 hour can be expected until the next pile is commenced, during which there will be no noise or vibration impacts. Given that the area which will be affected by noise impacts covers the full width of the river from c. 1 m upstream to c. 1km downstream of the Project, i.e. a 2km length of the river, and the cruising speed of Twaite Shad of c. 0.5 m/s (Clough et al., 2004), the majority of individuals will be able to traverse the affected area during the 1-hour gaps between pile drives (in reality, as fish will most likely be moving with the tide, most will be able to clear the area much faster than this). Given that most piles are expected to take 1-2 hours to complete, each followed by a 1-hour break in piling noise, these breaks are considered sufficiently regular to allow near-natural movement of shad past the construction area.

In order to guarantee these gaps in piling noise, particularly if there is more than one piling rig in operation at the site, the Contractor will appoint an Ecological Clerk of Works to supervise all piling activities and ensure that all breaks in piling noise are of at least 1 hour's duration and, in the case of multiple piling rigs being operational simultaneously, that these breaks are concurrent. This mitigation will ensure that noise and vibration impacts arising from the construction of the Project will not give rise to a significant barrier to the movements of Twaite Shad in the Suir Estuary.

Soft-start/ramp-up procedure

Apart from creating barriers to migration, noise and vibration impacts arising from pile driving also have the potential to directly affect, i.e. cause injury or death, to individual fish, potentially leading to effects on population structure (as discussed in Section 4.2.3 above). Given the mitigation prescribed above in respect of barriers to migration, the only species for which direct injuries to/mortality of individuals and consequent effects on population structure are potentially significant is Twaite Shad. Such impacts are likely to occur if individuals are so close to piling operations that they are subject to an SPL_{peak} above the threshold for injury/death or SEL_{cum} increases at a rate which is too fast to allow individuals to escape.

In order to minimise the risk of such impacts, it is common practice to use a "soft-start" or "ramp-up" procedure whereby the force of impact/vibration is gradually increased over a period of c. 30 minutes, affording noise-sensitive species to move away from the source of the impact and avoid injury/death. This procedure has been deemed to be effective following its widespread application in aquatic environments where there are acoustically sensitive receptors such as cetaceans or clupeid fishes. Therefore, a 30-minute soft-start/ramp-up procedure will apply to all pile driving for the Project and be supervised and enforced by the Ecological Clerk of Works. This will ensure that any direct impacts on individual shad will not give rise to significant effects on the population structure of Twaite Shad in the Lower River Suir SAC.

European Otter

The mitigation prescribed for noise and vibration impacts (above) are considered more than adequate to eliminate any risk of significant noise and vibration impacts on otters during the construction of the Project. Therefore, no further mitigation is required in respect of noise and vibration impacts on this species.

Summary

In short, the following are the mitigation measures which will apply to pile driving:

- All pile driving shall be restricted to the following periods:
  - 1st June to 31st August, inclusive; and,
  - 1st November to 31st January, inclusive.
- All pile driving shall be restricted to Monday to Friday, inclusive, i.e. there shall be no pile driving on Saturdays or Sundays.
- All pile driving shall be restricted to between 8:00 am and 6:00 pm.
- All breaks between pile drives shall be of at least 1 hour's duration and, in the case of multiple piling rigs being operational simultaneously, all such breaks shall be concurrent.
- A 30-minute soft-start/ramp-up procedure shall apply to each pile drive.
- If, for any reason, a derogation from any of the above is required, this shall only be permitted with the consent of WCCC, the NPWS and IFI.
- All of the above shall be supervised by an Ecological Clerk of Works appointed by the Contractor.

5.2.3 Lighting and Shade

Migratory fishes

The likely effects of artificial lighting and shade on the migratory fish species listed as Qualifying Interests of the Lower River Suir SAC and the River Barrow and River Nore SAC are discussed in detail in Section 4.2.3 above. In summary, light spill onto the

river channel during hours of darkness has the potential to form a barrier to the migration of nocturnal species and to encourage night-time activity of diurnal species, causing them to become more vulnerable to nocturnal predators. Owing to the scale of the Project, it will not result in significant shading impacts.

Turning off construction lighting over the river outside of working hours will eliminate any risk of these impacts outside of those hours. This will eliminate the risk of such impacts occurring during the months of April to September, inclusive, and restrict such impacts to before 7:00 pm and after 7:00 am on weekdays and before 4:30 pm and after 8:00 am on Saturdays during the months of October to March, inclusive. This would ensure at least 12 hours free of artificial light every night of the year and more at weekends. The remaining level of artificial lighting is considered unlikely to result in the significant effects discussed above. However, the risk of such effects occurring can be minimised further by ensuring that construction lighting is limited to the minimum area required, thereby minimising any light spill onto the river channel.

Therefore, subject to any Health & Safety and navigational requirements, construction lighting over the river channel shall be turned off outside of working hours. In addition, construction lighting will be limited to the minimum area required to be lit and minimise light spill onto the river channel. The Ecological Clerk of Works will ensure that these measures are adhered to during the construction stage.

During the operational phase, lighting will be limited to the minimum area required to be lit and there will be no light spill onto the river channel. This will prevent any effects of artificial lighting on the fish species which use the estuary.

European Otter

The mitigation prescribed for impacts of artificial lighting (above) are considered more than adequate to eliminate any risk of significant such impacts on European Otter during the construction and operation of the Project. Therefore, no further mitigation is required in respect of lighting impacts on this species.

5.2.4 Other Measures

Biosecurity Protocol

As discussed in Section 4.3.1 above, the use of construction vessels, e.g. the jack-up barge, poses a risk that invasive species such as Chinese Mitten Crab could be spread within the Suir-Barrow-Nore Estuary. The import or spread of invasive species has the potential to adversely affect the conservation condition of Annex I habitats, particularly "Estuaries", which is listed as a Qualifying Interest of the River Barrow and River Nore SAC. Therefore, the Contractor shall prepare a Biosecurity Protocol detailing his/her proposed approach to ensuring that invasive species are not imported or spread during construction. The Contractor's Biosecurity Protocol will be approved by the Ecological Clerk of Works prior to its acceptance and implementation.

Fish rescue during dewatering

During the erection of cofferdams, there is a risk that fish may become trapped within. In order to prevent the death of these fish, they will be removed from the cofferdam during dewatering. Owing to the high conductivity, there is a significant Health & Safety issue with electrofishing within the cofferdams at this location. Therefore, rescue of any fish present within the cofferdams shall be carried out using nets whilst the cofferdam is being dewatered.

5.2.5 Monitoring

Details of the monitoring of the mitigation measures prescribed in Sections 5.2.1-5.2.4 above are explained in detail in Section 5.3 below as part of the description of how these measures are to be implemented.

Water quality monitoring

Monitoring of water quality shall be undertaken in the River Suir, with samples taken monthly for at least 6 months prior to commencement, weekly for the entire duration of construction and monthly for at least 24 months post-completion. The parameters which shall be monitored, include but are not limited to:

- Suspended solids and turbidity;
- Total hydrocarbons;
- Ammonia, nitrates, nitrites and total nitrogen;
- Phosphates and total phosphorus;
- Dissolved oxygen and biological oxygen demand; and,
- Temperature and salinity.

Samples shall be taken from at least two different locations, including at least one location at an appropriate distance upstream of the Project and at least one other at an appropriate distance downstream of the Project. The final number and location of sampling points will be determined by the Site Environmental Manager. Given the strong tidal influence at the location of the Project, the date and exact time at which each sample is taken, as well as the direction of flow, must be recorded in order to ensure that comparative analysis of samples can control for tidal influence, as well as other variables, e.g. fluvial conditions.

The results of the water quality monitoring programme will be reviewed by the Site Environmental Manager and Ecological Clerk of Works on an ongoing basis during construction. In the event of any non-compliance with regulatory limits for any of the water quality parameters monitored, an investigation shall be undertaken to identify the source of this non-compliance and corrective action will be taken where the this is deemed to be associated with the Project.

Hydroacoustic monitoring

In order to allow for greater accuracy in the assessment of future plans and projects, it is recommended that hydroacoustic monitoring be undertaken for the full duration of the Project's construction. This monitoring will establish the ambient underwater noise levels in the estuary (and the rate of sound attenuation) and more accurately characterise the sound outputs in terms of SPL and SEL at different frequencies arising from the different methods of pile driving and different types and sizes of piles. This monitoring shall be undertaken on a continuous basis for the duration of construction and the results will be frequently reviewed (at least fortnightly) by the Ecological Clerk of Works, who may make appropriate adjustments/improvements to the mitigation in this NIS based on the result so this monitoring.

Record of intertidal habitats

In order to record any changes in the intertidal habitats, particularly mud habitats, in the vicinity of the Project, a photographic record shall be made of these habitats. This record shall cover both sides of the river from 150m upstream of the proposed bridge location to 300m downstream. All photographs shall be taken at low tide, every two

months, beginning 6 months prior to commencement of construction and finishing 12 months after completion.

5.3 Implementation

In order to give effect to the mitigation prescribed in this NIS, it should be a condition of any consent granted in respect of the Project that all of the mitigation, including monitoring and enforcement, prescribed in this NIS be binding, during the construction phase, on the Contractor and, during operational phase, on WCCC. Accordingly, all of the mitigation prescribed herein shall be transposed into the Contract Documents for the construction of the Project.

During construction, all works must comply with relevant legislation and guidelines in order to reduce and minimise environmental impacts and to protect the Lower River Suir SAC, the River Barrow and River Nore SAC and all other ecological receptors. In particular, there must be full compliance with the following:

- The Schedule of Commitments.
- The mitigation prescribed in Section 5.2 of this NIS and Chapter 7 (Biodiversity) of the Environmental Impact Assessment Report (EIAR).
- Any conditions which might be attached to the proposed development's planning consent.
- Any requirements of stakeholders and statutory bodies, e.g. the NPWS and IFI, including:
    - *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016).
- All applicable legislative requirements in relation to environmental protection.
- All relevant construction industry guidelines, including:
    - *C532 Control of water pollution from construction sites: guidance for consultants and contractors* (CIRIA, 2001).
- Any biosecurity requirements arising from the preceding points.
- The Transport Infrastructure Ireland (TII) and National Roads Authority (NRA) Environmental Assessment and Construction Guidelines, specifically:
    - *Guidelines for the Treatment of Badgers prior to the Construction of a National Road Schemes.*
    - *Guidelines for the Treatment of Bats during the Construction of National Road Schemes.*
    - *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*
    - *Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes.*
    - *Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post-Construction of National Road Schemes.*
    - *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.*
    - *Guidelines on the Management of Noxious Weeds on National Roads.*
    - *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
    - *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.*

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

This list is non-exhaustive. All environmental commitments/requirements and relevant legislation and guidelines which are current at the time of construction will be followed.

5.3.1 Environmental Management Plans

Construction Environmental Management Plan

Prior to any demolition, excavation or construction, the Contractor will be required to produce a Construction Environmental Management Plan (CEMP) describing the Contractor's overall management and administration of the construction of the Project. The CEMP will be prepared by the Contractor during the pre-construction phase to ensure that the Project is completed on time and within budget. The CEMP will include a detailed programme of works and budget and will also ensure that all construction activities are undertaken in a satisfactory and safe manner and to a programme which meets WCCC's requirements.

The CEMP will contain the following information of general importance:

- An overview of the proposed development.
- An organisational chart illustrating the structure of the Contractor's project team and the duties and responsibilities of the various members.
- The Contractor's communications strategy.
- The contact details of relevant persons/entities, e.g. the Safety Officer, the Site Environmental Manager and the emergency services.
- A list of the documents which will have informed the CEMP, including all relevant legislation and construction/environmental guidelines.

In relation to environmental management, the CEMP will provide and full list of the Contractor's environmental commitments and will detail the Contractor's approach to the following:

- Management of waste arising from construction and demolition.
- Control of sediment, run-off, erosion and pollution.
- Minimisation of noise and vibration impacts.
- Minimisation of artificial lighting and shading.
- Management of risk from invasive alien species.
- Response to emergencies/other incidents, including environmental incidents.
- Awareness of the surrounding environment and the Contractor's environmental commitments among site personnel.
- Monitoring, inspection and auditing of the Contractor's compliance with his/her environmental commitments.

Other topics covered by the CEMP will include the management of construction traffic and Health & Safety issues.

All of the mitigation measures prescribed in Section 5.2 of this NIS must be effectively transposed into the appropriate sections of Contractor's CEMP.

Environmental Operating Plan

The Contractor's Environmental Operating Plan (EOP) will be prepared in accordance with *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan* (NRA, 2007). The protection of European sites will be a core objective of the EOP, which will set out the Contractor's approach to managing environmental issues during the construction of the Project and detail how the Contractor will ensure the full and proper implementation of all of the mitigation prescribed in this NIS and in other relevant documents. The details to be contained in the EOP include, as a minimum:

- All environmental commitments and mitigation stipulated in the planning documentation in respect of the Project, including sediment controls and other measures to ensure that water quality in the River Suir and Waterford Harbour is not degraded.
- Any requirements of statutory bodies such as the NPWS and IFI, including adherence to Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016).
- A detailed Biosecurity Protocol.
- A list of all applicable legislative requirements in relation to environmental protection and a method of documenting compliance with these requirements.
- Outline methods by which construction activities will be managed in such a manner as to avoid, reduce or remedy potential negative impacts on the environment.
- An Incident Response Plan (described below).

Incident Response Plan

The Incident Response Plan (IRP) will form part of the EOP and detail the Contractor's planned response to fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incidents within an area of traffic management. This must include:

- Contact names and telephone numbers for the local authority, i.e. Waterford City & County Council (all sections and departments), An Garda Síochána and ambulance and fire services; and,
- Method statements for weather forecasting and continuous monitoring of water levels in the River Suir and Waterford Harbour. The plan must outline how the Contractor will respond to forecasted flood events, including but not limited to, details of removal of site materials, fuels, tools, vehicles and persons from flood zones.

Construction and Demolition Waste Management Plan

The Construction and Demolition Waste Management Plan (CDWMP) will detail the Contractor's proposals regarding the treatment, storage and recovery or disposal of waste. This plan will contain, but not be limited to, the following:

- Details of waste storage, e.g. skips, bins, containers, to be provided for different waste and collection times;
- Details of where and how materials are to be disposed of, e.g. landfill or other appropriately licensed waste management facilities;
- Details of storage areas for waste materials and containers;

- Details of how and where hazardous wastes such as oils, diesel and other hydrocarbons or chemical waste are to be stored and disposed of in a suitable manner; and,
- Details of how construction and demolition waste will be dealt with.

Outline Environmental Management Plans

The CEMP, the EOP, including the IRP, and the CDWMP are grouped together as Environmental Management Plans (EMPs).

Outline EMPs are included in Appendix E. These outline EMPs will be provided to the Contractor and it will be his/her responsibility to develop his/her own EMPs based on the outlines provided. Prior to their acceptance and implementation, the Contractor's EMPs will be subject to approval by the Site Environmental Manager and Ecological Clerk of Works (described in Sections 5.3.2 and 5.3.3 below), as well as the Employer's Representative.

5.3.2 Site Environmental Manager

To ensure the successful development, implementation and maintenance of the EOP, the Contractor will appoint an independent Site Environmental Manager (SEM). He/she must possess training, experience and knowledge appropriate to the role, including a National Framework of Qualifications (NFQ) Level 8 qualification (or equivalent) or other acceptable qualification in environmental science, environmental management, hydrology or engineering. The principal functions of the SEM will be to ensure that the mitigation prescribed in this NIS, the EIAR, the CEMP, the EOP and the CDWMP, is fully and properly implemented and to monitor the construction stage from an environmental perspective. The SEM will also provide independently verifiable audit reports.

Separate from the on-going and detailed monitoring carried out by the Contractor as part of the EOP, the SEM will carry out the inspection and monitoring described below on behalf of WCCC. The results will be stored in the SEM's monitoring file and will be available for inspection or audit by WCCC, the NPWS or IFI.

- Daily reporting on weather and flood forecasting and daily reporting on the monitoring of water levels in the Lower River Suir.
- Weekly inspections of the principal control measures described in the CEMP and reporting of findings to the Contractor.
- Daily inspections of surface water treatment measures.
- Daily inspections of all outfalls to watercourses.
- Daily visual inspections of watercourse to which there are discharges from the works and those in the vicinity of construction works.
- Weekly inspections of wheel-wash facilities.
- Daily monitoring of any stockpiles.
- Auditing at least six times per quarter of the Contractor's EOP monitoring results.

5.3.3 Ecological Clerk of Works

In order to ensure the successful development and implementation of the CEMP, the Contractor will appoint an independent Ecological Clerk of Works (ECoW). The ECoW must possess training, experience and knowledge appropriate to the role, including:

- An NFQ Level 8 qualification or equivalent or other acceptable qualification in ecology or environmental biology; and,

- Demonstrable experience in the protection of European sites.

The principal functions of the ECoW are:

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

During the preparation of the Contractor's CEMP, the SEM may, as appropriate, assign other duties and responsibilities to the ECoW.

In exercising his/her functions, the ECoW will be required to keep a monitoring file and this will be made available for inspection or audit by WCCC, the NPWS or IFI at any time.

5.4 Residual Effects

5.4.1 Annex I Habitats

Following the inclusion of the mitigation measures in Section 5.2 above, the probability of impacts on water quality arising from the construction of the Project are very low and the significance of any such impacts, if they were to occur, would be slight to imperceptible. The probability and significance of any such impacts arising from the operation of the Project are lower still. In addition, the inclusion of a Biodiversity Protocol and enforcement of the same by the ECoW will ensure that the risk posed by invasive species is effectively managed during construction. Thus, it can be concluded beyond reasonable scientific doubt that any residual impacts on water quality arising from the Project will not constitute adverse effects on any of the Annex I habitats.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and operation of the Project will not adversely affect the integrity of either the Lower River Suir SAC, in view of its Conservation Objectives for "Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)", "Mediterranean salt meadows (*Juncetalia maritimi*)" and "Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels", or the River Barrow and River Nore SAC, in view of its Conservation Objectives for "Mudflats and sandflats not covered by seawater at low tide", "Reefs", "*Salicornia* and other annuals colonising mud and sand", "Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)", "Mediterranean salt meadows (*Juncetalia maritimi*)" and "Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels".

5.4.2 Desmoulin's Whorl Snail

The mitigation prescribed in respect of water quality impacts and invasive species will provide for the protection of any riparian habitat for Desmoulin's Whorl Snail present within the likely zone of impact of the Project. As stated in Section 5.4.1 above, any residual impacts on these habitats will not constitute adverse effects.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and

operation of the Project will not adversely affect the integrity of the River Barrow and River Nore SAC, in view of its Conservation Objective for Desmoulin's Whorl Snail.

5.4.3 Migratory Fish Species

Following the inclusion of the mitigation measures in Section 5.2 above, the probability of impacts on water quality arising from the construction of the Project are very low and the significance of any such impacts, if they were to occur, would be slight to imperceptible. The probability and significance of any such impacts arising from the operation of the Project are lower still. Thus, it can be concluded beyond reasonable scientific doubt that any residual impacts on water quality arising from the Project will not constitute adverse effects on migratory fish species.

The mitigation prescribed in Section 5.2 above in respect of noise and vibration almost completely avoids impacts on nocturnal fish species and reduces the potential impacts on these species and Twaite Shad to slight to imperceptible. The residual impacts on migratory fish species arising from noise and vibration concern:

- The movement of upstream-migrating adult River Lamprey and Atlantic Salmon during winter, i.e. the months of November, December and January, and a few downstream-migrating individuals of these species later in this period;
- The movements of downstream-migrating Twaite Shad (post-spawning) during the summer, i.e. the months of June, July and August; and,
- The movement and population structure of juvenile Twaite Shad resident in the estuary during both summer and winter.

Owing to the mitigation prescribed in this NIS and the duration of the Project, which is not expected to exceed two years, it can be concluded that these residual impacts do not constitute adverse effects on these species.

Any residual impacts of artificial lighting arising from the Project are restricted to the period from October to March, inclusive, and the construction stage only. Owing to the mitigation prescribed, these impacts are characterised as an imperceptible impact on the movement of nocturnal species, i.e. Sea Lamprey, River Lamprey and Atlantic Salmon, and a slight impact of increased predation risk on juvenile Twaite Shad. Given the small scale and short duration of these residual impacts, it can be concluded that they do not constitute adverse effects on these species.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and operation of the Project will not adversely affect the integrity of either the Lower River Suir SAC or the River Barrow and River Nore SAC, in view of their Conservation Objectives for Sea Lamprey, Brook Lamprey, River Lamprey, Twaite Shad and Atlantic Salmon.

5.4.4 European Otter

As stated in Sections 5.2.2 and 5.2.3 above, the mitigation prescribed in relation to the impacts of piling noise and artificial light on migratory fish species are considered more than adequate to address disturbance impacts on European Otter. Thus, it can be concluded that any residual impacts of disturbance to otters do not constitute adverse effects on this species.

Similarly, as explained in Section 4.2.4 above, the impact of the Project on fish biomass available to otters was considered was treated as a potentially significant impact on this species. However, as the residual impacts on migratory fish species have been

shown to be slight to imperceptible, it can now be concluded that there will not be a significant reduction in the fish biomass available to otters. Thus, any residual impact in terms of fish biomass will not constitute an adverse effect on this species.

Therefore, given the full and proper implementation of the mitigation prescribed in this NIS, it can be concluded beyond all reasonable scientific doubt that construction and operation of the Project will not adversely affect the integrity of either the Lower River Suir SAC or the River Barrow and River Nore SAC, in view of their Conservation Objectives for European Otter.

6.0 IN-COMBINATION EFFECTS

6.1 Introduction

Article 6(3) of the Habitats Directive requires that AA be carried out in respect of plans and projects that are likely to have significant effects on European sites, "either individually or in combination with other plans or projects". Therefore, the combined effects of the plan or project under assessment and other past, present or foreseeable future plans or projects must also be examined, analysed and evaluated.

6.2 Methodology

In-combination effects were assessed by examining all previous plans and projects, plans and projects currently in planning and proposed future plans and projects within 15 km of the Project location from 2008 to the present. There is too much uncertainty associated with development proposals beyond 5 years into the future and this NIS can only be based on data that is readily available. This assessment has considered in-combination effects that are:

- Likely;
- Significant; and
- Relating to a future event which is reasonably foreseeable

Data sources included the following:

- Waterford City & County Council (planning and roads sections)
- Kilkenny County Council (planning and roads sections)
- An Bord Pleanála website (planning searches)
- Web search of windfarm projects in Waterford City and County and Co. Kilkenny
- General web search for major infrastructure projects in Waterford City & County and in Co. Kilkenny
- Waterford City Development Plan 2013-2019
- Waterford County Development Plan 2011-2017
- Kilkenny County Development Plan 2014-2020
- Ferrybank Belview Local Area Plan 2009-2020 (including Amendment 1)
- Coillte Website
- Inland Fisheries Ireland (IFI) website
- The National Spatial Strategy

6.3 Adverse In-combination Effects

Table 6.1 below details the assessment of the likelihood of significant effects arising from the Project in combination with other plans or projects. This assessment was undertaken in view of the Conservation Objectives of the relevant European sites and found that the Project does not have the potential to significantly affect any European site in combination with other plans or projects, except for developments which are part of the North Quays SDZ.

Table 6.1 Assessment of adverse effects arising from the Project in combination with plans or projects.

Name of plan or project	Description of plan or project	Likely in-combination effects
Waterford North Quays Strategic Development Zone	The proposed development will support the future development and social integration with the North Quays SDZ Planning Scheme that includes the development of a new urban quarter with commercial, residential developments, a transport hub and tourism infrastructure that will be connected via the Project to the existing city centre urban core.	Owing to the potential for significant noise and vibration impacts arising from the SDZ developments and the likely overlap in programme between these developments and the Project, significant in-combination effects cannot be ruled out at this stage. Therefore, mitigation is required to minimise the risk of such impacts occurring.
Waterford City Development Plan 2013-2019	This plan sets out an overall strategy for the proper planning and sustainable development of Waterford City and supports the development of the proposed Sustainable Transport Bridge.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Waterford County Development Plan 2011-2017	This plan sets out the overall strategy for the proper planning and sustainable development of the County for the period 2011-2017. Key strategic sites supporting and fostering entrepreneurship are promoted.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Kilkenny County Development Plan 2014-2020	This plan sets out Kilkenny County Council's policies and objectives for the proper planning and sustainable development of the county for the period 2014-2020. The Project will assist with allowing the sustainable development objectives of the plan to be realised by encouraging sustainable modes of transport. The Project will also allow South Kilkenny to grow by connecting the region with Waterford City centre.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Waterford Planning, Land Use and Transportation Study (PLUTS) (2004)	The Waterford PLUTS recognises the potential of the North Quays as an extension of the city centre and prioritises a new city centre sustainable transport bridge and a new public transport interchange at North Quay. Key recommendations of the PLUTS include: • A new city centre bridge for pedestrians and cyclists which will link the redeveloped North Quays with the existing City Centre; • Provision of a rail-passenger platform on the North Quays as part of a new Public Transport Interchange; and, • A future third bridge crossing downstream on the River Suir which would complete the loop around the system connecting the N25 Bypass, the River Suir Bridge and the Outer Ring Road. The Project will satisfy the proposals outlined in the PLUTS by providing a bridge for pedestrians and cyclists, easing and improving accessibility between the city centre and the future redevelopment of the North Quays through an additional river crossing.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Economic Strategy for Waterford City and County (2013)	The strategy includes a number of proposals for the of the North Quarter and waterfront. Key long-term (2018) economic objectives outlined in the report include: • Assess the roles of South and North Quays and to better connect with the waterfront. Agree demolition of much of North Quays silos and develop an amenity area, open up stretches of South Quays, less parking and more defined zones of different activity. • Potential for a self-contained river-side village – south-facing and often sheltered from the prevailing winds. Waterside restaurants, festival shopping, boutique hotels, apartments, offices, ateliers and galleries beside a riverside boardwalk. Scope for development (probably residential and hotel-led) that benefits from the south facing aspect and views to the core city centre. The strategy aims to identify measures to maximise the economic development of Waterford and its wider hinterland/region and, in particular, to enhance the role of Waterford City as a generator of growth and a strong and dynamic focus for development of the wider region. The Project will assist the economic strategy reach its objectives by improving connectivity of Waterford City with residential areas in South Kilkenny and with the North Quays SDZ.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Waterford North Quays – Urban Design Framework Plan (2008)	This plan presents a vision for the North Quays, providing basic development concepts and key urban design guidelines, bringing together an integrated framework plan for the area. The Plan outlines the need for more balanced growth between north and south sides of the River Suir, a new city centre pedestrian and cycle bridge, the provision of a rail platform on the North Quays and the development of a mix of uses on the site. The Project is a key enabler of the Waterford North Quays Urban Design Framework Plan and the proposed expansion of the City Centre.	This framework plan is a high-level strategy for the development of the North Quays and does not provide for any adverse effects. Therefore, there will be no in-combination effects with the Project.
Ferrybank – Belview Local Area Plan 2017	This plan outlines a strategy for the proper planning and sustainable development of an area of land stretching from Grannagh to Belview and from the River Suir to the line of the Waterford bypass. The policies, objectives and zoning for existing and future development of the Ferrybank area have been considered as part of the Planning Scheme proposals. The LAP re-emphasises the PLUTS requirement for a "*new city centre bridge for pedestrians and cyclists which will link the redeveloped North Quays with the existing City Centre*". The plan also highlights that the Ferrybank/Belview area is in close proximity to Waterford City which "*means that many opportunities exist for the promotion of walking, cycling and public transport".*	This plan is a high-level strategy for development in the Ferrybank-Bellview area. Therefore, there is no potential for adverse effects in combination with the Project.
One Waterford: Local Economic & Community Plan 2015-2020	This plan identifies positive step changes that will deliver the economic and social transformation of Waterford, to grow the local and regional economy, strengthen Waterford's role as the regional leader of the South East, ensure that our communities are strong and engaged, and ensure that all people have an excellent quality of life. An objective of the plan is to revitalise, regenerate and improve the urban environment, including realising the economic potential of the North Quays by 2019. The Project is necessary in order for these objectives to be realised.	This plan is a high-level strategy for development in Waterford. Therefore, there is no potential for adverse effects in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Report of the Waterford Re-Organisation Implementation Group and Economic Strategy for Waterford City and County, One Waterford – Delivering Jobs, Efficiency and Growth (2013)	This plan outlines an Economic Strategy for Waterford City and County. The plan determines that certain key interventions are needed to enable the sustainable growth and recovery of the economy of Waterford and the South East and addresses the inhibitors of growth. The development, improvement of public realm and commercial opportunities of the North Quays are recommended to help develop the critical mass of Waterford as a Gateway City. The Project is necessary in order for the strategy to be realised.	This is a high-level strategic plan which will set out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Waterford City and County Council Corporate Plan 2014-2019	This plan outlines strategic priorities and objectives for the Council for its lifetime and is reflective of the needs and priorities of all the communities and citizens of Waterford.	This is a corporate plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Waterford City Retail Strategy 2012	This strategy provides a quantitative and qualitative analysis of the potential of Waterford City to accommodate further retail development. The strategy outlines policies with the aim of meeting the City's shopping needs in a way that is efficient, equitable and sustainable. Additional convenience and comparison retail floor space is required for Waterford City.	This is a strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Waterford Climate Change Strategy 2011	This strategy aims to implement a series of measures that will result in reductions in the emissions of greenhouse gases. Climate change measures are addressed under the Strategic Environmental Objectives.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Waterford Kilkenny Advisory Regional Strategic Plan 2015-2020	The Teagasc Strategic Plan for the Waterford Kilkenny Advisory Region outlines ways to help farmers exploit their natural advantages and become world leaders in sustainable agricultural production.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Strategic Plan 2014-2017 Waterford – Active People, Active Place	This plan's objective is the development and delivery of sport and physical activity opportunities in County Waterford.	This is a strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Waterford City Centre Urban Renewal Scheme (2015)	This scheme outlines public realm upgrades, alterations to traffic circulation and the demolition of a number of old buildings in the hope to upgrade the urban centre. The Urban Renewal Scheme focuses on the city centre.	Owing to the nature of this scheme, it will not give rise to adverse effects in combination with the Project.
Kilkenny City and Environs Development Plan 2014-2020 – Appendix A Retail strategy	This plan looks at the 2008 update to the Kilkenny City and County Retail Strategy and takes into account the economic changes in the city since. Waterford is identified within the strategy as the Gateway of the region. As the Project will allow the connectivity of Waterford City Centre with the proposed North Quays shopping facilities in the SDZ, it will encourage the growth of retail in the city.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Fisheries Local Action Group (FLAG) Local Development Strategy 2016	This strategy assesses the development needs of the FLAG area, outlining objectives and actions to further develop the industry within the area. The strategy does not relate specifically to the location of the Project. The nearest location included in the strategy is Cheekpoint, c. 4 km downstream.	As the Project has been assessed as not having adverse effects on fisheries, it will not give rise to significant in-combination effects with this strategy.
Waterford Children & Young People's Services Committee Children & Young People's Plan 2015-2018	This plan identifies the needs of children and young people and lays out a set of priority actions which are intended to improve service delivery and achieve better outcomes for all children in the area.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Regional Planning Guidelines for the South East Region 2010-2022	These guidelines are a strategic planning framework for the period 2010-2022 for the development of each region and for interregional cooperation. The strategic policies and objectives set out in the guidelines will form the backdrop for socio-economic planning by national and regional agencies and will constitute the policy framework within which county, city, town and local area development plans will be made. The guidelines support the re-development of the North Quays was included as a Critical Enabling Investment Priority in the Regional Planning Guidelines in 2004. A rail passenger platform on the North Quays and a river crossing to provide a link across the river are outlined as objectives.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Southern Regional Spatial and Economic Strategy	A Regional Spatial and Economic Strategy (RSES) is currently being prepared by the Southern Regional Assembly. The main statutory purpose of the RSES is to support the implementation of the draft National Planning Framework and the economic policies and objectives of the Government by providing a long-term strategic planning and economic framework for the development of the three regions: Eastern & Midland; Southern; and Northern & Western. The Southern RSES will be a strategic plan which identifies regional assets, opportunities and pressures and will provide appropriate policy, objective and target responses. It will put in place policies and recommendations that will better manage regional planning and economic development throughout the region.	This is a high-level strategic plan which will set out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
River Basin Management Plans and Programme of Measures	The River Basin Management Plans, once produced, will ensure the Rivers Suir and Barrow achieve "good" status by 2027.	These measures will result in positive impacts on water bodies. Therefore, there will be no adverse effects on European sites in combination with the Project.
Catchment Flood Risk Assessment and Management (CFRAM) (2011)	The CFRAM Programme was brought into place in Ireland in 2011, as a strategy for medium- to long-term flood risk reduction and management. The Programme is led by local authorities as well as the OPW, and it incorporates core components of the National Flood Policy (2004) and requirements of the Floods Directive.	Any flood protection interventions arising out of this programme will require assessments to ensure that they do not give rise to adverse effects in combination with other plans and projects, including the project. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Draft Flood Risk Catchment Management Plans for the South East	The objectives of this draft plan are to identify flood risk, to identify structural and non-structural measures and options for managing flood risk.	As above.
South East Region Employment Action Plan 2011	This revisits the Regional Competitiveness Agendas for the South East region, taking account of recent developments and analysis, and outlines specific actions that can be taken to maximise employment creation in the region in the short and medium-long-term. It promotes Waterford as a gateway, taking action to maximise employment creation.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Southern Regional Waste Management Plan 2015-2021	This plan is a guide to help us manage our wastes in a safe and compliant manner, through policies and actions. It provides policy direction in a broad manner, setting out what we want to achieve and a roadmap of actions to get us there.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
River Basin Management Plan 2018-2021	The River Basin Management Plan 2018-2021 aims to protect all waters within the district and where necessary, improve waters and achieve sustainable water use. The SEOs have included an objective to maintain the water quality standards in the South East River Basin Management Plan.	This plan will result in positive impacts on water bodies. Therefore, there will be no adverse effects on European sites in combination with the Project.
Southern and Eastern Regional Operational Programme 2014-2020	This programme is intended to support and facilitate Member States and Managing Authorities in the implementation of the partnership principle. A priority objective is to revitalise, regenerate and improve the urban environment in the designated urban centres as part of integrated urban strategies. Waterford Gateway was awarded funding in 2014 through the Designated Urban Centres Grant Scheme 2014-2020, with aims to regenerate substantial brownfield sites in the city centre, while improving accessible public realm and transport modes.	This is a high-level strategic programme and does not provide for measurable impacts on biodiversity. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
South East Economic Development Strategy (SEEDS) 2013-2023	This strategy aims to identify the economic needs of the South East, with the objective of considering what steps can be taken to improve the employment situation, examining the region's particular circumstances and making specific proposals to create jobs and grow the regional economy.	This is a high-level strategic plan which sets out policies and objectives. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
River Suir Sustainable Transport Bridge Ground Investigations	Ground investigations were undertaken in 2017 within the proposed development location to inform the bridge design.	These works did not result in any adverse effects on the River Suir and have now ceased. Therefore, there is no potential for adverse effects on any European site in combination with the Project.
Newgate Properties Ltd. [Planning Ref. 16175]	The development is to include (i) a shopping centre bounded by Alexander St to the north; Michael Street to the east; Stephen's Street to the west and New Street to the south, and (ii) a multi-storey car park accommodating 385 spaces on four levels, linked to the shopping centre by a glazed pedestrian bridge and (iii) demolition works. Permission was granted in February 2017 subject to conditions. The decision found that the scheme would not have unacceptable adverse effects on the environment. The proposal is c. 400 m SSE of the Project.	Owing to the distance of this proposal to the River Suir, there is no potential for adverse effects in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Waterford – New Ross (Kilkenny) Greenway	The proposed development comprises of the disused railway line on lands which extend from within Waterford City & County Council's administrative boundary through to Rosbercon, New Ross as a cycle and pedestrian route. The route, which is 22 km in length, will begin at Abbey Road, Ferrybank. The development received Part VIII planning permission in 2018. An EIA Screening, EcIA and AA Screening were submitted with the planning application, concluding that no significant impacts will occur to protected sites as a result of the development.	Owing to the nature and scale of the greenway and the fact that no new watercourse crossings are included, there will be no adverse effects in combination with the Project.
ESB 110KV Station [Planning Ref. 16768]	The development consists of alterations to the existing 110KV station consisting of one 38KV MV module, one MV GIS module, one house transformer, 2 No. cable chairs, new internal gates in existing fence, associated drainage and site works at the ESB Waterford 110 kV station at Gracedieu Road. The site is located 950 m upstream of the Project on the south side of the River Suir. Planning permission was granted in January 2017 [Planning Reference: 16768]. An AA Screening determined that the development will not significantly affect any European site.	Owing to the nature and scale of this development and its distance from the River Suir, there will be no adverse effects in combination with the Project.
CHI Environmental [Planning Ref. 15647]	Planning permission was granted in 2016 for change of use of existing industrial site and buildings, formerly used as an aluminium paint manufacturing facility, to a materials recovery and transfer facility and civic amenity centre, alterations to the external elevations of buildings and all associated site works.	Owing to the scale of this development and its distance from the Project, there will be no adverse in-combination effects.
Waterford Flood Alleviation Scheme Phase 1	Flood protection works were completed in 2014 along the River Suir upstream at its confluence with John's River at Scotch's Quay/George's Quay along the length of the South Quay to Rice Bridge and on John's River from its confluence with the River Suir at Scotch Quay/George's Quay. The flood protection works are in immediate proximity to the Project.	These works have been completed and did not give rise to adverse effects. As there are no ongoing or future effects, there will be no adverse effects in combination with the Project.
Waterford Greenway Cycle and Pedestrian Route – Kilmeaden to Bilberry	A 9.6km Greenway between Kilmeaden and Bilberry, Waterford, 600 m upstream of the Project, on the south side of the River Suir, is open to the public. The route forms part of the Waterford to Dungarvan "Déise Greenway".	These works have been completed and did not give rise to adverse effects. As there are no ongoing or future effects, there will be no adverse effects in combination with the Project.
Stafford Bonded Warehousing Ltd [Planning Ref. 1624]	Permission was granted in 2016 for the erection of a 11.2 m high twin-portal industrial warehouse unit (c. 1,984 m^2) for the bonded storage of spirits with associated office, canteen and toilet facilities, parking, external lighting, boundary fencing and associated site works. The site is located c. 10 km south of the Project.	Given the distance between this site and the River Suir, there is no potential for adverse effects in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Uptown Property Developments Ltd [Planning Ref. 16392]	Planning permission was granted in 2016 for 6 No. light industrial/warehouse units comprising of ground floor storage, office, canteen, reception, toilets, together with storage area on mezzanine level and associated external signage, 3 No. pavement area for external storage and associated boundary treatments; 2 No. vehicular access points, car-parking, access roads, landscaping and boundary treatment and all other associated site works. The proposed development is located in Waterford Airport Business Park, Kilowen, approximately 9 km SE of the Project.	Given the distance between this site and the River Suir, there is no potential for adverse effects in combination with the Project.
Roadstone Ltd [Planning Ref. 16700]	Permission was granted in 2017 for the continuation of quarrying activities and to include the extension of the existing excavation by an additional 2 × 15m high benches from the current floor level of c. -15 mOD to -45 mOD within the permitted extraction footprint area of 27.06 ha. The quarry is located c. 5 km ENE of the Project.	Given the nature of these activities and the distance between this site and the River Suir, there is no potential for adverse effects in combination with the Project.
Seed Technology Ltd [Planning Ref. 15397]	Permission was granted in 2015 for a seed processing and storage building (4,836 m^2), fertilizer bagging and storage building (6,094 m^2), 2 No. external dust extraction silos, single storey office building and car parking (156 m^2), weighbridge, external fertilizer pallet storage yard, 4 No. external fire-water storage tanks, storm water attenuation pond, on site borewell and associated pump house, wastewater treatment system and percolation area, extension of existing site access road, infilling of low-lying portion of site with excavated material from the development, signage, boundary fencing and landscaping together with all associated site development works. The site is located near Belview Port.	Due to the distance between the Project and the processing and storage building, there is no potential for significant in-combination effects.

Name of plan or project	Description of plan or project	Likely in-combination effects
Glanbia Ingredients Ireland DAC [Planning Ref. 17153 and 1777]	Permission was granted in June 2017 for extensions to an existing dairy processing facility [Planning Ref. 17153]. The extensions will incorporate a new warehouse, 5-storey production building, evaporator building, wet process, extension to the utility building, new boiler building (with new exhaust stack 45 m), new dairy intake building, single-storey extension to the sprinkler building, as well as other items of external plant and machinery, pipe bridges, ingredient silos and refrigeration plant. The proposed extensions also includes landscaping, internal road changes with lighting and ancillary external works. The second permission [Planning Ref. 1777] is for an extension to the existing milk powder processing plant, extensions to the existing administration building to accommodate an enlarged food preparation area, additional personnel facilities, offices and a laboratory. The development will also include alterations to existing roads, car parks, drainage system, services and landscaped areas, a new 97-space car park, truck loading and unloading bays, paved areas and all associated drains and services, including lighting and landscaping. The extension is located in IDA Science & Technology Park, Gorteens, 4 km east of the Project.	An Environment Impact Statement and NIS was submitted with the applications. Permission was granted subject to conditions including the provision of a CEMP and WMP. Given the distance between these developments and the conditions attached to the planning permissions, there will be no adverse effects in combination with the Project.
Target Fertilisers Ltd. [Planning Ref. 1646]	Permission was granted for the erection of an industrial warehouse building for the storage and bagging of fertiliser products, superseding a previous permission [Planning Ref. 15/263]. The permission also includes alterations to site boundaries including new boundary wall and fencing and all associated site works and ancillary services. The proposed warehouse location is c. 4 km east of the Project.	Given the nature and scale of this development and its distance from the Project, there will be no adverse in-combination effects.
Glanway Ltd. [Planning Ref. 1591]	Permission for an extension of use including additional processing and an increase in throughput up to 95,000 tonnes per annum of municipal waste material at the waste facility. Permission was also sought for a prefabricated building with an office, canteen and toilet; alterations to site works and retention of existing doors on the north elevation of Store No.5 (P11/397) and on the east elevation of Store No.6 (P13/585). The site is located at Belview Port, c. 4 km E of the Project and EIAs and NISs were submitted with the planning applications.	Due to the distance between the Project and this development and the absence of adverse effects arising from either, there will not be significant in-combination effects.

Name of plan or project	Description of plan or project	Likely in-combination effects
Kent Quarries Ltd. [Planning Ref. 15366]	Permission was granted in March 2017 within part of an existing quarry for a recycling facility for the recycling of construction and demolition waste and for the importation and recovery of non-hazardous soils, subsoil and other similar material. Material will be crushed and screened using existing mobile quarry plant and machinery and non-hazardous soils will be used in the existing rehabilitation scheme for the quarry. The planning application was accompanied by an NIS and Environmental Impact Statement. The quarry is located c. 8.3 km north of the Project.	Given the distance between this development and the River Suir, there will be no adverse effects in combination with the Project.
Abbey Community College Extension	Permission for the construction of 3,240 m^2 standalone 2-storey extension to existing school, provision of new staff and visitor carpark, reorientation of existing grit pitch, alterations to the existing school building, provision of new on-site bus and car set down facilities, new paved external social space, works to existing site entrance and all associated site works. This application is part of a joint application with Kilkenny County Council (with part of the proposed development located in County Kilkenny). The college extension is located c. 550 m east of the Project.	Owing to the nature and scale of this development, there will be no adverse effects in combination with the Project.
Dredging	A permit was granted with conditions by the EPA for the dumping at sea of dredged material arising from maintenance dredging by Port of Waterford Company at a number of discrete locations in the Suir Estuary/Waterford Harbour over an 8-year timeframe (2014-2021). This disposal site has been used in the past by Waterford Port Company and licensed previously (1996, 1999-2002, 2003-2007 and 2008-2012) to dispose dredge material excavated from Waterford Port. An NIS was prepared as part of the application. The NIS concluded that the increase in suspended solids and associated sedimentation will be very limited both in concentration, duration and spatial extent and will be comparable to naturally occurring conditions in the estuary. Therefore, no impact on protected shoreline habitats or reef habitat is anticipated. The NIS further concluded that migrating fish will not be impeded by the temporary increases in suspended sediments as salmon, shad and lampreys are adapted to migrate through turbid estuarine waters and in most cases will bypass the affected areas. Otters are similarly adapted to turbid estuarine environments and are limited to foraging within 80 m of the shore. Grey seals are mobile species and will vacate an area that is temporarily disturbed, therefore the impact on this qualifying interest is negligible. The NIS concludes as follows: "*The proposed dredging and disposal operations will not negatively impact on the integrity of the Natura 2000 sites, their qualifying interests or marine mammals.*"	Given the discussion and conclusions of the NIS for the dredging activities, there will be no adverse effects in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
Demolition of Former R&H Grain Store	The 9-storey reinforced concrete former R&H grain store on the North Quays in Waterford City was demolished in July 2018. The demolition works were carried out to facilitate the future redevelopment of the Waterford North Quays.	These works have been completed and did not give rise to adverse effects. As there are no ongoing or future effects, there will be no adverse effects in combination with the Project.
Waterford City Public Infrastructure Project: Rock Stabilisation and Rock Protection Works Part VIII Application	The rockface running parallel to the railway line behind Plunkett Station requires works to reduce the risk of global slope instability and of rockfalls which could affect railway infrastructure, Irish Rail personnel or the public. The project comprises of c. 380 m of rockface remedial works consisting of a combination of rock face stabilisation measures (rock bolting and netting) and rock fall protection systems (metal rockfall barriers fixed to the rockface or rockfall strengthened earth embankments). Other works which are anticipated to be required to facilitate the construction include the temporary removal of the existing signal cabin adjacent to the rockface (to be reinstated following the works), construction of a temporary access embankment from imported & site won material in front of sections of the rockface to enable rockface reprofiling, installation of a cut off drain at the top of the rockface and its connection into the existing station drainage network, excavation of existing rockfall debris at the place of the proposed rockfall embankment and de-vegetation of the rock face where required.	Owing to the nature and scale of these works and their removal from the River Suir, they will not give rise to any adverse effects in combination with the Project.
Waterford City Public Infrastructure Project: SDZ Access and Public Road Infrastructure Part VIII Application	The proposed road and access infrastructure will consist of modifying and upgrading the existing R711 dual carriageway and Abbey Road to facilitate the connection of the existing and proposed future planned road, cycling and pedestrian network with a future planned internal road, cycle and pedestrian network within the North Quays SDZ. Connection into the SDZ is proposed through two bridge access points located at the eastern and western ends of the SDZ respectively. The eastern access will connect into a realigned Abbey Road and the western access will connect to the R711 opposite the currently unoccupied Ard Rí Hotel entrance. The site is set back from the existing Dock Road and adjacent properties and is also set back from the River Suir.	Owing to the nature and scale of the proposed road works and their removal from the River Suir, they will not give rise to adverse effects in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
WCCC Transportation Hub: Dock Road and North Quays SDZ Application	Construction of a new transport hub to accommodate the relocation of the existing passenger terminus from Plunkett train station. The project has not yet been fully defined or designed at this stage. However, the site is defined and the works are likely to comprise of the following; site clearance (including the demolition of the existing railway overbridge at the site); 2 No. 200 m long station platforms; a train station building at the eastern end of the platform which will comprise of a concourse/waiting area and a footbridge/plaza bridge over the railway line connecting into the SDZ development; a footbridge at the western end of platforms connecting into the SDZ development; hard landscaping of the area between the Project (access infrastructure) drop-off/set-down area and the station/platforms to facilitate safe access and egress into the station and North Quays SDZ. The site is set back from the existing Dock Road and adjacent properties and is also set back from the River Suir.	Owing to the nature and scale of this project and its proximity to the River Suir, there is considered to be some potential for adverse effects in combination with the Project. However, the AA Screening and, if required, AA for this project will include the Project in its assessment of in-combination effects and any such effects will be assessed and, if necessary, mitigated at that stage.
WCCC Flood Defences Project	The aim of this future project is to provide flood protection to the west of Rice Bridge. This project will be developed between Irish Rail, the Office of Public Works and WCCC and is currently at preliminary discussion stage. In the absence of any design or even design options, an assessment of cumulative effects with this project cannot be undertaken at this stage. Once developed, this project will be required to undertake the appropriate assessments including EIA Screening and AA Screening and consider the cumulative effects resulting from all other projects, as appropriate.	Owing to the nature and scale of this project and its proximity to the River Suir, there is considered to be potential for adverse effects in combination with the Project. However, the AA Screening and, if required, AA for this project will include the Project in its assessment of in-combination effects and any such effects will be assessed and, if necessary, mitigated at that stage.
Sisters of the Sacred Heart of Mary	Permission for the construction of a Sheltered Residential Care Home for the Sisters of the Sacred Heart of Mary was granted in January 2018. Accommodation will consist of 8 No.1-bedroom independent living units, communal living accommodation, oratory and all associated ancillary accommodation in 2 No. single-storey blocks. All of the above works will be undertaken with new site car parking, alterations to internal site road access and all associated site works. The site is located c. 700 m east of the Project.	Given the nature and scale of this development, there will be no adverse effects in combination with the Project.
Carrickphierish, Noel Frisby [Planning Ref. 16/534]	Planning permission for the construction of 18 No. 2-storey houses and 2 No. 2-storey apartment blocks was granted in 2017. Block 1 will contain 6 No. 2-bedroom apartments while Block 2 will contain 5 No. 2-bedroom and 2 No. 1-bedroom apartments. Permission also includes for all associated site works. The location of the development is 3 km west of the Project.	Owing to the nature and scale of this development and its distance from the River Suir, there will be no adverse effects in combination with the Project.

Name of plan or project	Description of plan or project	Likely in-combination effects
McInerney Homes Ltd – Housing Development [Planning Ref. 14500067]	Extension of the duration of a previous permission under Planning Ref. 09/500006 was granted in 2014 and will be valid until 2019. The development consists of the construction of 22 No. semi-detached homes to replace 18 No. detached houses on site numbers 58 -75 granted under Planning Permission No. 04/500131, minor adjustments to the approved road layout and all associated site works. The proposed development is located 1.8 km upstream of the Project.	Owing to the nature and scale of this development and its distance from the River Suir, there will be no adverse effects in combination with the Project.
Michael Hanrahan [Planning Ref. 17222]	An extension in duration of the planning application 12/500066 was granted in May 2017. The development comprises building 36 No. houses consisting 3- and 4-bedroom detached and semi-detached 2-storey and/or dormer-style 3-storey houses. Estate entrances are provided from Gracedieu Road and Quarry Road and together with all associated site development works and all associated services installation. The site is located 1.7 km upstream of the Project, adjacent to the Bilberry Industrial Estate.	Owing to the nature and scale of this development and its distance from the River Suir, there will be no adverse effects in combination with the Project.
Dermot Fitzpatrick – Housing Development at Prospect Lodge [Planning Ref. 9500222]	Permission was granted in 2010 for the construction of 97 No. dwelling units, a 2-storey crèche, change of use of Prospect Lodge from residential to office use and 4-bed dwelling including demolitions, landscaping, boundary treatment, outfall sewers to Billberry Road and River Suir and vehicular access from Gracedieu Road, c. 1 km upstream of the Project.	Owing to the nature and scale of this development and its distance from the River Suir, there will be no adverse effects in combination with the Project.
Respond! Housing Association	Permission was granted in May 2014 for the demolition of existing building and construction of 10 Bo. 2-bedroom sheltered housing units in 1- and 2-storey buildings and all associated site development works. The site is located c. 550 m E of the Project, on Abbey Road. The development is subject to environmental requirements by the planning authority which must be followed by the developer to ensure best practicable means are implemented to prevent and minimise impacts due to construction and operation of the development. An AA Screening completed by Waterford City Council found there to be no significant effects on the Lower River Suir SAC as a result of the proposed development.	Given the nature and scale of the development and the findings of its AA Screening, there will be no significant in-combination effects with the Project.
S.E. Construction (Kent) Limited [Planning Ref. 16675]	Permission was granted in 2017 for the construction of Phase 3: 44 No. dwelling houses at Cluain Lárach, Knockenduff, Tramore including alternations to existing services. This project is 12 km SW of the Project.	Given the distance between this development and the River Suir, there will be no adverse effects in combination with the Project.

6.4 Mitigation

In order to mitigate against the potential adverse effects arising from the in-combination effects of the Project with developments associated with the North Quays SDZ, WCCC, as the developer of the River Suir Sustainable Transport Bridge and the Competent Authority for the future SDZ planning applications and all associated Part VIII planning applications, shall not permit pile driving to be undertaken for any of these developments within 100 m of any element of ongoing piling works for the bridge, unless otherwise agreed with IFI and the NPWS. This will require coordination with the SEM and ECoW for the construction of the Project.

It is considered that this coordination of pile driving between the Project and any SDZ developments will effectively mitigate any cumulative impacts, thereby preventing adverse in-combination effects on either the Lower River Suir SAC or the River Barrow and River Nore SAC.

7.0 CONCLUSION

This NIS has been prepared in accordance with the relevant provisions of the Habitats Directive, the Habitats Regulations and the Planning and Development Act, as well as the relevant case law and current guidance. It has demonstrated that, in the absence of appropriate mitigation, the River Suir Sustainable Transport Bridge, individually or in combination with other plans or projects, would adversely affect the integrity of two European sites, namely the Lower River Suir SAC and the River Barrow and River Nore SAC, in view of their Conservation Objectives. In light of this finding, this NIS has prescribed appropriate mitigation to eliminate or minimise such effects. Any residual effects, either individually or in combination with other plans or projects, have been assessed as not constituting adverse effects on the integrity of the European sites concerned. This assessment has been undertaken on the basis of the best scientific knowledge in the field and the Precautionary Principle. No reasonable scientific doubt remains as to the absence of such effects.

It is the considered opinion of ROD, as the author of this NIS, that, in making its AA in respect of the proposed River Suir Sustainable Transport Bridge, the Board, as the Competent Authority in this case, may determine that, given the full and proper implementation of the mitigation prescribed in this NIS, the Project, either individually or in combination with other plans or projects, will not adversely affect the integrity of the Lower River Suir SAC, the River Barrow and River Nore SAC or any other European site. Furthermore, ROD recommends that it be a binding condition of any consent granted in respect of the Project that the mitigation prescribed in this NIS be fully and properly implemented.

8.0 REFERENCES

Andrade, N.O., Quintella, B.R., Ferreira, J., Pinela, S., Póvoa, I. Pedro, S. and Almeida, P.R. (2007) Sea lamprey (*Petromyzon marinus* L.) spawning migration in the Vouga river basin (Portugal): poaching impact, preferential resting sites and spawning grounds. *Hydrobiologia* 582:121-132.

Bailey, M. and Rochford, J. (2006) Otter Survey of Ireland 2004/2005. *Irish Wildlife Manuals* 23. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Caltrans (2015) *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. July 2015.* California Department of Transport, Sacramento.

Chanin, P. (2003) Ecology of the European Otter. *Conserving Natura 2000 Rivers Ecology Series* 10. English Nature, Peterborough.

Clough , S.C., Lee-Elliott, I.E., Turpenny, A.W.H., Holden, S.D.J. and Hinks, C. (2004) *The swimming speeds of twaite shad (Alosa fallax). R&D Technical Report W2-049/TR3.* The Environment Agency, Bristol.

Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed.).* The Bat Conservation Trust, London.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Official Journal of the European Communities, *L206/7*.

CRFB & DCMNR (2005) *Guidelines on the Construction & Operation of Small-Scale Hydro-Electric Schemes and Fisheries. Consultation Document. June 2005.* Central & Regional Fisheries Boards and the Engineering Division of the Department of Communications, Marine and Natural Resources.

DAHG (2014) *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters. January 2014.* Department of Arts, Heritage and the Gaeltacht, Dublin.

Dawson, H., Quintella, B., Almeida, P., Treble, A. and Jolley, J. (2015) *The Ecology of Larval and Metamorphosing Lampreys.* In: Docker, M. (eds) Lampreys: Biology, Conservation and Control. *Fish & Fisheries Series* 37. Springer, Dordrecht.

DEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin.

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive). Official Journal of the European Union, *L20/7*.

Doherty, D., O'Maoiléidigh, N. and McCarthy, T.K. (2004) The Biology, Ecology and Future Conservation of Twaite Shad (*Alosa fallax* Lacépède), Allis Shad (*Alosa alosa* L.) and Killarney Shad (*Alosa fallax killarnensis* Tate Regan) in Ireland. *Biology and Environment: Proceedings of the Royal Irish Academy* 104B(3), 93-102.

EC (2000) *Managing Natura 2000 sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.

EC (2001) *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Environment Directorate-General of the European Commission.

EC (2007) *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the Concepts of Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence*. Opinion of the European Commission.

Esteves, E. and Andrade, J.P. (2008) Diel and seasonal distribution patterns of eggs, embryos and larvae of Twaite shad *Alosa fallax fallax* (Lacépède, 1803) in a lowland tidal river. *Acta Oecologica* 34(2):172-185.

European Communities (Birds and Natural Habitats) Regulations, 2011. *SI No. 477/2011.*

European Communities (Birds and Natural Habitats) (Amendment) Regulations, 2013. *SI No. 499/2013.*

European Communities (Birds and Natural Habitats) (Amendment) Regulations, 2015. *SI No. 355/2015.*

Fossitt, J. (2000) *A Guide to Habitats in Ireland*. The Heritage Council, Kilkenny.

Foster-Turley, P., Macdonald, S.M. and Mason C.F. (eds.) (1990) *Otters: An Action Plan for their Conservation*. International Union for the Conservation of Nature and Natural Resources (Species Survival Commission) Otter Specialist Group.

Freyhof, J. and Kottelat, M. (2008) *The IUCN Red List of Threatened Species 2008:* Alosa fallax *e.T904A13092303.* <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T904A13092303.en> [Accessed 15/10/2018]. International Union for Conservation of Nature and Natural Resources, Cambridge.

Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coughlan, B., and King, J.J. (2016) *National Programme: Habitats Directive and Red Data Book Species Executive Report 2015.* Inland Fisheries Ireland, Dublin.

Gallagher, T., O'Gorman, N.M., Rooney, S.M., Coghlan, B., and King, J.J. (2017) *National Programme: Habitats Directive and Red Data Book Species Summary Report 2016.* Inland Fisheries Ireland, Dublin.

Garcia de Leaniz, C., Forman, W.D., Davies, S. and Thomson, A. (2006) Non-intrusive monitoring of otters (*Lutra lutra*) using infrared technology. *Journal of Zoology* 270(4):577-584.

Gregory, J. and Clabburn, P. (2003) Avoidance behaviour of *Alosa fallax fallax* to pulsed ultrasound and its potential as a technique for monitoring clupeid spawning migration in a shallow river. *Aquatic Living Resources* 16:313-316.

Haraldstad, T., Kroglund, F., Kristensen, T., Jonsson, B. and Haugen, T.O. (2017) Diel migration pattern of Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) smolts: an assessment of environmental cues. *Ecology of Freshwater Fish* 26(4):541-551.

Hendry, K. and Cragg-Hine, D. (2003) Ecology of the Atlantic Salmon. *Conserving Natura 2000 Rivers Ecology Series* 7. English Nature, Peterborough.

Hillman, R. (2003) *The Distribution, Biology and Ecology of Shad in South-West England. R&D Technical Report W1-047/TR.* The Environment Agency, Bristol.

Hoover, J.J. and Murphy, C.E. (2018) *Maximum swim speed of migrating Sea Lamprey (*Petromyzon marinus*): reanalysis of data from a prior study.* ERDC/TN ANSRP-18-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Hubley, P.B., Amiro, P.G., Gibson, A.J.F., Lacroix, G.L. and Redden, A.M. (2008) Survival and behaviour of migrating Atlantic salmon (*Salmo salar* L.) kelts in river, estuarine, and coastal habitat. *ICES Journal of Marine Science* 65:1626-1634.

Hydro Environmental Ltd (2018) *Hydraulic Modelling of Proposed River Suir Sustainable Transport Bridge. Report No. HEL212202 v1.1. October 2018.* Report by Hydro Environmental Ltd, Clarinbridge for Roughan & O'Donovan, Sandyford.

Ibbotson, A.T., Beaumont, W. R. C., Pinder, A., Welton, S. and Ladle, M. (2006) Diel migration patterns of Atlantic salmon smolts with particular reference to the absence of crepuscular migration. *Ecology of Freshwater Fish* 15(4):544-551.

Ibbotson, A.T., Beaumont, W.R.C. and Pinder, A.C. (2011) A size-dependent migration strategy in Atlantic salmon smolts: Small smolts favour nocturnal migration. *Environmental Biology of Fishes* 92(2):151-157.

IFI (2012) *National Programme: Habitats Directive and Red Data Book Fish species. Executive Report 2011. IFI Report Number: IFI/2012/1-4103.* Inland Fisheries Ireland, Dublin.

IFI (2013) *National Programme: Habitats Directive and Red Data Book Fish Species. Summary Report 2013.* Inland Fisheries Ireland, Dublin.

IFI (2014) *National Programme: Habitats Directive and Red Data Book Fish Species. Summary Report 2014.* Inland Fisheries Ireland, Dublin.

IFI (2016) *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*. Inland Fisheries Ireland, Dublin.

IFI (2018a) *Twaite Shad* <https://www.fisheriesireland.ie/fish-species/twaite-shad .html> [Accessed 15/10/2018]. Inland Fisheries Ireland, Dublin.

IFI (2018b) *Juvenile Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/juvenile-shad-monitoring.html> [Accessed 15/10/2018]. Inland Fisheries Ireland, Dublin.

IFI (2018c) *Adult Shad Monitoring* <https://www.fisheriesireland.ie/Habitats-and-Red-Data-Book/adult-shad-monitoring.html> [Accessed 15/10/2018]. Inland Fisheries Ireland, Dublin.

King, J.J. (2007) Ecological Impact Assessment (EcIA) in relation to Atlantic Salmon in Special Areas of Conservation and potential for impact of OPW's channel maintenance work. *Series of Ecological Assessments on Arterial Drainage Maintenance* 3. Environment Section, Office of Public Works, Headford.

King, J.J. and Linnane, S.M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals* 14. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

King, J.J. and Roche, W.K. (2008) Aspects of anadromous Allis shad (*Alosa alosa* Linnaeus) and Twaite shad (*Alosa fallax* Lacépède) biology in four Irish Special Areas of Conservation (SACs): status, spawning indications and implications for conservation designation. *Hydrobiologia* 602, 145-154.

King, J.J., Hanna, G. and Wightman, G.D. (2008) Ecological Impact Assessment (EcIA) of The Effects of Statutory Arterial Drainage Maintenance Activities on Three Lamprey species (*Lampetra planeri* Bloch, *Lampetra fluviatilis* L., and *Petromyzon marinus* L.). *Series of Ecological Assessments on Arterial Drainage Maintenance* 9. Environment Section, Office of Public Works, Headford.

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) *Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Lindberg, D.E. (2011) Atlantic salmon (*Salmo salar*) migration behavior and preferences in smolts, spawners and kelts. *Introductory Research Essay* 14. Department of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences, Umeå.

Lucas, M. and Bracken, F. (2010) *Potential impacts of hydroelectric power generation on downstream-moving lampreys at Howsham, Yorkshire Derwent.* School of Biological and Biomedical Sciences, Durham University.

Maitland, P.S. (2003) Ecology of the River, Brook and Sea Lamprey. *Conserving Natura 2000 Rivers Ecology Series* 5. English Nature, Peterborough.

Maitland, P.S. and Hatton-Ellis, T.W. (2003) Ecology of the Allis and Twaite Shad. *Conserving Natura 2000 Rivers Ecology Series* 3. English Nature, Peterborough.

Mills, D.H. (1989) *Ecology and Management of Atlantic Salmon.* Chapman and Hall, London.

Moore, A., Potter, E.C.E., Milner, N.J. and Bamber, S. (1995) The migratory behaviour of wild Atlantic salmon (*Salmo salar*) smolts in the estuary of the River Conwy, North Wales. *Canadian Journal of Fisheries and Aquatic Sciences* 52:1923-1935.

MOR (2010) *Grattan Quay, Bilberry Road & Quarry Road Improvement Works, Waterford City. Environmental Impact Report.* Report by Malone O'Regan, Dublin for Waterford City Council, Waterford.

Moser, M.L., Jackson, A.D., Lucas, M.C. and Mueller, R.P. (2014) Behavior and potential threats to survival of migrating lamprey ammocoetes and macrophthalmia. *Reviews in Fish Biology and Fisheries* 25(1):103-116.

NBDC (2018) *Biodiversity Maps* <https://maps.biodiversityireland.ie> [Accessed 23/08/2018]. National Biodiversity Data Centre, Waterford.

NPWS (2009) *Threat Response Plan: Otter (2009-2011)*. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

NPWS (2010) *Circular NPW 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin.

NPWS (2011a) *Conservation Objectives for the River Barrow and River Nore SAC [002162]. Version 1.0.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2011b) *Conservation Objectives for the Hook Head SAC [000764]. Version 1.0.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2012) *Marine Natura Impact Statements in Irish Special Areas of Conservation – a working document. April 2012.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2013a) *The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3. Version 1.0.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2013b) *The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2013c) *Site Synopsis for the Lower River Suir SAC [002137]. Rev13.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2016) *Site Synopsis for the River Barrow and River Nore SAC [002162]. Rev16.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2017a) *Conservation Objectives for the Lower River Suir SAC [002137]. Version 1.* National Parks & Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin.

NPWS (2017b) *Natura 2000 Standard Data Form for the Lower River Suir SAC [002137]. Update 2017-09.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2017c) *Natura 2000 Standard Data Form for the River Barrow and River Nore SAC [002162]. Update 2017-09.* National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2018) *Online Map Viewer* <http://webgis.npws.ie/npwsviewer/> [Accessed 23/08/2018]. Department of Culture, Heritage and the Gaeltacht, Dublin.

NRA (2006) *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*. National Roads Authority, Dublin.

NRA (2007) *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*. National Roads Authority, Dublin.

NRA (2008) *Guidelines for Crossing Watercourses during the Construction of National Road Schemes*. National Roads Authority, Dublin.

NRA (2014) *Management of Waste from National Road Construction Projects*. National Roads Authority, Dublin.

OPW (2006) *The Office of Public Works Ecological Impact Assessment (EcIA) of the Effects of Statutory Arterial Drainage Maintenance Activities on the Otter (Lutra lutra)*. Series of Ecological Assessment on Arterial Drainage Maintenance. Office of Public Works.

People Over Wind and Peter Sweetman *v*. Coillte Teoranta [2018] C-323/17.

Planning and Development Act, 2000. *No. 30 of 2000*.

Planning and Development (Amendment) Act, 2002. *No. 32 of 2002*.

Planning and Development (Strategic Infrastructure) Act, 2006. *No. 27 of 2006*.

Planning and Development (Amendment) Act, 2010. *No. 30 of 2010*.

Potter, I.C. (1980) Ecology of Larval and Metamorphosing Lampreys. *Canadian Journal of Fisheries and Aquatic Sciences* 37(11):1641-1657.

Quintella, B.R., Póvoa, I. and Almeida, P.R. (2009) Swimming behaviour of upriver migrating sea lamprey assessed by electromyogram telemetry. *Journal of Applied Ichthyology* 25(1):46-54.

Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. and Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. *Irish Wildlife Manuals* 76. National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Rossmore *v*. An Bord Pleanála [2014] IEHC 557.

Rooney, S. and King, J.J. (2015) *A poster on acoustic tracking of twaite shad by the Habitats Directive and Red Data Book Species team presented at the 3rd International Conference on Fish Telemetry (ICFT) in Halifax, Nova Scotia in 2015.* Inland Fisheries Ireland, Dublin.

Russon, I.J. and Kemp, P.S. (2011) Experimental quantification of the swimming performance and behaviour of spawning run river lamprey *Lampetra fluviatilis* and European eel *Anguilla anguilla*. *Journal of Fish Biology* 78:1965-1975.

Silva, S., Servia, M.J., Vieira-Lanero, R. and Cobo, F. (2013) Downstream migration and hematophagous feeding of newly metamorphosed sea lampreys (*Petromyzon marinus* Linnaeus, 1758). *Hydrobiologia* 700:277-286.

Smith, I.P. and Smith, G.W. (1997) Tidal and diel timing of river entry by adult Atlantic salmon returning to the Aberdeenshire Dee, Scotland. *Journal of Fish Biology* 50(3):463-474.

Smith, G.F., O'Donoghue, P., O'Hora, K. and Delaney, E. (2011) *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council, Kilkenny.

Sweetman & Others *v*. An Bord Pleanála [2013] C-258/11.

Teague, N. and Clough, S.C. (2011) *Investigations into the response of 0+ twaite shad (*Alosa fallax*) to ultrasound and its potential as an entrainment deterrent.* In: Turnpenny, A.W.H. and Horsfield, R.A. (2014) International Fish Screening Techniques. *WIT Transactions on State of the Art in Science and Engineering* 71. WIT Press, Southampton.

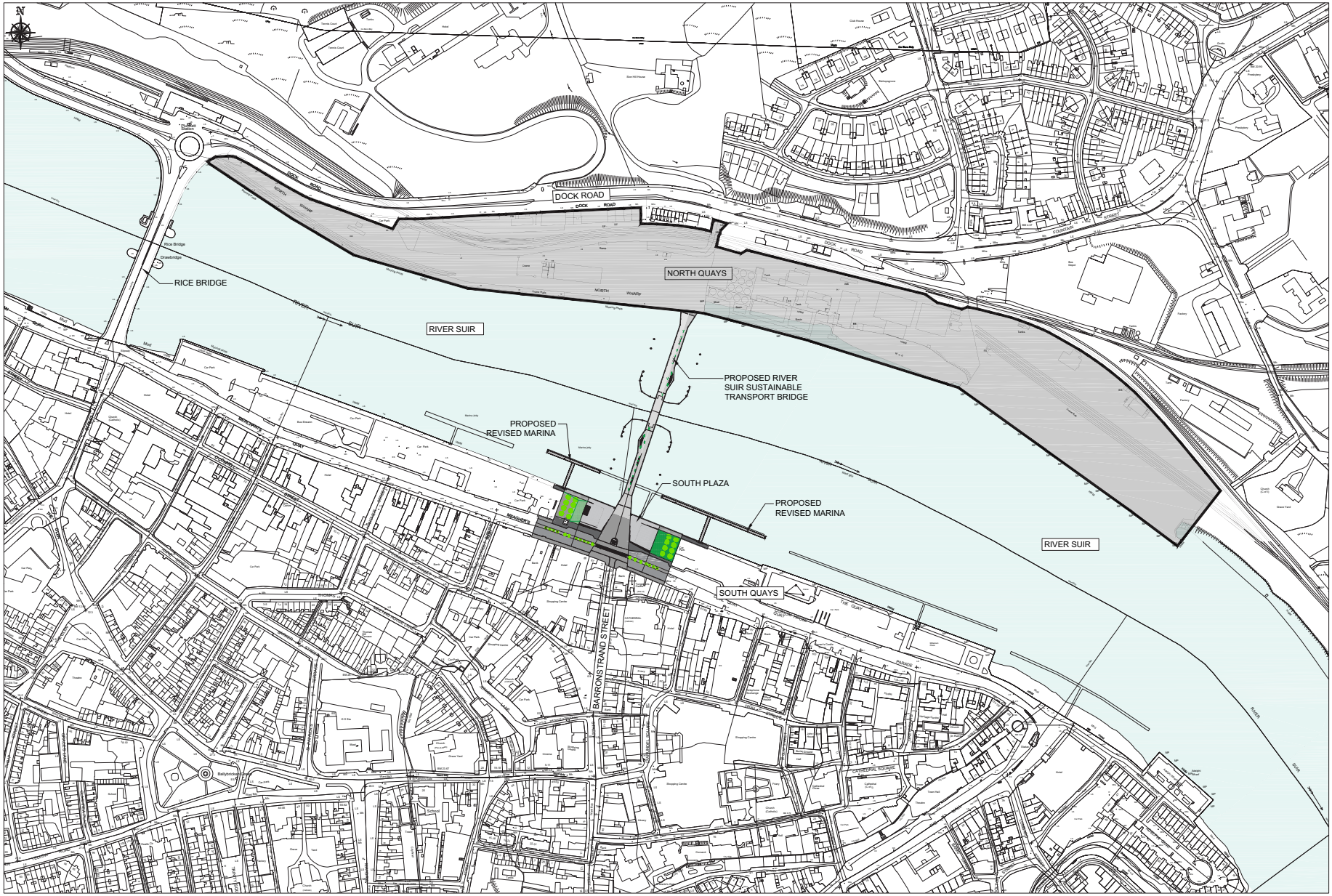
Thorpe, J.E., Metcalfe, N.B and Fraser, N.H.C. (1994) *Temperature dependence of switch between nocturnal and diurnal smolt migration in Atlantic salmon.* In: MacKinlay, D.D. (ed.) *High Performance Fish.* International Fish Physiology Symposium, Vancouver, pp. 83-86.

Vrieze, L.A., Bergstedt, R.A. and Sorensen, P.W. (2011) Olfactory-mediated stream-finding behavior of migratory adult sea lamprey (*Petromyzon marinus*). *Canadian Journal of Fisheries and Aquatic Sciences* 68(3):523-533.

APPENDIX A
Project Drawings

LEGEND:

STRATEGIC DEVELOPMENT ZONE



Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

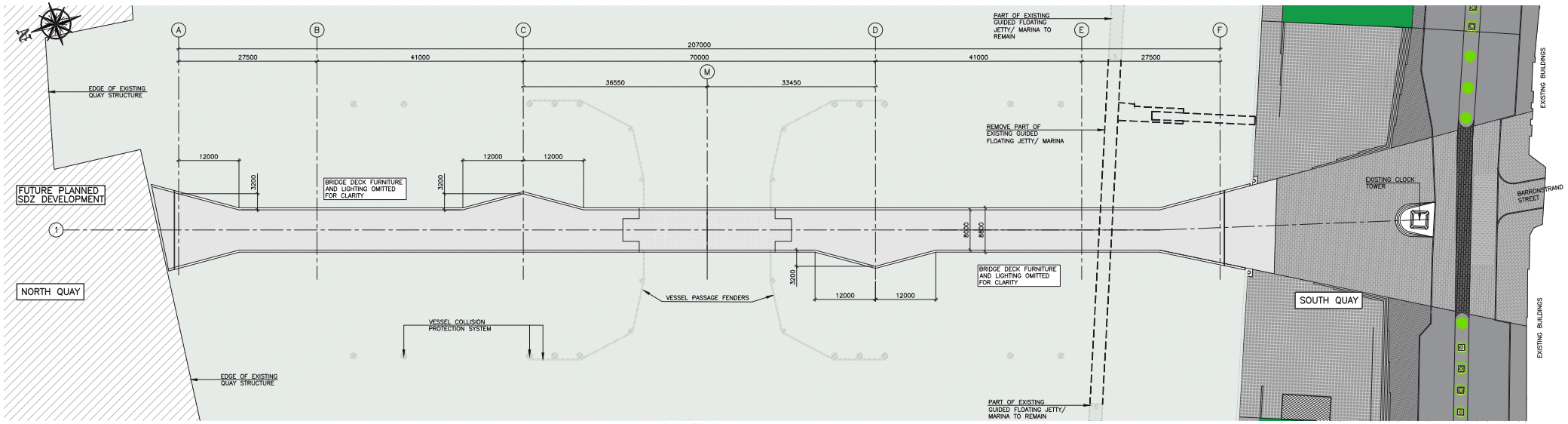
Drawing Title: EXTENT OF SITE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Designed:	Checked:	Approved:	Status:	Drawn:	Job No:	Drawing No:	Rev:
EP	CS	TD	E.I.A.R	OB	16.169	Figure 4.1	-

Scale: (A1) 1:1500 - (A3 1: 3000) Date: JUL '18

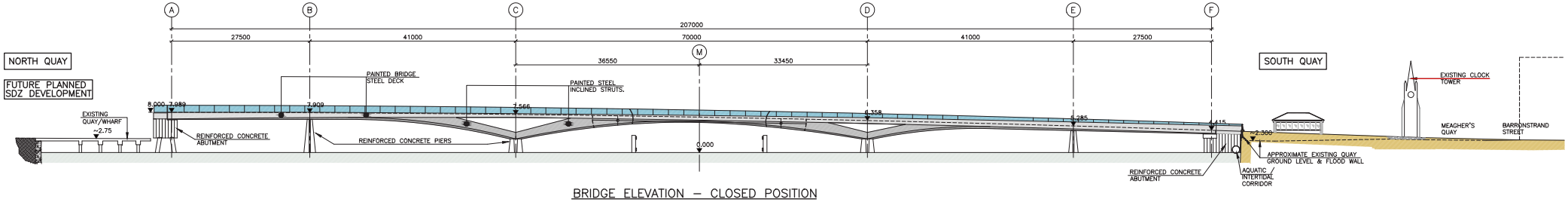
14 December 2018 14:05:29 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.1_REV B.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY



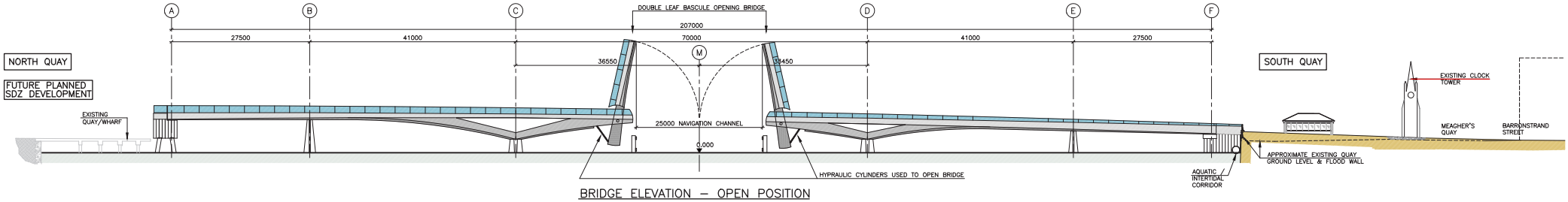
BRIDGE PLAN

SCALE 1:400



BRIDGE ELEVATION – CLOSED POSITION

SCALE 1:400



BRIDGE ELEVATION – OPEN POSITION

SCALE 1:400

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
-					
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

Drawing Title: BRIDGE PLAN, VERTICAL ALIGNMENT & ELEVATION
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

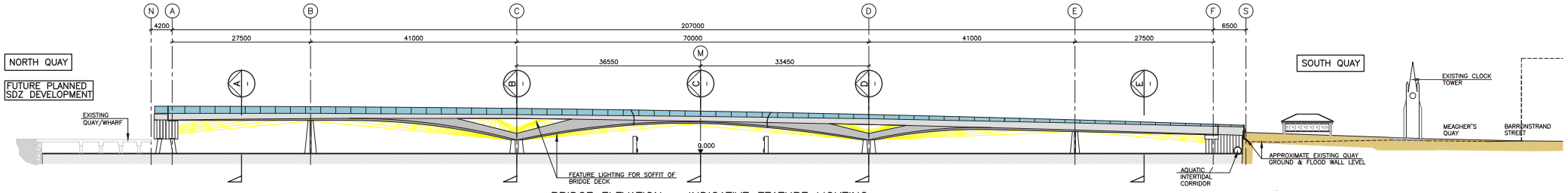
Designed:	Checked:	Approved:	Status:
DC / EP	CS	TD	E.I.A.R

Drawn:	Job No:	Drawing No:	Rev:
PE	16169	Figure 4.2	-

Scale: (A1) AS SHOWN | Date: OCT '18

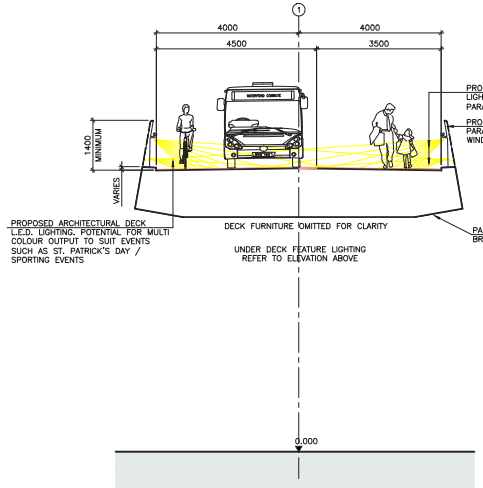
14 December 2018 16:16:43 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.2_4.3_4.4_4.5.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

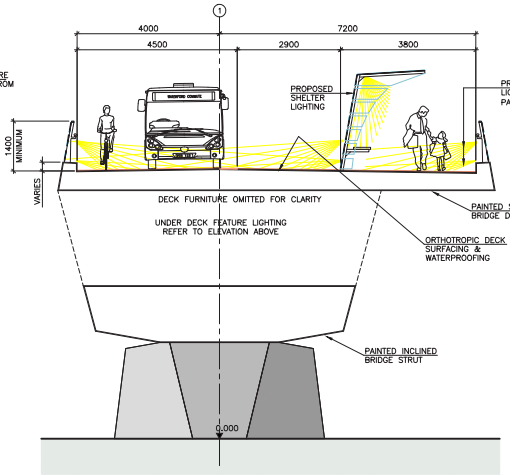


BRIDGE ELEVATION – INDICATIVE FEATURE LIGHTING

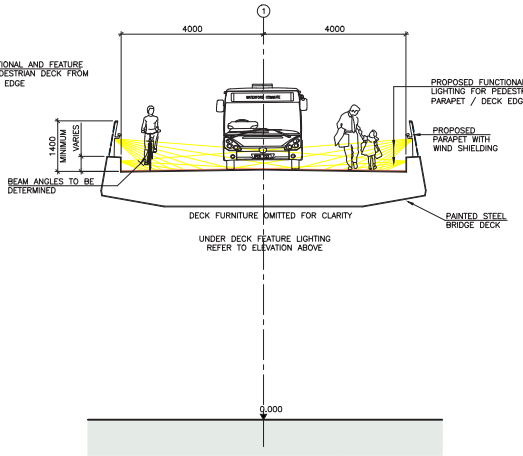
SCALE 1:400



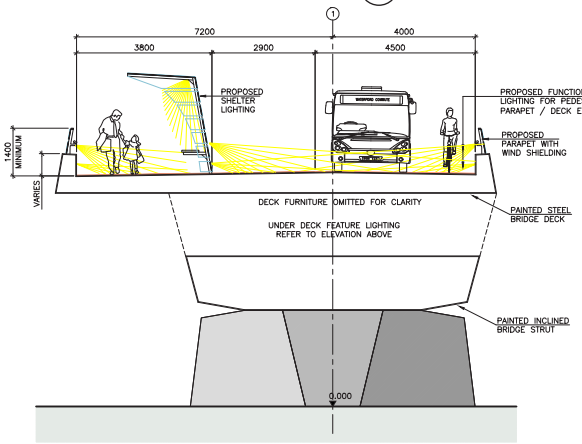
SECTION A
SCALE 1:75



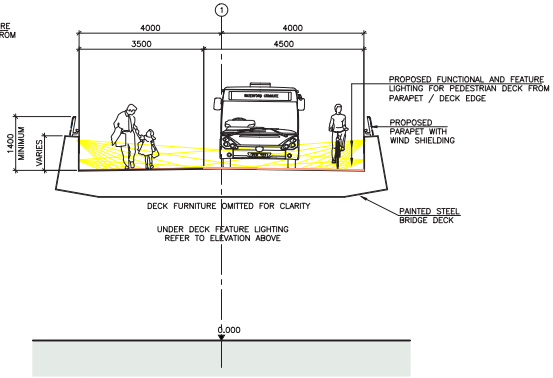
SECTION B
SCALE 1:75



SECTION C
SCALE 1:75



SECTION D
SCALE 1:75



SECTION E
SCALE 1:75

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
-					

Stage	Date	App'd
PRELIMINARY		
APPROVAL		
TENDER		
CONSTRUCTION		

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Designed:	Checked:	Approved:	Status:
DC / EP	CS	TD	E.I.A.R

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

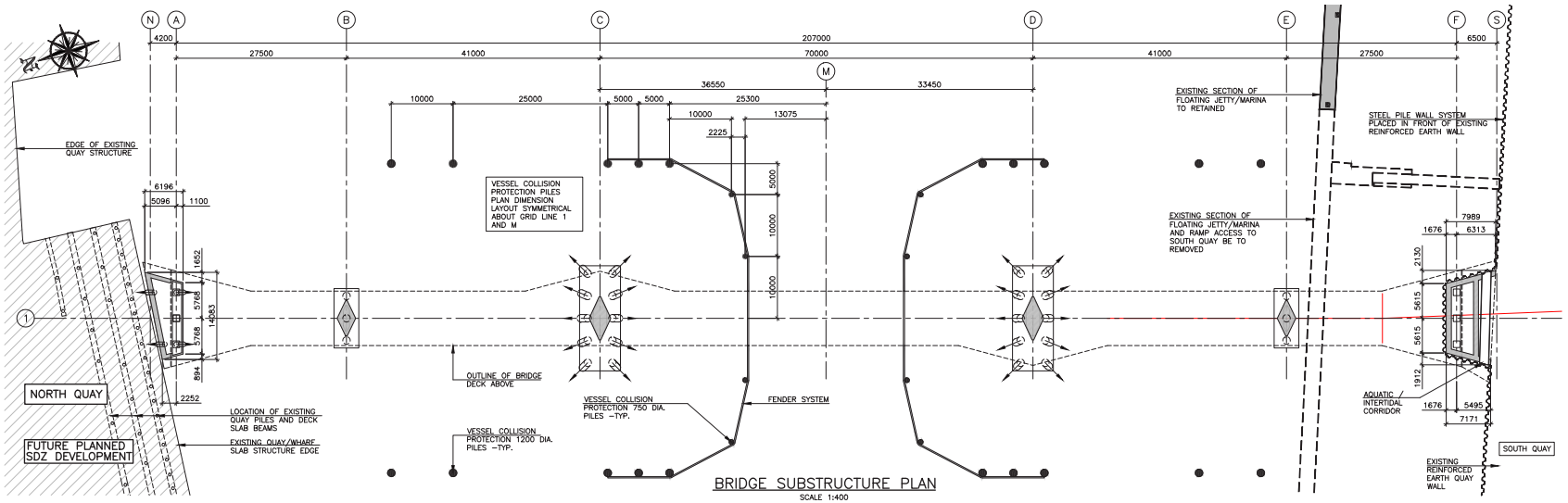
Drawing Title: BRIDGE DECK CROSS SECTIONS & LIGHTING
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Drawn:	Job No:	Drawing No:	Rev:
PE	16169	Figure 4.3	-

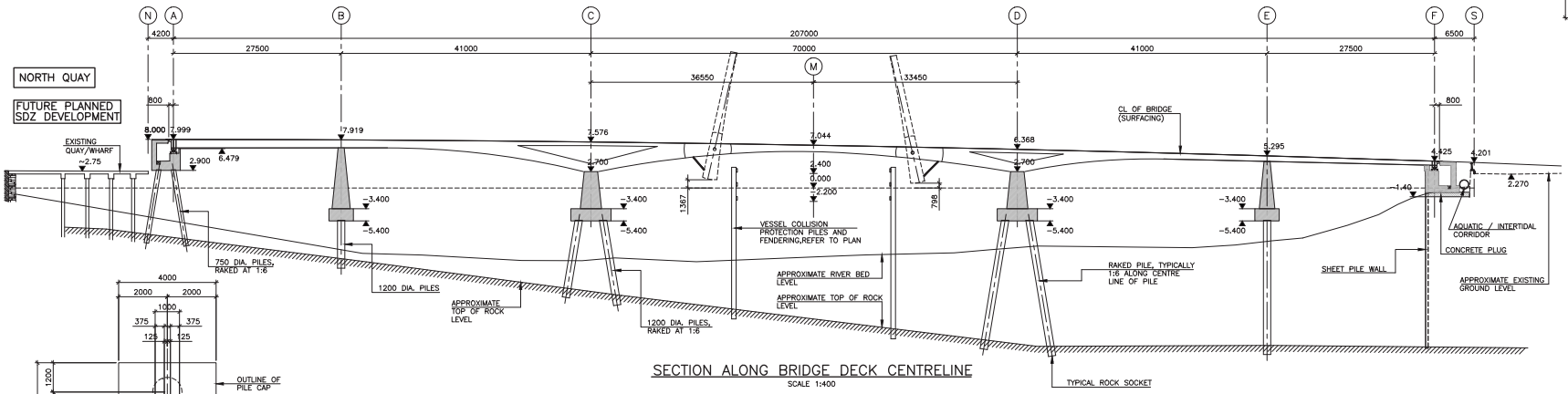
Scale: (A1)	Date:
AS SHOWN	OCT '18

14 December 2018 14:10:26 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.2_4.3_4.4_4.5.DWG

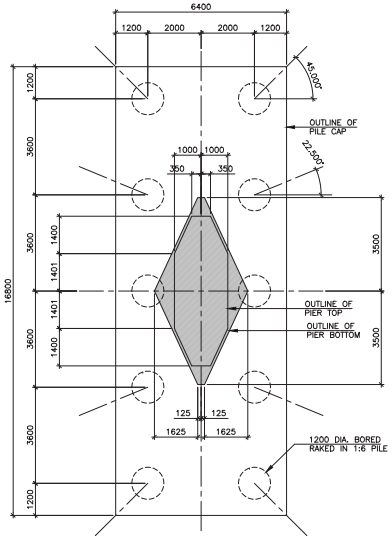
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



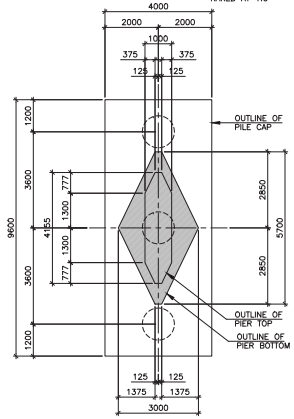
BRIDGE SUBSTRUCTURE PLAN
SCALE 1:400



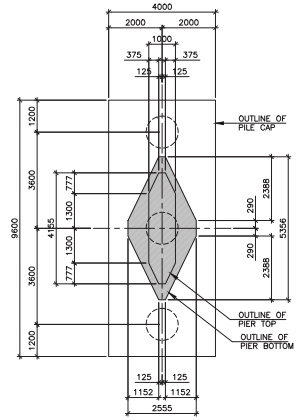
SECTION ALONG BRIDGE DECK CENTRELINE
SCALE 1:400



GRID LINE C AND D PIER AND PILECAP PLAN
SCALE 1:100



GRID LINE B PIER AND PILECAP PLAN
SCALE 1:100



GRID LINE E PIER AND PILECAP PLAN
SCALE 1:100

NOTES:

1. HIGH AND LOW WATER LEVELS INDICATED ARE HAVE BEEN BASED ON DATA OBTAINED FROM THE OFFICE OF PUBLIC WORKS WATER LEVEL MONITORING STATION AT ADELPHI QUAY (APPROXIMATE 670 METRES DOWN RIVER OF THE BRIDGE LOCATION).
2. MINOR ADJUSTMENTS IN DECK SPLAY AT BRIDGE ENDS MAY BE CONSIDERED AT DETAINED DESIGN STAGE.

2. WATER LEVEL TABLE:

+4.42	200 YEAR COMBINED FLOOD + 0.5m FREEBOARD + MEDIUM SEA LEVEL RISE + ISOSTATIC LAND TILT	+2.90	HIGH WATER (SEE NOTE 1) + 0.5m FREEBOARD
+3.47	200 YEAR TIDE + 100 YEAR FLUVIAL FLOOD LEVEL	+2.70	LOWEST LEVEL OF STEEL STRUCTURE
+3.61	1000 YEAR COMBINED FLOOD	+2.40	HIGH WATER (SEE NOTE 1)
+3.37	200 YEAR COMBINED FLOOD	±0.000	ORDNANCE DATUM (MALIN HEAD)
		−2.20	LOW WATER (SEE NOTE 1)

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

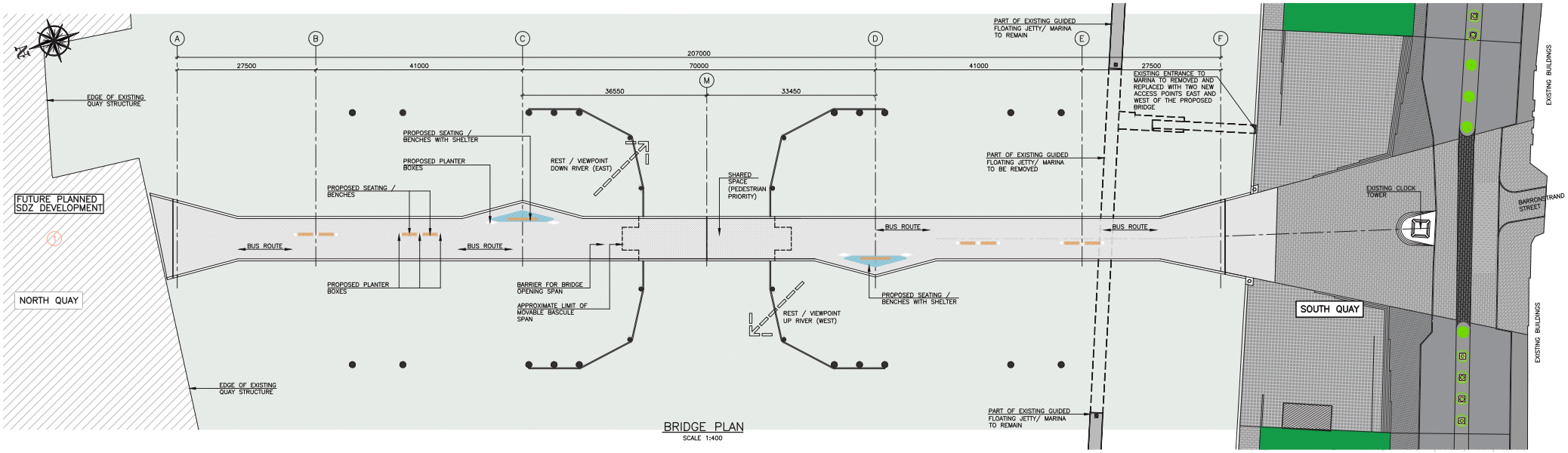
Drawing Title: BRIDGE SUBSTRUCTURES
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Designed:	Checked:	Approved:	Status:
DC / EP	CS	TD	E.I.A.R

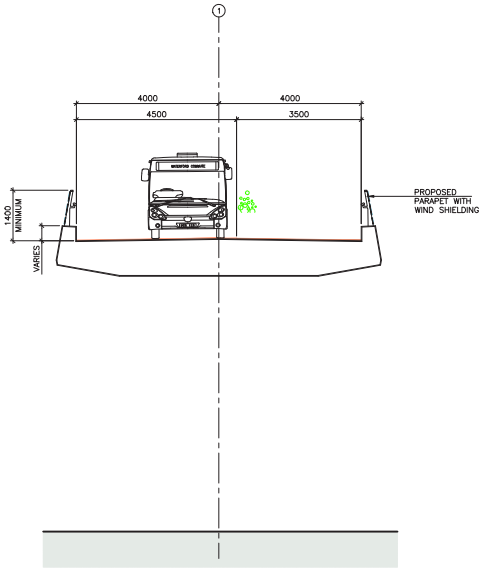
Drawn:	Job No:	Drawing No:	Rev:
PE	16169	Figure 4.4	-
Scale: (A1) AS SHOWN	Date: OCT '18		

14 December 2018 14:12:06 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.2_4.3_4.4_4.5.DWG

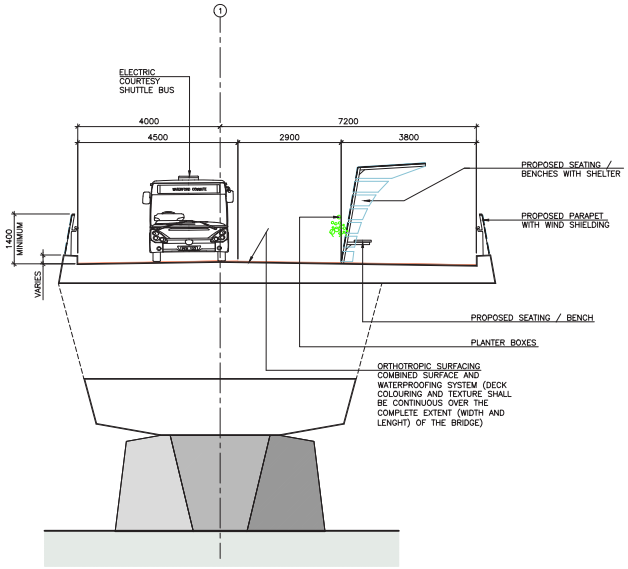
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



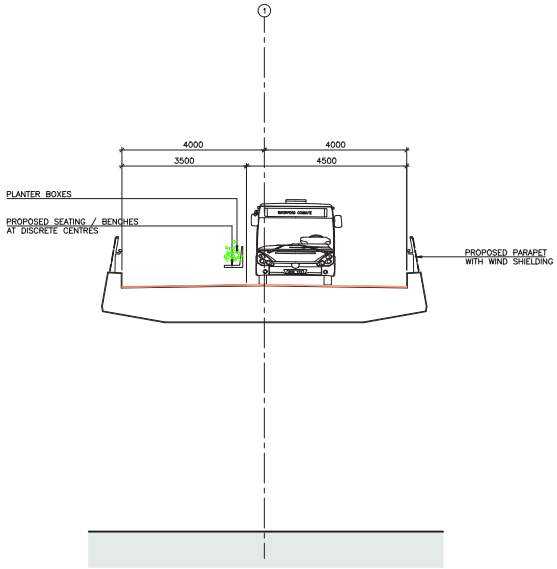
BRIDGE PLAN
SCALE 1:400



SECTION A
SCALE 1:75



SECTION B
SCALE 1:75



SECTION C
SCALE 1:75

LEGEND:

- COMBINED PEDESTRIAN, CYCLIST AND COURTESY BUS CORRIDOR
- PEDESTRIAN CORRIDOR
- SHARED SPACE

NOTES:

1. ALL DETAILS OF DECK FURNITURE ARE SUBJECT TO FINAL DESIGN AND AGREEMENT WITH WCCC ARCHITECTS DEPARTMENT.

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

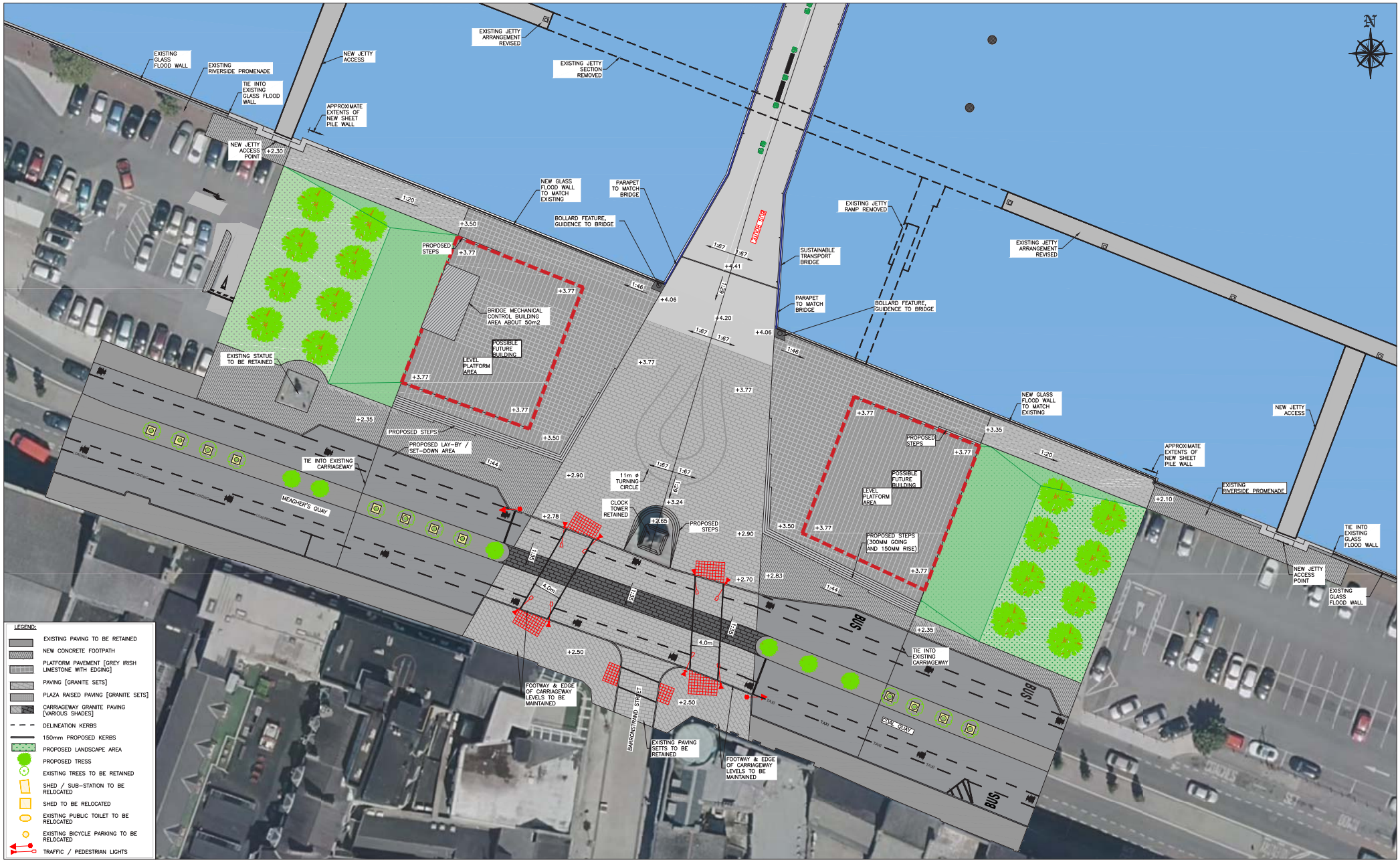
Drawing Title: PROPOSED SURFACING AND FURNITURE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Designed:	Checked:	Approved:	Status:
DC / EP	CS	TD	E.I.A.R

Drawn:	Job No:	Drawing No:	Rev:
PE	16169	Figure 4.5	-
Scale: (A1) AS SHOWN	Date: JUL '18		

14 December 2018 16:16:09 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.2_4.3_4.4_4.5.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY



Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Designed: JB | Checked: CS | Approved: TD | Status: E.I.A.R

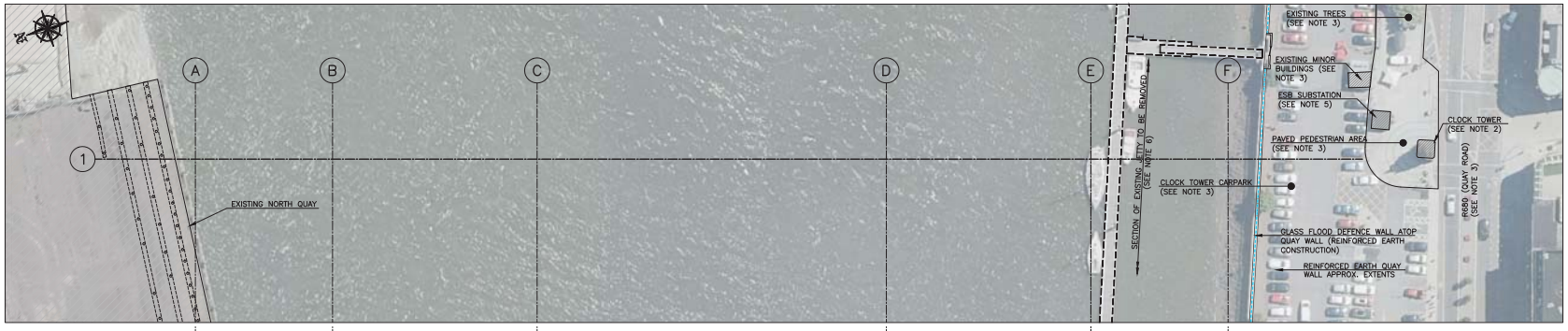
Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

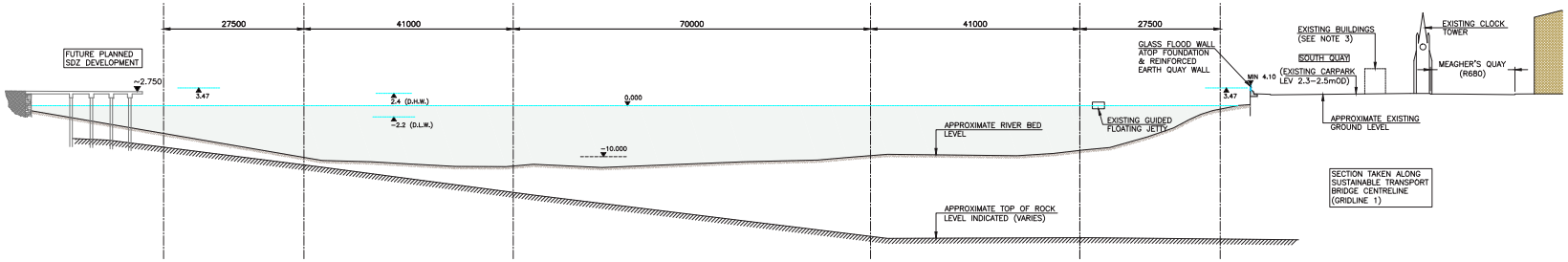
Drawing Title: SOUTH QUAY PLAZA PLAN
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Drawn: JMK | Job No: 16.169 | Drawing No: Figure 4.6 | Rev: -
Scale: (A1) 1:250 - (A3 1: 500) | Date: OCT '18

14 December 2018 16:38:53 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.6_ REV C.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY





STAGE 1 - SITE SETUP AND CLEARANCE

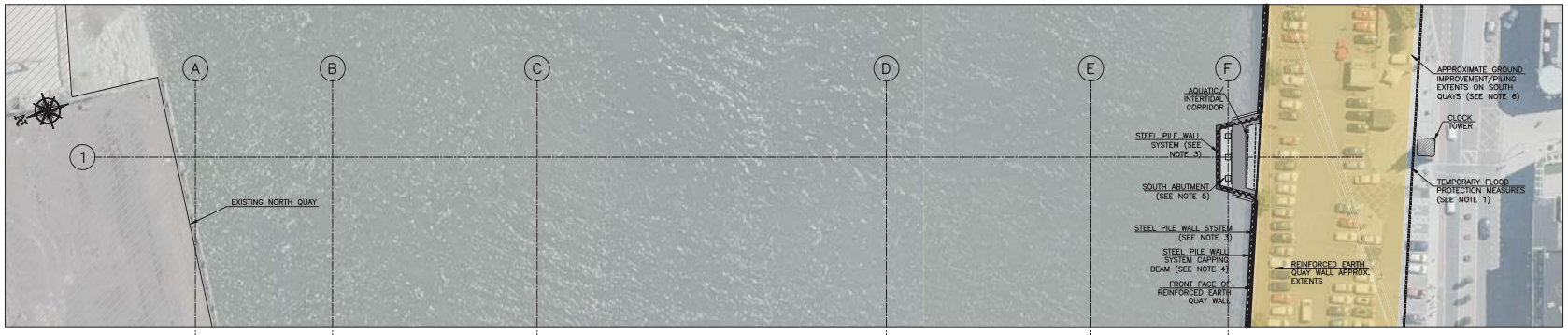
NOTES:

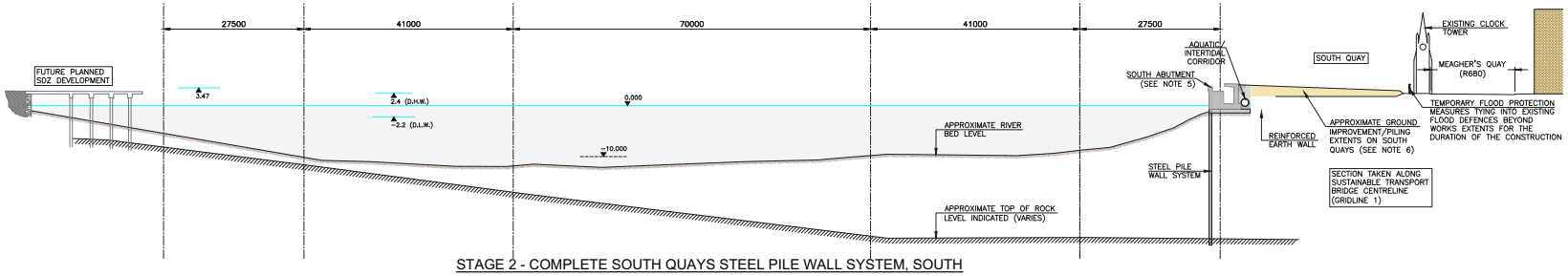
1. CONSTRUCTION COMPOUND/ SITE SETUP ON THE SOUTH QUAY TO FACILITATE THE BRIDGE AND SOUTH PLAZA CONSTRUCTION.
2. IMPLEMENTATION OF MEASURES TO PROTECT AGAINST ACCIDENTAL DAMAGE TO THE CLOCK TOWER (RPS NO. 392) AND MEMORIAL STATUE DURING THE WORKS (REFER TO FIGURE 4.6 FOR LOCATION).
3. SITE CLEARANCE OF THE CLOCK TOWER CAR PARK, PAVED PEDESTRIAN AREAS / R680 ROAD (STREET FURNITURE, MINOR BUILDINGS, TREES ETC) OVER THE EXTENTS OF THE SOUTH PLAZA WORKS SITE AS REQUIRED (REFER TO FIGURE 4.2 FOR SOUTH QUAY PLAZA SITE EXTENTS).
4. IMPLEMENT TRAFFIC MANAGEMENT AT THE SITE AND AS REQUIRED ON THE SOUTH QUAYS & APPROACHES.
5. DIVERSION OF UTILITIES AFFECTED BY THE WORKS ON THE SOUTH QUAYS INCLUDING THE RELOCATION OF THE ESB SUBSTATION LOCATED ON THE SOUTH PLAZA SITE.
6. REMOVAL OF THE REQUIRED SECTIONS OF THE EXISTING FLOATING JETTY (DECK AND RAMP). REMOVAL OF REQUIRED EXISTING JETTY PILES AT THE BRIDGE LOCATION (REFER TO FIGURE 4.2 FOR EXTENTS).

WATER LEVEL NOTES:

1. HIGH AND LOW WATER LEVELS HAVE BEEN BASED ON DATA TAKEN FROM THE OPW WATER LEVEL MONITORING STATION AT ADELPHI QUAY (APPROXIMATELY 670 METRES DOWN RIVER OF THE BRIDGE LOCATION).
2. WATER LEVEL TABLE:

+3.47	200 YEAR TIDE + 100 YEAR FLUVIAL FLOOD LEVEL
+2.40	HIGH WATER (SEE NOTE 1)
-2.20	LOW WATER (SEE NOTE 1)





STAGE 2 - COMPLETE SOUTH QUAYS STEEL PILE WALL SYSTEM, SOUTH ABUTMENT AND SOUTH PLAZA FOUNDATION WORKS

NOTES:

1. TAKE DOWN REQUIRED SECTIONS OF THE GLASS PANEL FLOOD WALL SYSTEM (REFER TO FIGURE 4.2 FOR EXTENTS). REPLACEMENT TEMPORARY FLOOD PROTECTION TO BE IMPLEMENTED PRIOR TO COMMENCEMENT OF THE WORKS.
2. DEMOLITION OF EXISTING GLASS PANEL FLOOD WALL SYSTEM FOUNDATIONS (REFER TO FIGURE 4.2 FOR EXTENTS).
3. CONSTRUCT PERMANENT STEEL PILE WALL SYSTEM FOR THE SOUTH ABUTMENT AND SOUTH QUAY IN FRONT OF THE EXISTING REINFORCED EARTH QUAY WALL (REFER TO FIGURE 4.2 FOR EXTENTS OF STEEL PILE WALL SYSTEM).
4. CONSTRUCT REINFORCED CONCRETE CAPPING BEAM TO SOUTH QUAY STEEL PILE WALL SYSTEM, NEW FLOATING JETTY ACCESS POINTS AND TIE IN WITH EXISTING GLASS FLOOD WALL SYSTEM EITHER SIDE OF THE SOUTH PLAZA (REFER TO FIGURE 4.2 FOR EXTENTS).
5. CONSTRUCT BRIDGE REINFORCED CONCRETE SOUTH ABUTMENT INTEGRAL WITH THE STEEL PILE WALL SYSTEM.
6. INSTALLATION OF SOUTH PLAZA PILE SUPPORT SYSTEM OR THE COMPLETION OF GROUND IMPROVEMENT THROUGH THE INSTALLATION OF VERTICAL DRAINS AND PRELOADING THE GROUND WITH SURCHARGE FILL MATERIAL.

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

Drawing Title: INDICATIVE CONSTRUCTION SEQUENCE - SHEET 1
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

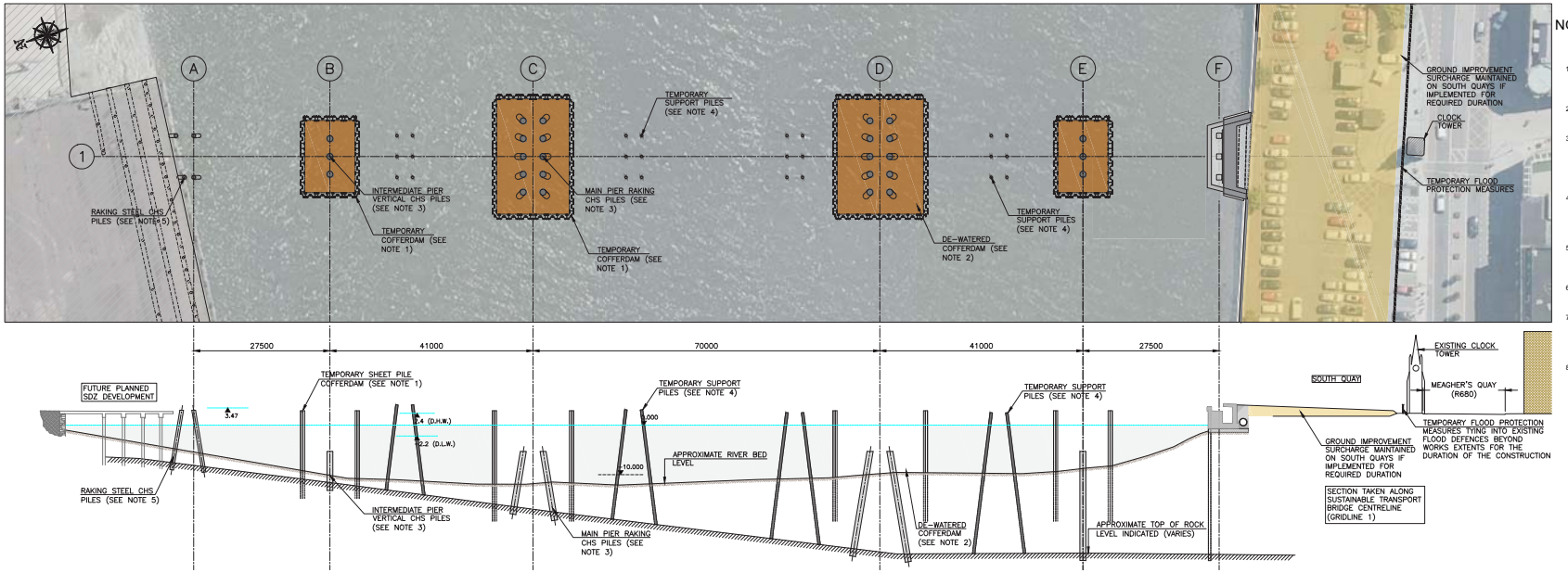
Designed:	Checked:	Approved:	Status:
EP	CS	TD	E.I.A.R

Drawn:	Job No:	Drawing No:	Rev:
OB	16.169	Figure 4.8	-

Scale: (A1)	Date:
1:500 (A1)	OCT '18

14 December 2018 14:15:53 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.8_4.11_REV B.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY



STAGE 3 - INSTALLATION OF TEMPORARY COFFERDAMS AND SUPPORT PILES AND BRIDGE PERMANENT PILES

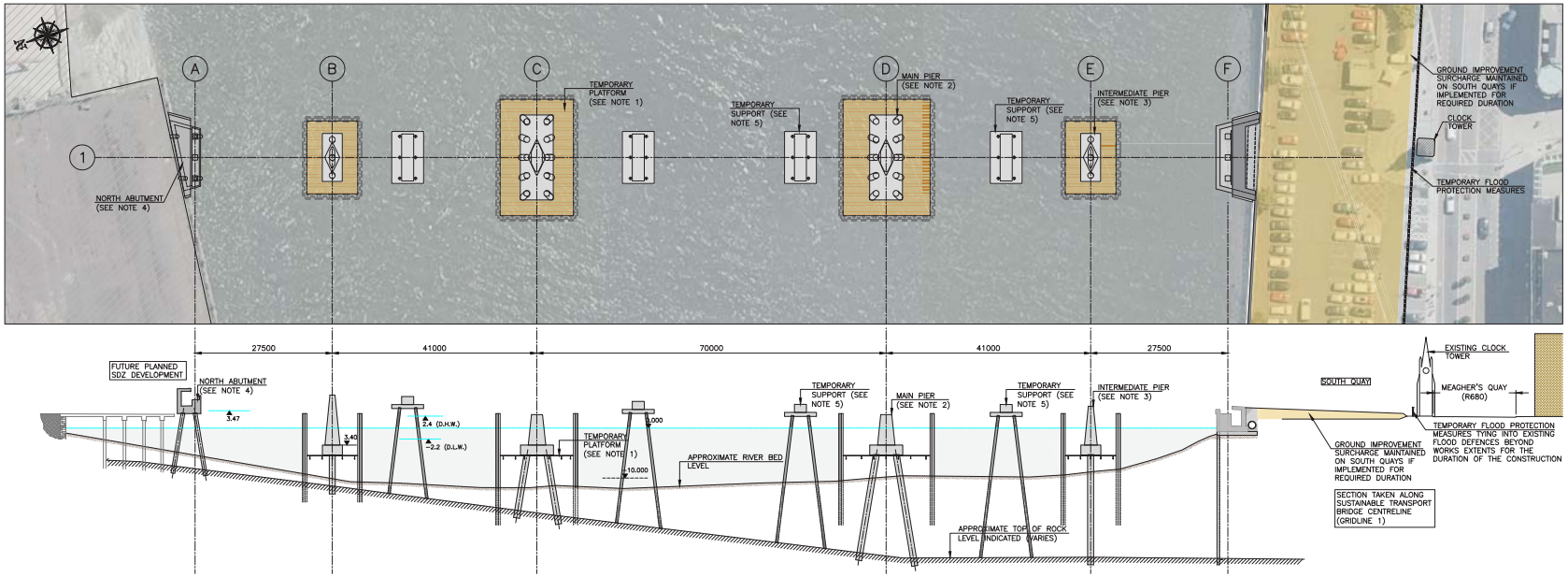
NOTES:

1. CONSTRUCTION OF TEMPORARY WORKS SHEET PILE COFFERDAMS FROM JACK-UP PONTOON OR BARGE TO ALLOW FOR CONSTRUCTION OF BRIDGE INTERMEDIATE AND MAIN SPAN PIERS AND PILE SUPPORTS.
2. DE-WATER COFFERDAMS. COFFERDAMS TO BE DE-WATERED IN STAGES TO ALLOW INSTALLATION OF COFFERDAM BRACING SYSTEM.
3. INSTALLATION OF MAIN PIER STEEL CIRCULAR HOLLOW SECTION (CHS) PILES (RAKING) AND INTERMEDIATE PIER CHS PILES (VERTICAL) WITHIN THE CONFINES OF THE COFFERDAMS USING A CRANE MOUNTED RIG OPERATED FROM THE JACK-UP BARGE/PONTOON. DRILLING PILE SOCKETS AND CONCRETING AS REQUIRED. CUT DOWN EACH PILE TO REQUIRED LEVEL FOLLOWING INSTALLATION & TESTING AS REQUIRED.
4. INSTALLATION OF DRIVEN STEEL PILES FOR FOUR NUMBER TEMPORARY PLATFORMS REQUIRED TO SUPPORT THE BRIDGE DECK PRIOR TO COMPLETION OF THE INTEGRAL CONNECTION WITH PERMANENT PIER SUPPORTS. CUT DOWN EACH PILE TO REQUIRED LEVEL FOLLOWING INSTALLATION & TESTING AS REQUIRED.
5. INSTALLATION OF NORTH ABUTMENT DRIVEN STEEL PILES (GRIDLINE A). DRILLING PILE SOCKETS AND CONCRETING AS REQUIRED. CUT DOWN EACH PILE TO REQUIRED LEVEL FOLLOWING INSTALLATION & TESTING AS REQUIRED.
6. THE SIMULTANEOUS PRESENCE OF No. 4 COFFERDAMS IN THE RIVER REPRESENTS THE WORST CASE SCENARIO IN TERMS OF CONSTRUCTION IMPACTS ON THE RIVER.
7. INSTALLATION OF COFFERDAMS, TEMPORARY SUPPORT PILING WITHIN THE RIVER AND ABUTMENT PILING SHALL BE COMMENCED IN JUNE FOR EITHER THE WORKS AT GRIDLINE A, B AND C OR D, E AND F, BUT NOT THE WORKS ASSOCIATED WITH ALL GRIDLINES. THE WORKS ASSOCIATED WITH THE GRIDLINES NOT PROGRESSED IN JUNE CAN COMMENCE IN NOVEMBER.
8. PILING WITHIN ANY COFFERDAM OUTSIDE OF THE SEASONAL CONSTRAINTS, AS AGREED WITH THE NPWS AND IFI, CAN ONLY PROCEED WITH THE AGREEMENT OF THE NPWS AND IFI.

WATER LEVEL NOTES:

1. HIGH AND LOW WATER LEVELS HAVE BEEN BASED ON DATA TAKEN FROM THE OPW WATER LEVEL MONITORING STATION AT ADELPHI QUAY (APPROXIMATE 670 METRES DOWN RIVER OF THE BRIDGE LOCATION).
2. WATER LEVEL TABLE:

+3.47	200 YEAR TIDE + 100 YEAR FLUVIAL FLOOD LEVEL
+2.40	HIGH WATER (SEE NOTE 1)
-2.20	LOW WATER (SEE NOTE 1)



STAGE 4 - REINFORCED CONCRETE PIER NORTH ABUTMENT & TEMPORARY SUPPORT PLATFORM CONSTRUCTION

NOTES:

1. CONSTRUCT TEMPORARY WORKING PLATFORMS WITHIN COFFERDAMS TO ALLOW PILECAP & PIER CONSTRUCTION.
2. CONSTRUCTION OF MAIN PIER IN-SITU CONCRETE PILECAPS AND VERTICAL SQUAT PIERS (GRIDLINES C & D) WITHIN THE CONFINES OF THE COFFERDAMS.
3. CONSTRUCTION OF INTERMEDIATE IN-SITU CONCRETE PILECAPS AND PIER WALLS (GRIDLINES B & E) WITHIN THE CONFINES OF THE COFFERDAMS.
4. CONSTRUCTION OF IN-SITU CONCRETE ABUTMENT AT GRIDLINE A.
5. INSTALLATION OF TEMPORARY SUPPORT STEEL PLATFORMS ABOVE HIGH WATER LEVEL..

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

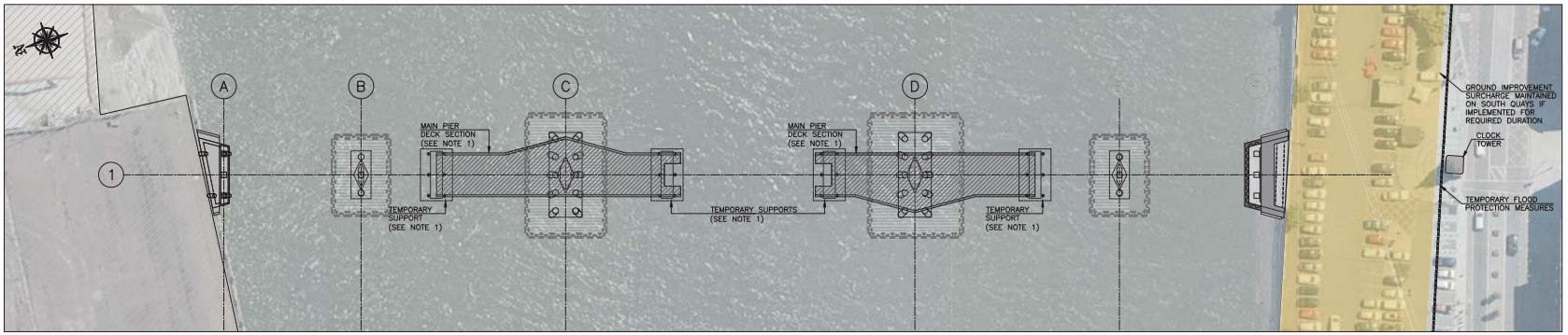
Drawing Title: INDICATIVE CONSTRUCTION SEQUENCE - SHEET 2
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

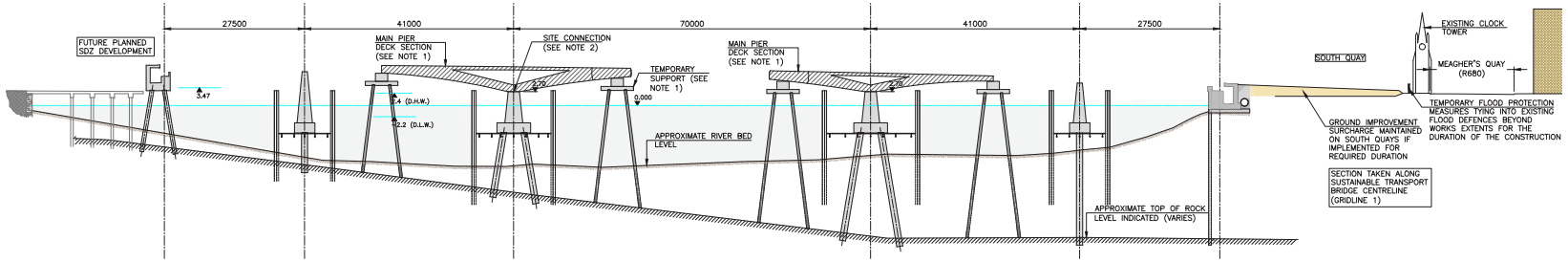
Designed:	Checked:	Approved:	Status:	Drawn:	Job No:	Drawing No:	Rev:
EP	CS	TD	E.I.A.R	OB	16.169	Figure 4.9	-

Scale: (A1) 1:500 (A1) | Date: OCT '18

14 December 2018 14:17:46 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.8_4.11_REV B.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY





STAGE 5 - LAND MAIN PIER DECK SECTIONS

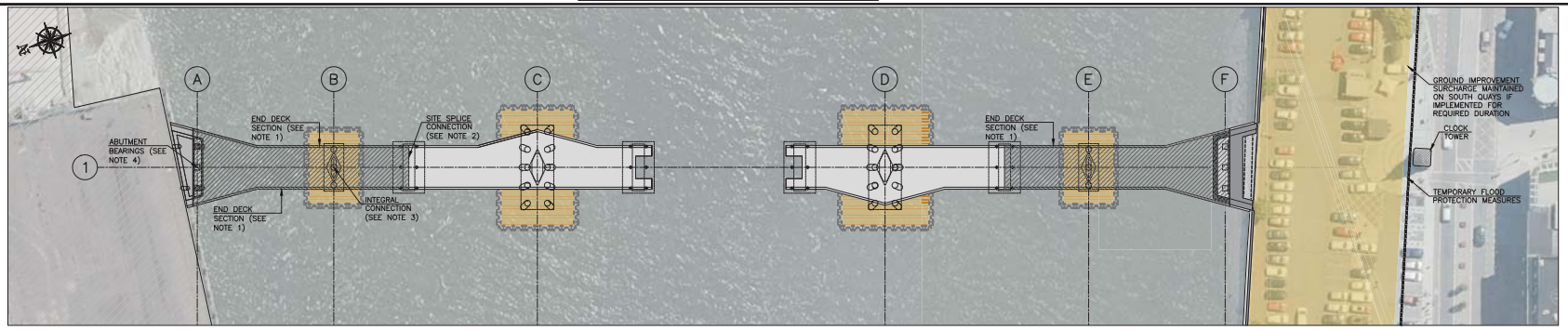
NOTES:

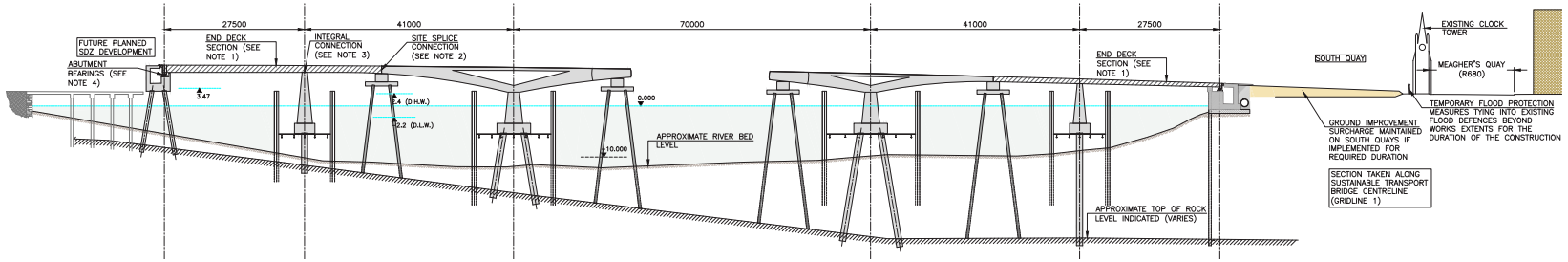
1. USING CRANE LOCATED ON PONTOON / BARGE LIFT EACH 50M LONG MAIN PIER DECK SECTION (COMPRISING OF THE V-SHAPED STEEL STRUTS) ONTO THE SUPPORTING JACKING POINTS LOCATED ON THE TEMPORARY SUPPORTS & PIERS @ GRIDLINES C & D.
2. CONSTRUCT IN-SITU CONNECTION BETWEEN STEEL STRUTS & CONCRETE PIERS.

WATER LEVEL NOTES:

1. HIGH AND LOW WATER LEVELS HAVE BEEN BASED ON DATA TAKEN FROM THE OPW WATER LEVEL MONITORING STATION AT ADELPHI QUAY (APPROXIMATE 670 METRES DOWN RIVER OF THE BRIDGE LOCATION).
2. WATER LEVEL TABLE:

+3.47	200 YEAR TIDE + 100 YEAR FLUVIAL FLOOD LEVEL
+2.40	HIGH WATER (SEE NOTE 1)
-2.20	LOW WATER (SEE NOTE 1)





STAGE 6 - LAND END DECK SECTIONS

NOTES:

1. LAND END DECK SECTIONS ON TO TEMPORARY BEARINGS AT THE ABUTMENTS AND ON THE INTERMEDIATE PIERS.
2. COMPLETE THE TWO END DECK SECTION SITE SPLICE CONNECTIONS TO THE MAIN PIER DECK SECTIONS.
3. MAKE INTERMEDIATE CONCRETE PIER/STEEL DECK INTEGRAL CONNECTIONS.
4. INSTALL THE ABUTMENT PERMANENT BEARINGS.

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

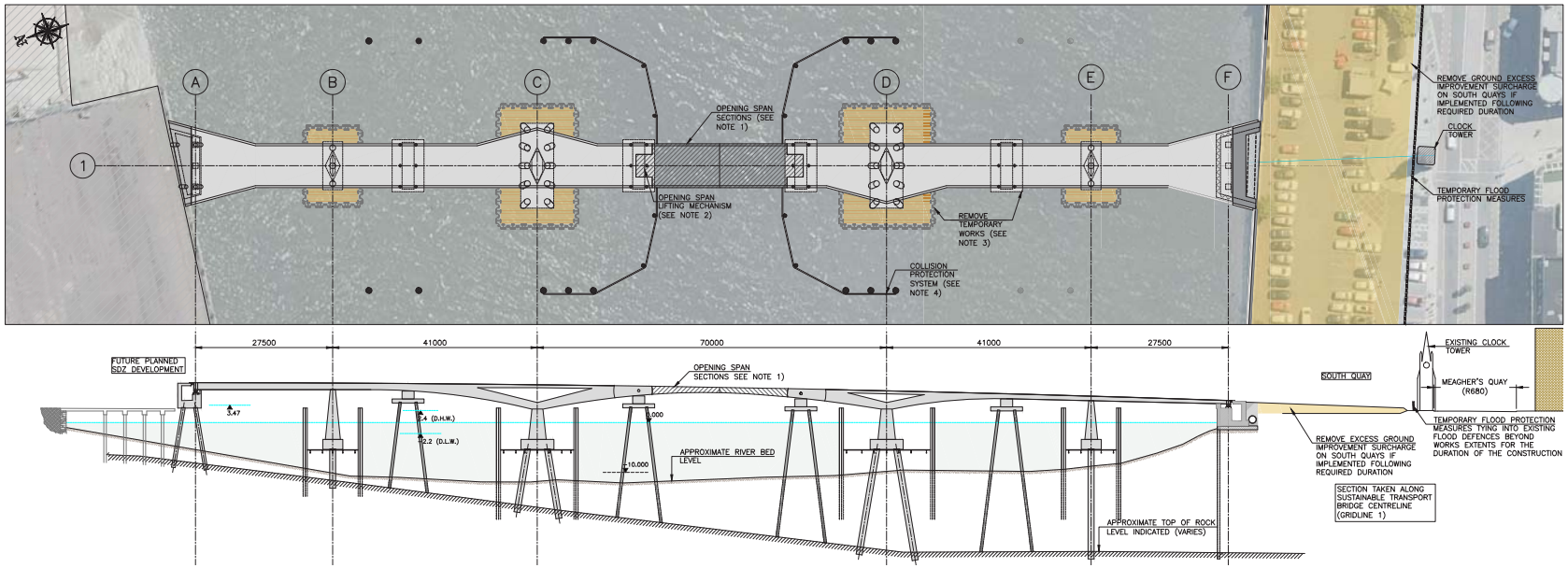
Drawing Title: INDICATIVE CONSTRUCTION SEQUENCE - SHEET 3
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Designed:	Checked:	Approved:	Status:	Drawn:	Job No:	Drawing No:	Rev:
EP	CS	TD	E.I.A.R	OB	16.169	Figure 4.10	-

Scale: (A1) 1:500 (A1) | Date: OCT '18

14 December 2018 15:07:42 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.8_4.11_REV B.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY



STAGE 7 - LAND CENTRAL OPENING SPAN BASCULE LEAF SECTIONS, TEMPORARY WORKS REMOVAL & INSTALLATION OF COLLISION PROTECTION SYSTEM

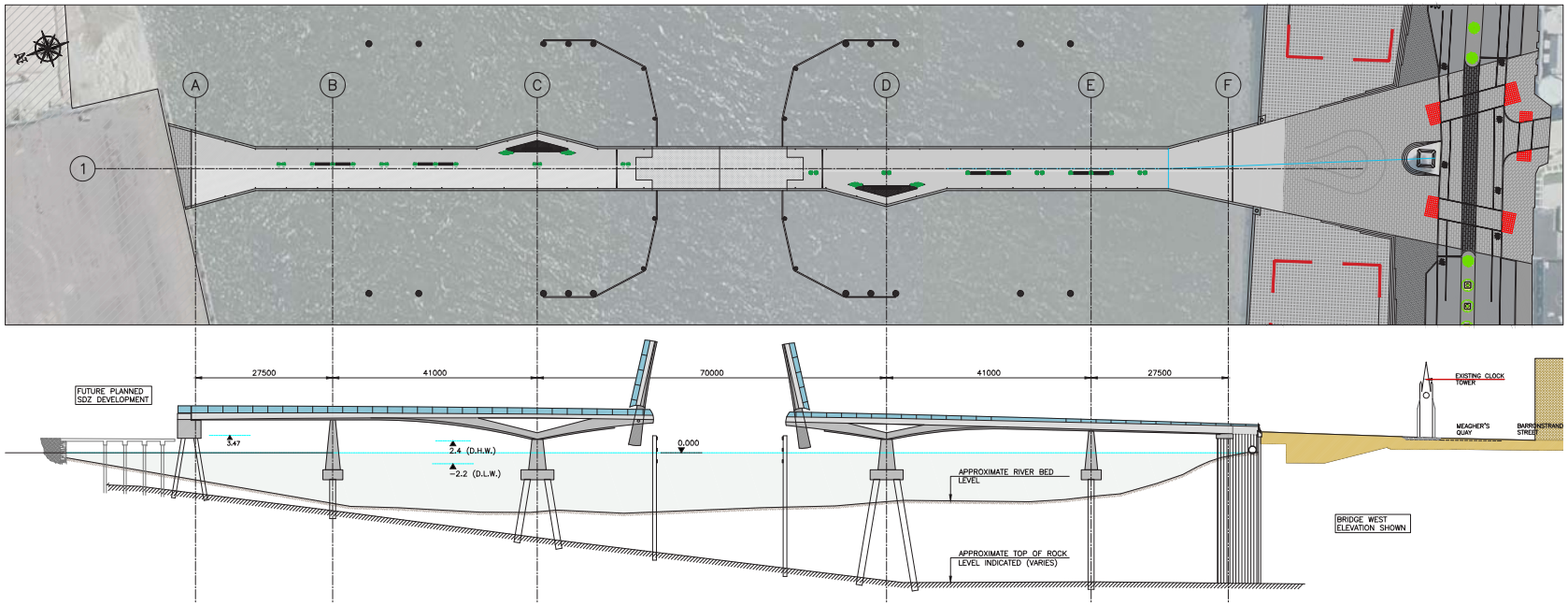
NOTES:

1. INSTALLATION OF TWO NUMBER 21M LONG BASCULE OPENING SPAN LEAVES TO COMPLETE THE BRIDGE DECK.
2. INSTALL LIFTING MECHANISM MACHINERY & COUNTERWEIGHT.
3. REMOVAL OF SHEET PILE COFFERDAMS AND TEMPORARY SUPPORTS.
4. COMPLETION OF BRIDGE VESSEL COLLISION PROTECTION PILE AND FENDERING SYSTEM.
5. INSTALLATION OF NEW FLOATING JETTY PILES AND COMPLETION OF REVISED JETTY ARRANGEMENT (REFER TO FIGURE 4.2 FOR PILE LOCATIONS).
6. REMOVAL OF EXCESS GROUND IMPROVEMENT SURCHARGE LOADING IF IMPLEMENTED.

WATER LEVEL NOTES:

1. HIGH AND LOW WATER LEVELS HAVE BEEN BASED ON DATA TAKEN FROM THE OPW WATER LEVEL MONITORING STATION AT ADELPHI QUAY (APPROXIMATE 670 METRES DOWN RIVER OF THE BRIDGE LOCATION).
2. WATER LEVEL TABLE:

+3.47	200 YEAR TIDE + 100 YEAR FLUVIAL FLOOD LEVEL
+2.40	HIGH WATER (SEE NOTE 1)
-2.20	LOW WATER (SEE NOTE 1)



STAGE 8 - COMPLETE DECK & SOUTH PLAZA FINISHES

NOTES:

1. COMPLETION OF SERVICE DIVERSIONS AND NEW CONNECTIONS.
2. CONSTRUCTION OF BASCULE SPAN SOUTH PLAZA PLANT ROOM. TESTING AND COMMISIONS OF THE BRIDGE OPENING SPAN.
3. COMPLETE BRIDGE FINISHES - LOCAL PAINTING AT CONNECTIONS, PARAPETS & WIND SHIELDING, HANDRAIL LIGHTING AND FEATURE LIGHTING, DECK PLATE COMBINED WATERPROOFING AND SURFACING, BRIDGE DRAINAGE SYSTEM, LIFTING SPANS PEDESTRIAN BARRIERS AND ABUTMENT END MOVEMENT JOINTS.
3. COMPLETION OF NEW SECTIONS OF FLOOD DEFENCE WALL ATOP STEEL PILE WALL SYSTEM AND CONNECTION TO THE EXISTING FLOOD DEFENCE WALL. REMOVAL OF TEMPORARY FLOOD PROTECTION.
4. CONSTRUCTION OF BRIDGE SOUTH PLAZA, R680 FINISHES AND TIE INTO BARRONSTRAND STREET.

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Designed: EP	Checked: CS	Approved: TD	Status: E.I.A.R

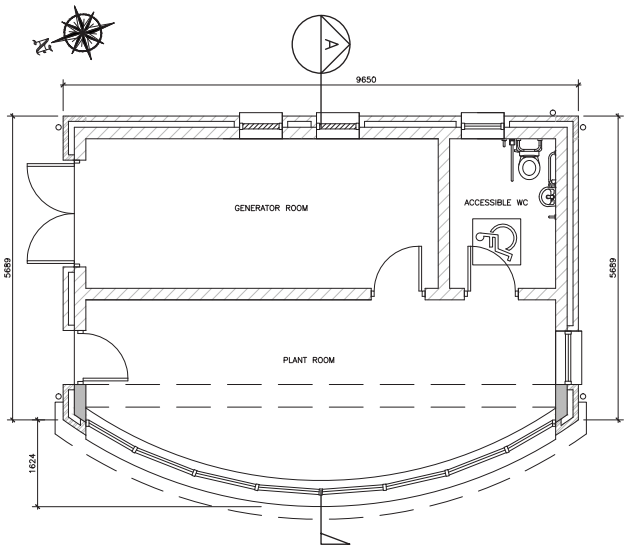
Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

Drawing Title: INDICATIVE CONSTRUCTION SEQUENCE - SHEET 4
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

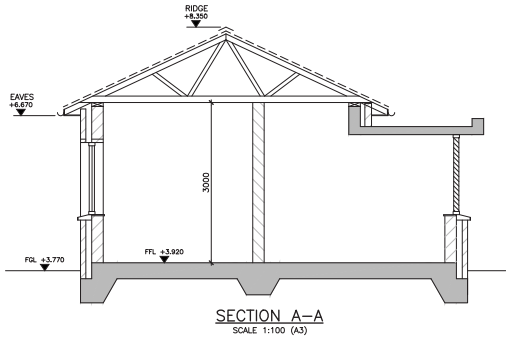
Drawn: OB	Job No: 16.169	Drawing No: Figure 4.11	Rev: -
Scale: (A1) 1:500 (A1)	Date: OCT '18		

14 December 2018 14:21:56 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.8_4.11_REV B.DWG

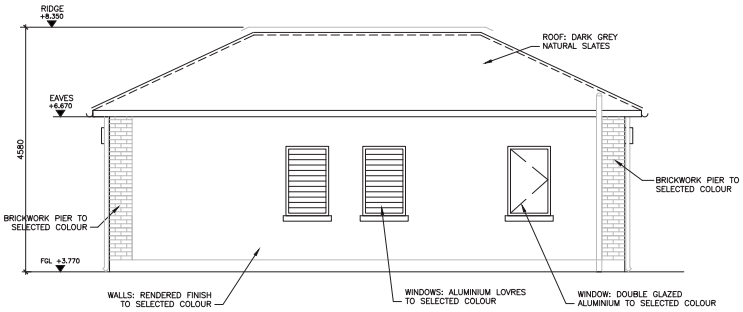
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



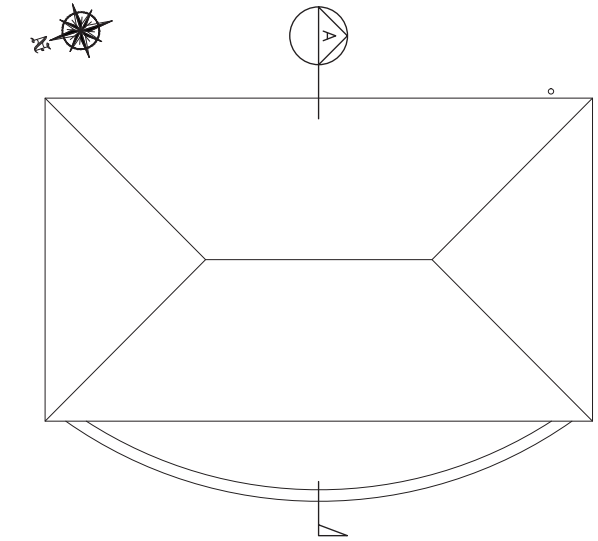
GROUND LEVEL PLAN
SCALE 1:100 (A3)



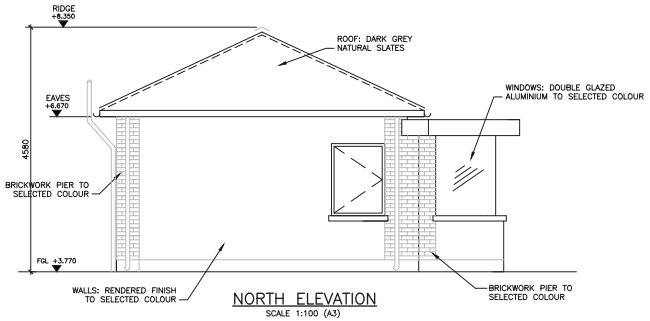
SECTION A–A
SCALE 1:100 (A3)



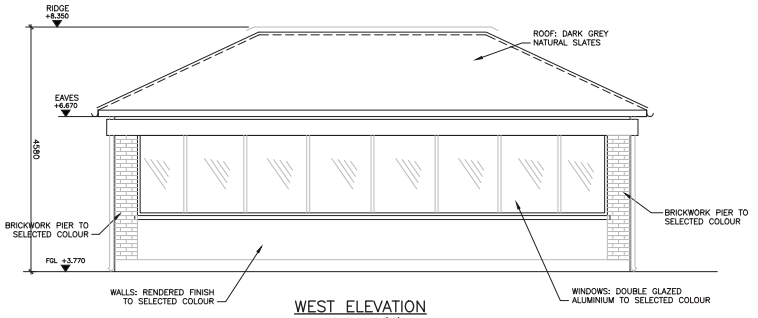
EAST ELEVATION
SCALE 1:100 (A3)



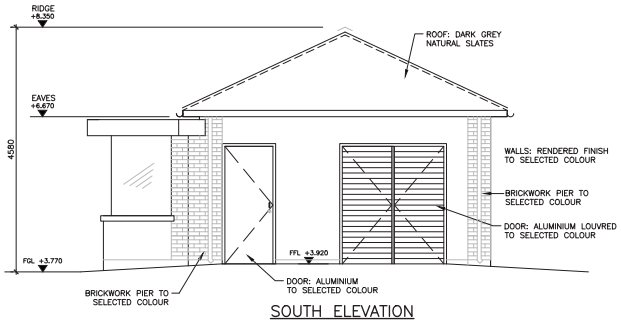
ROOF PLAN
SCALE 1:100 (A3)



NORTH ELEVATION
SCALE 1:100 (A3)



WEST ELEVATION
SCALE 1:100 (A3)



SOUTH ELEVATION
SCALE 1:100 (A3)

NOTES:

1. THE PROPOSED MECHANICAL AND ELECTRICAL PLANT ROOM BUILDING SHALL BE DESIGNED SUCH THAT IT CAN BE INCORPORATED INTO A FUTURE BUILDING WHICH WILL BE DESIGNED ON THE WESTERN SIDE OF THE SOUTH PLAZA.
2. FINAL DETAILS OF THE PROPOSED MECHANICAL AND ELECTRICAL PLANT ROOM BUILDINGS SHALL BE AGREED WITH WATERFORD CITY AND COUNTY COUNCIL'S ARCHITECT'S DEPARTMENT.
3. A SIMILAR PLANT ROOM / BUILDING SHALL BE INCORPORATED INTO THE STRATEGIC DEVELOPMENT ZONE NORTH QUAYS DEVELOPMENT AND BUILDINGS.

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

No.	Revision	Date	By	Chk'd	App'd
	Stage		Date		App'd
	PRELIMINARY				
	APPROVAL				
	TENDER				
	CONSTRUCTION				

ROD ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

Drawing Title: MECHANICAL AND ELECTRICAL PLANT BUILDING ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Designed:	Checked:	Approved:	Status:
JB	CS	TD	E.I.A.R

Drawn:	Job No:	Drawing No:	Rev:
PE	16.169	Figure 4.12	-
Scale: (A1) AS SHOWN	Date: DEC '18		

14 December 2018 14:02:52 J:\2016\16169\02 DWG\10 EIAR DRAWINGS\FIGURE 4.12.DWG

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX B
Habitat Map

Legend:

- BL3 / GA2, Building and Artificial Surface / Amenity Grassland
- BL3, Building and Artificial Surface
- CC1, Sea Walls, Piers and Jetties
- CM1, Lower Salt Marsh
- CW2, Tidal River
- ED3, Recolonising Bare Ground

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

WATERFORD

Sources: Esri, HERE, Garmin, Intermap, increment P Corp.,

ROD
ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Designed:	Checked:	Approved:	Status:
CM	CM	BC	EIAR

Project Title: RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

Drawing Title: HABITAT MAPPING

Drawn:	Job No:	Drawing No:	Rev:
LA	16.169	Figure 7.2	
Scale: (A1) 1:2,000 @A3	Date: August 2018		

Document Path: J:\2016\16169\02 DWG\10 EIAR drawings\ArcGIS\16169 - Figure 7.2 - Habitat.mxd

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX C
Hydraulic Modelling Report

Report No. HEL212202 v1.1

Hydraulic Modelling of Proposed River Suir Sustainable Transport Bridge

Prepared for

Roughan O'Donovan Consulting Engineers

October 2018

Hydro Environmental Ltd
No. 4 Caiseal Riada,
Clarinbridge,
Co. Galway.
Tel / Fax: 091 796734
email: info@HydroE.ie

Hydraulic Modelling of Proposed River Suir Sustainable Transport Bridge

Job No.:	212202
Report No.:	HEL0212202 v1.1
Prepared by:	Anthony Cawley BE, MEngSc, CEng MIEI
Date:	14th November 2018
Issue	**Final**

DISCLAIMER

This hydraulic modelling report has been prepared for Roughan O'Donovan Consulting Engineers as input to the River Suir Sustainable Transport Bridge Design Project. Hydro Environmental Ltd. accept no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned.

CONTENTS

1. INTRODUCTION

1.1 Background

Hydro Environmental Ltd., in association with Aquafact International Ltd., was commissioned by Roughan O'Donovan Consulting Engineers to carry out hydrodynamic modelling study of the proposed River Suir Sustainable Transport Bridge in Waterford in support of the preliminary design and input to the Hydrology chapter of the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS). The purpose of this study is to predict the potential change in flow velocities within the Suir Estuary and to assess the impact of the proposed development on bed morphology as a result of changes to the sediment transport regime.

1.2 Description of Proposed development

The proposed development aims to create a new pedestrian, cycle and electric vehicle crossing over the Suir Estuary to link the North Quays and the Strategic Development Zone (SDZ) to the South Quays and its commercial and shopping area in Waterford City centre. The proposed bridge crossing is located approximately 550m downstream of Edmund Rice Bridge (R680). Edmund Rice Bridge itself is of relatively recent construction (1986) with the central section being a movable vertical lift bridge for facilitating vessel navigation up and down the estuary. Historically a bridge crossing has existed at the Rice Bridge location since 1794 (Wooden (Timbertoes) Bridge (1794), John Redmond Bridge in 1913).

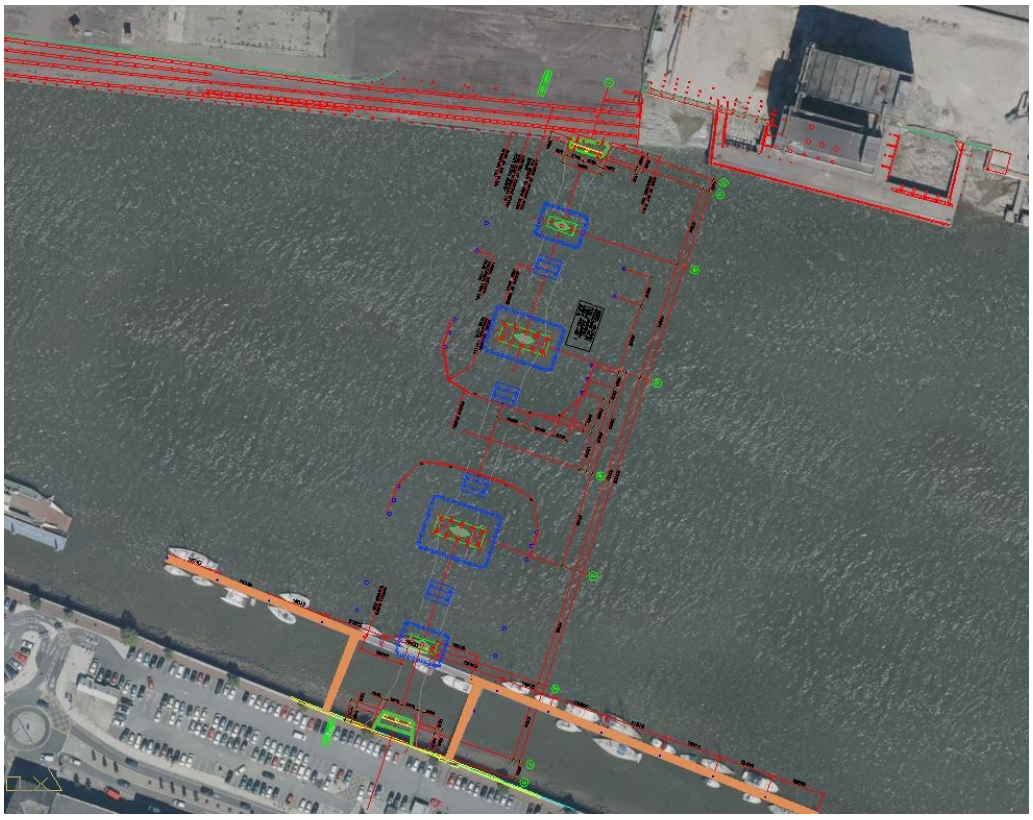


Figure 1 Proposed Bridge Crossing of Suir Estuary between North and South Quays in Waterford City

The proposed bridge will span a 207m width of the estuary with a movable central navigation section. The bridge will be formed on a series of 1200mm diameter piles supporting large concrete abutments and concrete piers (4 no concrete piers with spans of 27.5m, 41m, 70m, 41m and 27.5m). The base of the concrete piers will terminate at -5.4m OD and below this large 1200mm diameter pile columns extend down to bedrock. The bed level at the bridge crossing is typically at -9.5 to -11.5m O.D. and the bedrock level at the central piers is -18m to -26m OD falling from north to south, based on the ground investigations (GI). The supporting piles are driven to bedrock and a rock socket formed with the bedrock. A piled fender system (750mm diameter piles) will be provided to protect the bridge piers from vessel collision. This fender system will be on both sides of the navigation channel so as to protect the lift bridge section from damage. In the navigation section between the piled fenders a 25m open width is provided for vessel passage. Refer to Figure 2 below for cross-section details.

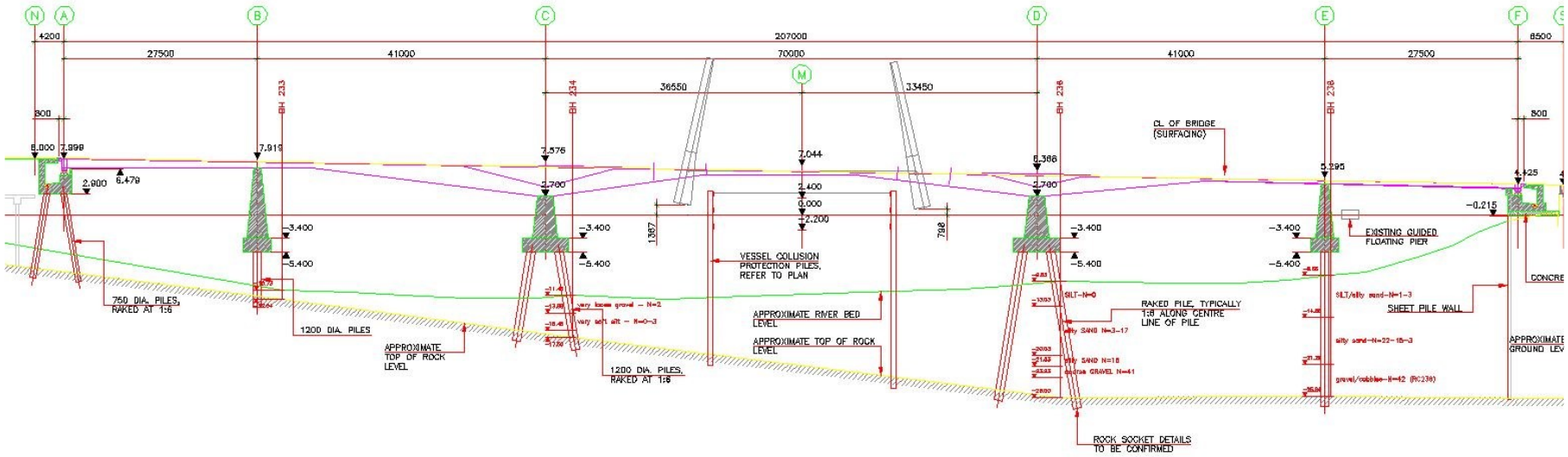


Figure 2 Section of Proposed Bridge showing the piled abutments and the four piled piers, anti-collision fenders and the vertical lift section.

1.3 Results of Ground Investigation

Ground investigation was carried out by IGSL for the proposed development between June and October 2017. A number of overwater boreholes were drilled (7 No.) at various locations across the estuary width at proposed bridge locations to establish the characteristics of the overburden (in terms of sediment distribution, overburden depth, bearing capacity, etc.), top of rock and characteristics of the bedrock. The borehole locations were selected to coincide with the location of the support points for the proposed bridge. The overwater drilling involved 7 No. cable percussive boring to refusal and 7 no. rotary cores. APEX Geoservices carried out an overwater geophysical survey along the footprint of the proposed bridge. The objectives of the geophysical investigation were to map variation in sediment type and thickness, determine depth to bedrock, estimate the mass characteristics of the rock and assess possible buried features.

The bed sediments based on the ground investigation indicate a variable bed sediment with overburden depths increasing from c. 7m to over 20m north to south.

The depth to top of rock increases from across the river from north to south with elevations of top of rock at -7m OD at rotary core RC232, -11.5m OD at RC233, increasing to c. -18m OD at RC234 and RC 235 and increasing to c. -26m OD at RC236, 237 and 238. The underlying bedrock is shale. The sediment sampling indicated varying layers of sandy gravelly silt to silty sand and gravel with the sediments being more silty to the south. Typically, the sediments returned had 30 to 40% silt, 30 to 40% sand and 20 to 30% gravel and cobbles. Aquafact, as part of the hydrometric survey, carried out bed surface grab sampling which showed the bed surface to be predominantly a medium to coarse sand with some gravel and a relatively low silt/clay content, as presented in Tables 1.1 and 1.2.

Table 1.1 Results from Sediment Sampling

Stn	>8mm	Gravel (4-8)	Gravel (2-4)	Very Coarse Sand (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Very Fine Sand (%)	Silt-Clay
W1	0	45.5	15.3	11.2	11.4	11.5	2.3	2.1	0.6
W2	0	0.1	0.1	1.9	32.6	32.7	7.2	20.2	5.1
W3	0	4.3	3.1	8.4	25.7	24.6	8.4	14.1	11.3
W4	0	15	4.9	5.6	13.2	51.7	4.4	4	1.2
W5	0	0.4	0.2	0.6	5.4	89	2.4	1.7	0.2

Table 1.2 Results from Sediment Sampling

Station	Gravel	Sand	Mud	Sand:Mud	Sand % (of Sand + Mud)
W1	60.8	38.5	0.6	64.17	98.47
W2	0.2	94.6	5.1	18.55	94.88
W3	7.4	81.2	11.3	7.19	87.78
W4	19.9	78.9	1.2	65.75	98.50
W5	0.6	99.1	0.2	495.50	99.80

2. HYDRAULIC MODEL DESCRIPTION

2.1 General

In order to assess accurately the potential impact of the proposed bridge crossing with its many in-stream piled bridge supports and its piled fender collision protection, a high resolution 2-D hydrodynamic model of the local reach was required so as to model the complex 2-D flow field around the supports. To efficiently drive this high resolution 2-D model a 1D node-link river estuary model was required, which extended from southern open sea upstream to the tidal extents on the Suir, Nore and Barrow Rivers, as presented in Figure 3. This enabled the large tidal flows generated within each of the estuaries to be computed under varying tides and fluvial inflows and appropriately specified as boundary conditions to the local “-D model Reach.

2.2 HEC-RAS 1-D model

A 1D river model using HEC-RAS hydraulic software system developed by the U.S. Army Corps of Engineers was used to model Waterford Harbour and its full estuarine reaches of the Suir, Barrow and Nore Rivers. HEC-RAS is the industry standard used internationally for hydraulic modelling of river and estuarine systems. HEC-RAS implements a 1-dimensional model of longitudinal channel flow (depth and width averaged) and solves for water elevation and average cross-sectional velocity under unsteady flows solving the full St. Venant equations that include the momentum and mass equations. HEC-RAS 1-D is ideal for modelling narrow elongated estuaries where the dominant flow is longitudinal with little variation in the energy slope in the transverse direction.

The unsteady model allows for tidal varying flow and elevation boundary conditions to be specified at the downstream Open Sea boundary and inflow hydrographs at the upstream fluvial boundaries. It also facilitates internal inflows at various nodes to allow for inclusion of lateral tributary inflows. The HEC-RAS model requires cross section survey data of bed and overbank levels versus Station distance from left overbank to right overbank and facilitates different channel roughnesses and various structure types including bridges, culverts spillways and weirs.

2.3 TELEMAC Hydraulic Software System

The TELEMAC system is the software of choice for modelling the complicated hydrodynamics of the Suir Estuary at the bridge crossing, particularly given the very high computation refinement required to model the individual slender piles for the proposed bridge structure and the collision fender system. TELEMAC is a software system designed to study environmental processes in free surface transient flows. It is therefore applicable to seas and coastal domains, estuaries, rivers and lakes. Its main fields of application are in hydrodynamics, water quality, sedimentology and water waves.

TELEMAC is an integrated, user friendly software system for free surface waters. TELEMAC was originally developed by Laboratoire National d'Hydraulique of the French Electricity Board (EDF-LNHE), Paris. It is now under the directorship of a consortium of organisations including EDF-LNHE, HR Wallingford, SOGREAH, BAW and CETMEF. It is regarded as one of the leading software packages for free surface water hydraulic applications and with more than 1000 Telemac Installations Worldwide.

The TELEMAC system is a powerful integrated modelling tool for use in the field of free-surface flows. Having been used in the context of very many studies throughout the world (several thousand to date), it has become one of the major standards in its field. The various simulation modules use high-capacity algorithms based on the finite-element method. Space is discretised in the form of an unstructured grid of triangular elements, which means that it can be refined particularly in areas of special interest. This avoids the need for systematic use of embedded models, as is the case with the finite-difference method. Telemac-2D is a two-dimensional computational code describing the horizontal velocities, water depth and free surface over space and time. In addition it solves the transport of several tracers which can be grouped into two categories, active and passive, with salinity and temperature being the active tracers which alter density and thus the hydrodynamics.

The TELEMAC System is a set of finite element programs designed to solve free water surface problems. A series of modules are available for solution of hydrodynamics, transport and dispersion of pollutants, sediment transport and wave dynamics. These are:

- TELEMAC-2D: 2-dimensional depth averaged hydrodynamics and transport and dispersion of tracers

- TELEMAC-3D: 3-dimensional hydrodynamics, transport and dispersion and sediment movement

- TOMAWAC: A third generation spectral wave model representing the generation of waves due to winds or offshore climates and propagation into shallow waters.

- ARTEMIS: A harbor wave model that solves the mild slope equation in elliptical form and includes the processes of refraction by bed shoaling, wave breaking, diffraction and reflection of waves due to structures.

- SISYPHE: Sediment transport module solving bed and suspended load of cohesive and non-cohesive sediments and can be coupled with TELEMAC-2D, -3D and TOMAWAC for the hydrodynamic transport and bed shear stress calculations

Each TELEMAC Module uses a completely flexible unstructured mesh of triangular elements allowing it to efficiently model complex geometry problems such as harbours and estuaries.

2.4 Data Sources

A range of survey information was utilised in constructing the 1D and 2D models which are described below:

- OPW CFRAM river cross-section survey of the Suir, Nore and Barrow river channels
- Apex cross-sections River Survey of the Suir at Waterford
- Infomar Sea bed Survey of Waterford Harbour
- Admiralty Chart of Waterford Harbour
- Apex Topographical Survey of the SDZ site and adjacent lands
- 2m Lidar Survey of Waterford City
- High resolution bathymetric Survey of the immediate area at the footbridge
- GI Borehole cores and sediment distribution analysis at the Footbridge crossing
- Bed sediment sampling by Aquafact at the bridge crossing
- ADCP (Acoustic Doppler Current Profiler) current metering over a 24day period at 1m vertical Bin depths by Aquafact

2.5 1-D Model Development

River channel and overbanks were defined for approximately 115km of river reach along the main river/estuarine channels of the Suir, Nore and Barrow. The complete estuarine reaches which extend many kilometres upstream along the Suir, Barrow and Nore were included in the model so that the simulations accurately accounted for the large tidal exchange volume that generate significant ebbing and flooding flows at Waterford Harbour. The model domain is presented in Figure 3 and the HEC-RAS model schematic in Figure 4.

The model domain extends from the open sea off Dunmore to 1km upstream of Carrick-On-Suir on the Suir, to 3km north of St. Mullin's Village on the River Barrow and to Inistoige on the Nore. A total of 249 river sections were included from the various surveys. Survey information was not available for a 19km upstream middle section of the Suir Estuary from Woodstown, Waterford to Piltown, southeast of Carrick-on-Suir. This unavailable (un-surveyed) reach was represented by simple liner interpolation between the nearest available upstream and downstream surveyed section so as to account for the tidal exchange volume.

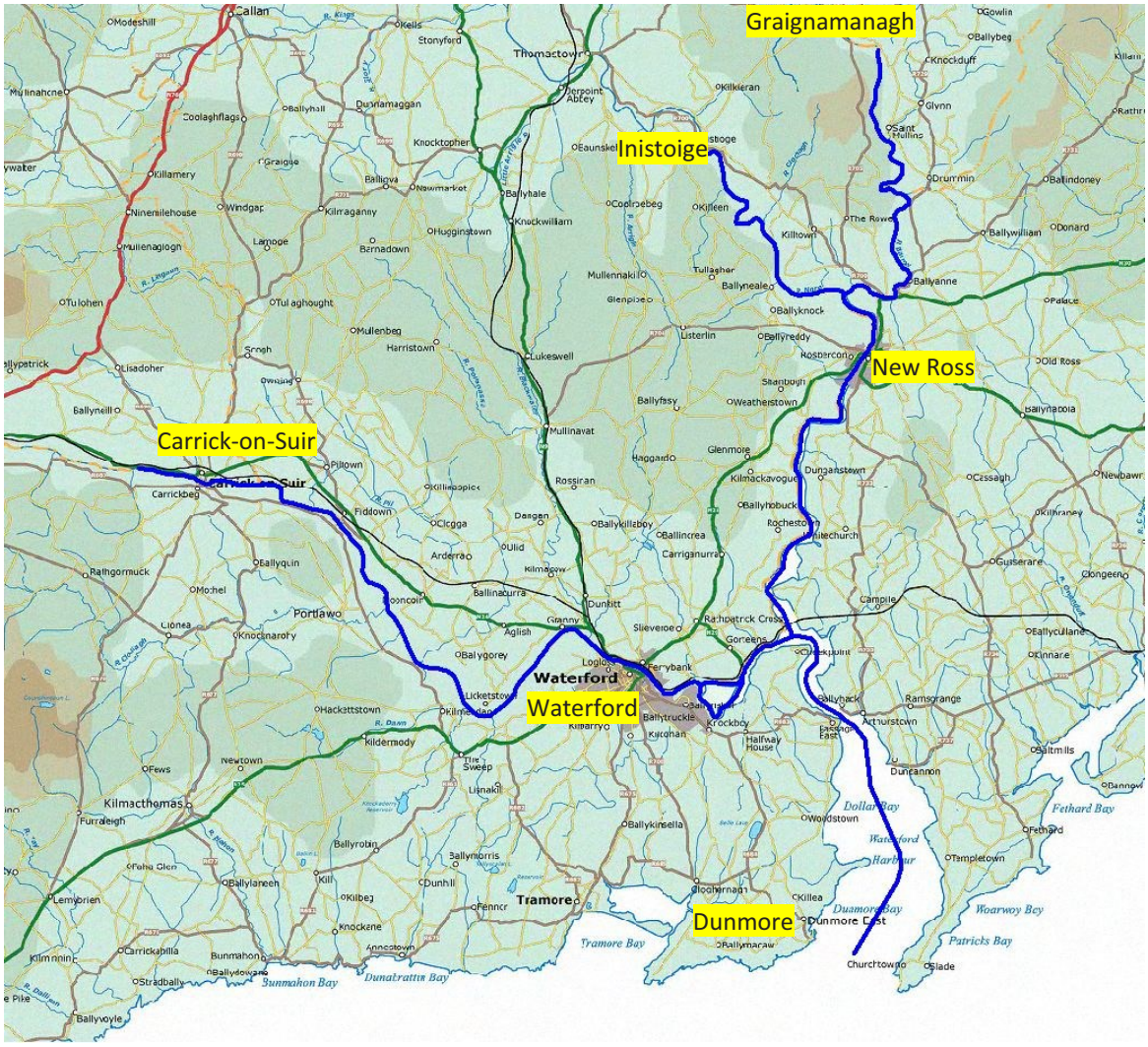


Figure 3 Extent of Waterford Harbour Estuarine Model

A Manning's roughness coefficient (n) of 0.028 was used for the various estuarine reaches and a lower roughness coefficient of 0.024 for the wider and deeper Waterford Harbour reach. These roughness coefficients are considered to be appropriate for the wide deep estuarine reaches through Waterford.

The model set-up included the loop configuration around King's island in Waterford Harbour. The draw bridge structure at Rice Bridge is located immediately upstream of the SDZ lands.

The survey section included the flood protection along the South Quays and the modelled river channel overbank sections extended through the SDZ lands along the north bank. The estuarine sections off Dunmore East are over 4km wide, whereas the estuarine sections near Cheekpoint were c. 800m wide and c. 220m, adjacent to the SDZ Lands.

Figure 4 HEC-RAS Model Schematic

2.6 2-D Model Development

The 2-D model domain area is presented in Figure 5 which represents the local estuarine reach at Waterford City, some 5.13km in length and 102.1ha in area.

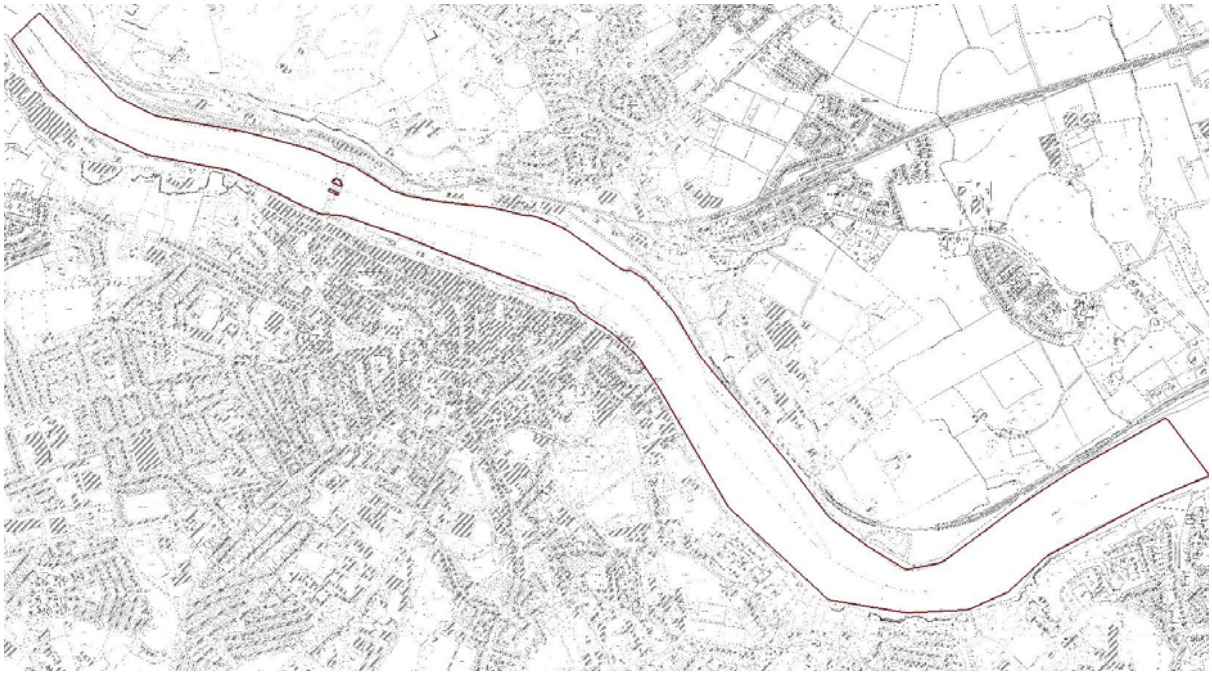


Figure 5 2-D Model Reach of Suir Estuary at Waterford City

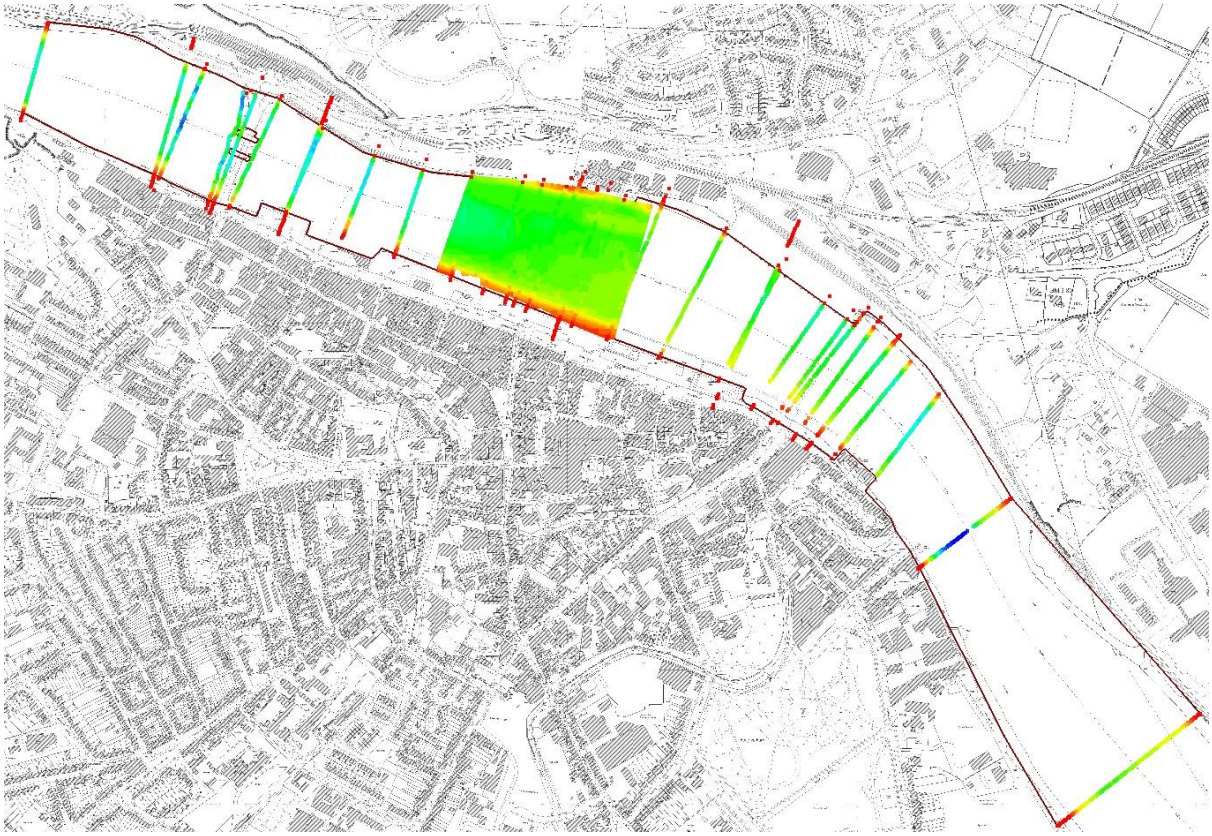


Figure 6 Bathymetric Survey data coverage for Study Reach in vicinity of proposed Bridge crossing

Figure 7 Modelled Bathymetry

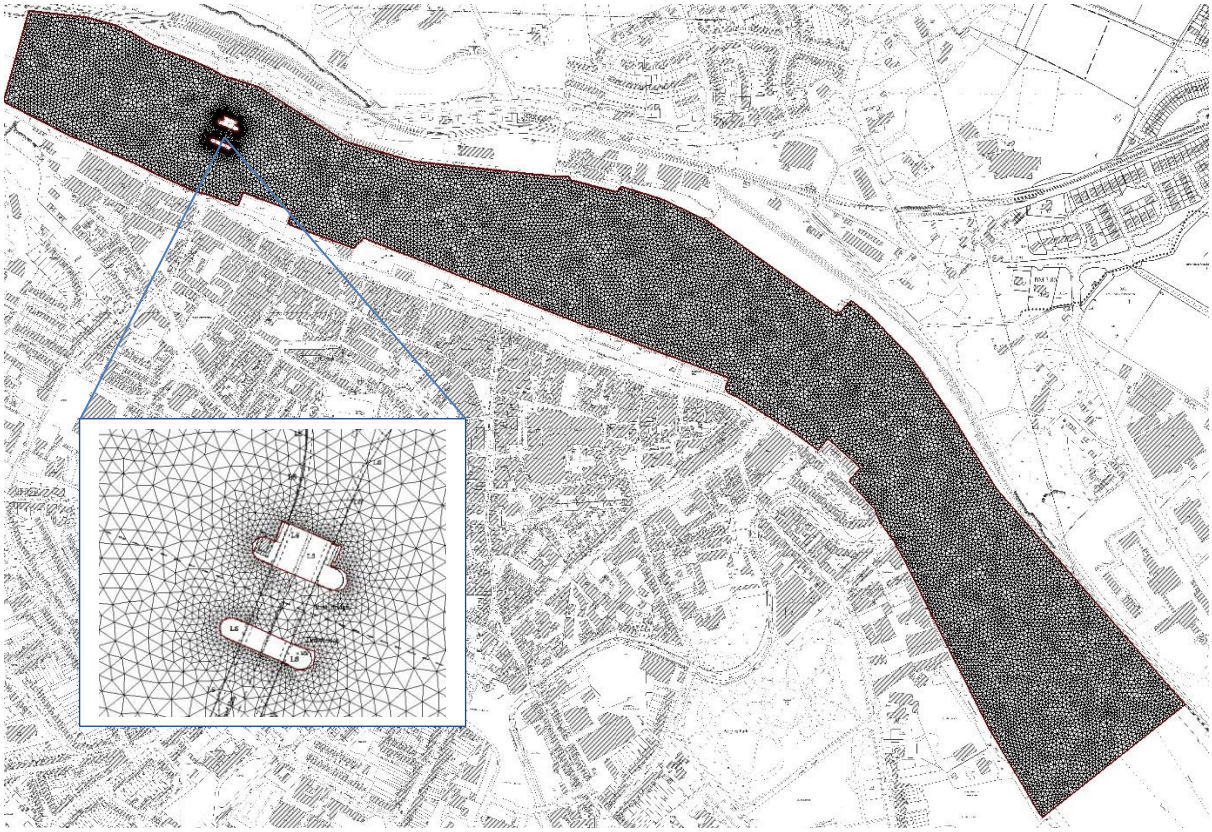


Figure 9 Finite Element Mesh for existing scenario

2.7 Model Calibration

The hydrodynamic model was calibrated against the tidal velocity and elevation measurements performed by Aquafact using an Acoustic Doppler Current meter for the period 25th June 2018 to 19th July 2018. The ADCP was deployed for

24days at the proposed bridge crossing section, located 42m out from the North Quay, National Grid Reference 260782, 112796 (refer to Figure 8).

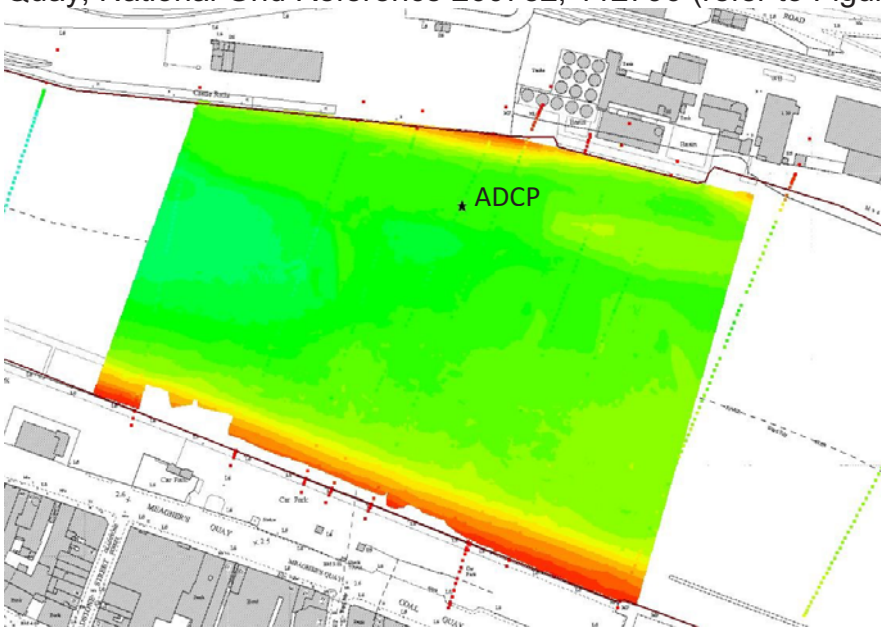


Figure 8 Location of ADCP current meter for model calibration.

The tide elevation recorded at Dumore East tidal gauge was input to the 1D HEC-RAS model and the model was run for the 24day simulation period so as to produce flow and elevation hydrographs at the upstream and downstream locations.

The hydrodynamic model was run for a start date of 25/06/2018 14:00 to the 19/07/2018 12:00 for a computational time step of 1second and simulation results were output every 10 minutes for the complete model domain and stored in a binary results database. Time series of tide elevation and depth averaged velocities were generated for the measurement point from this results database. A final calibrated Manning's roughness of 0.028 was used with a full k-ε turbulence model to simulate eddy viscosity / turbulence and accurately produce the observed hydrodynamics.

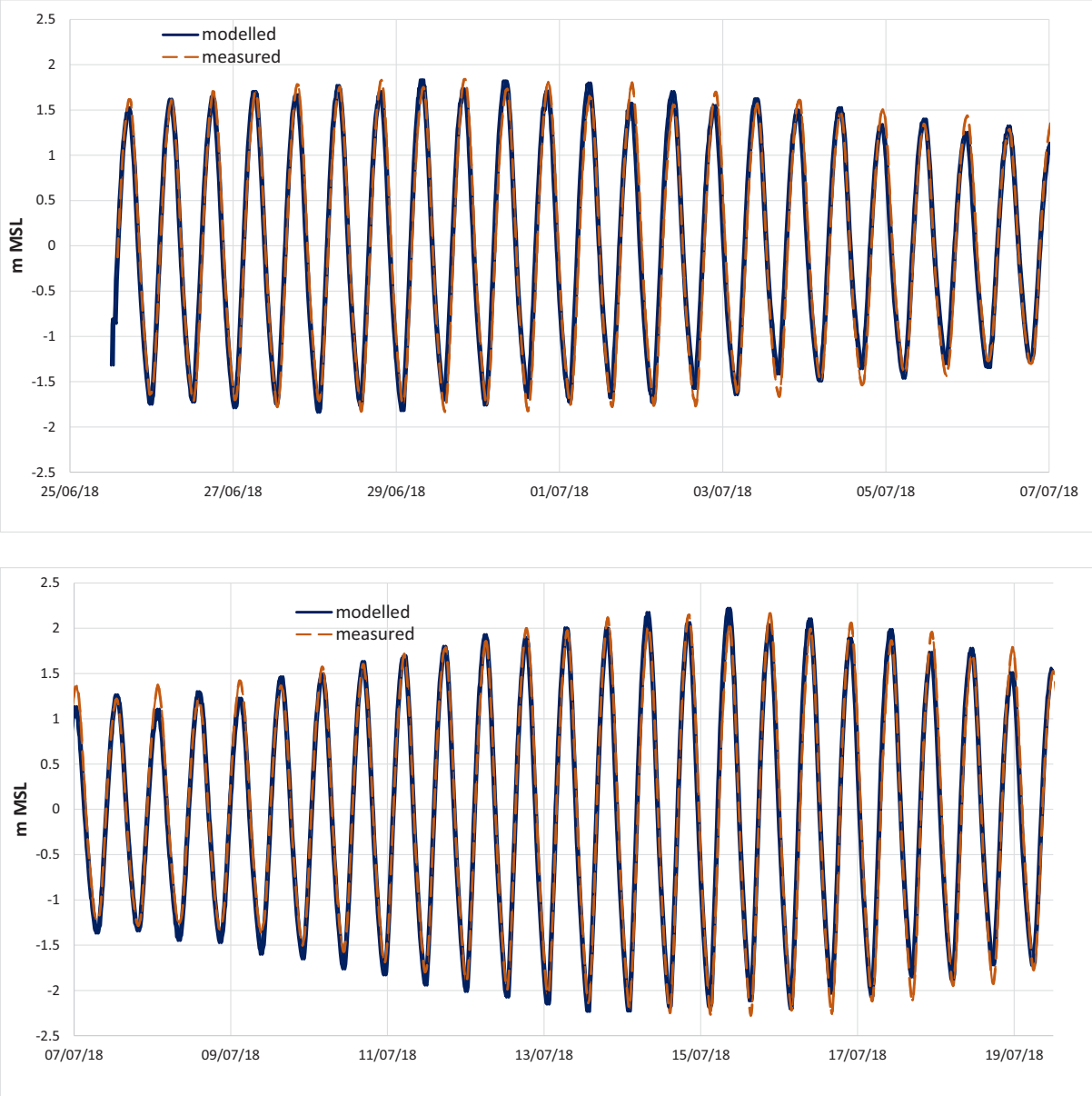


Figure 9 Measured and Predicted Tidal Elevation 25 June 2018 to 19 Jul 2018

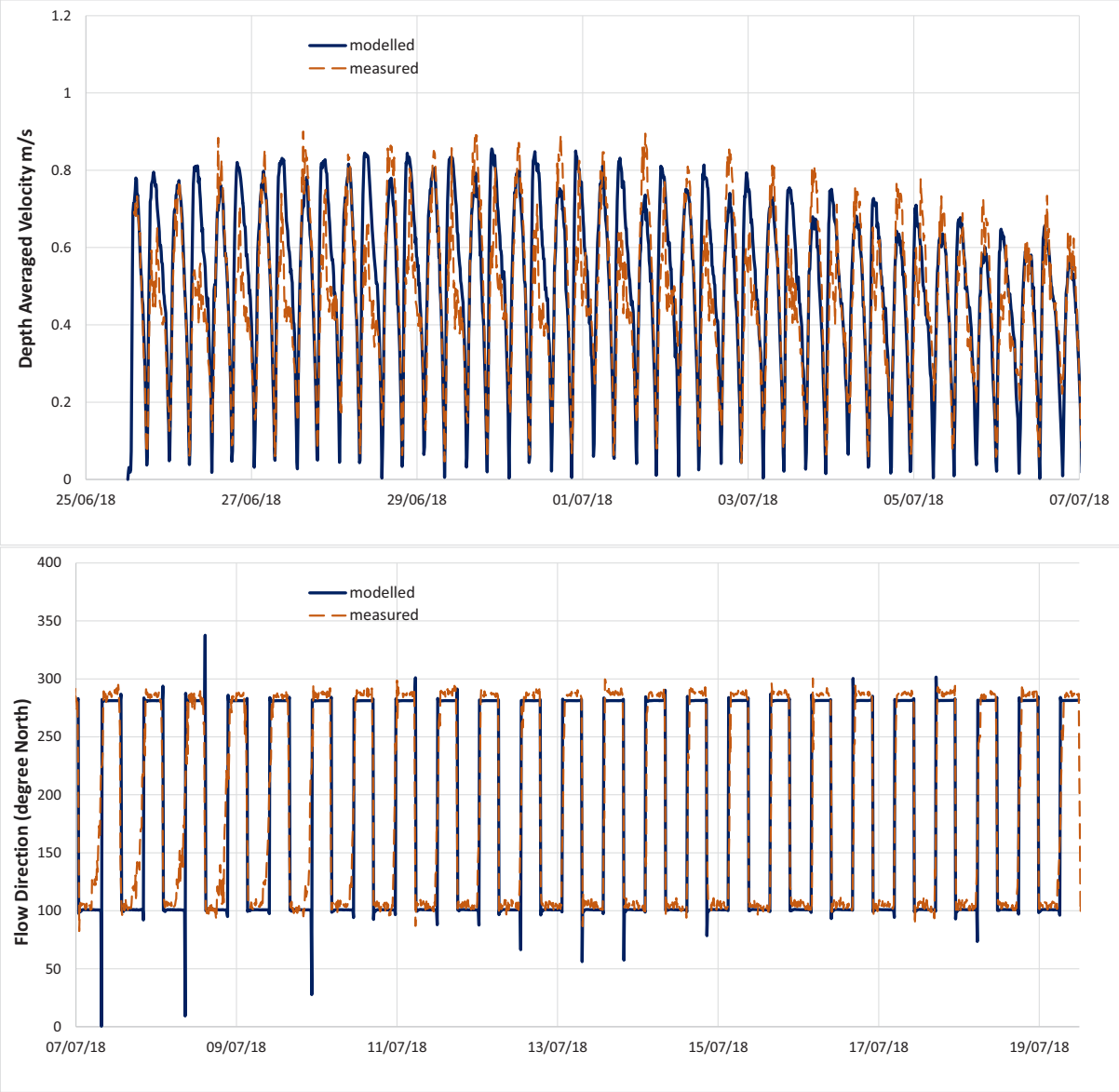


Figure 10 Measured and Modelled Depth Averaged Velocity Magnitude and Direction 26 June 2018 to 7 July 2008

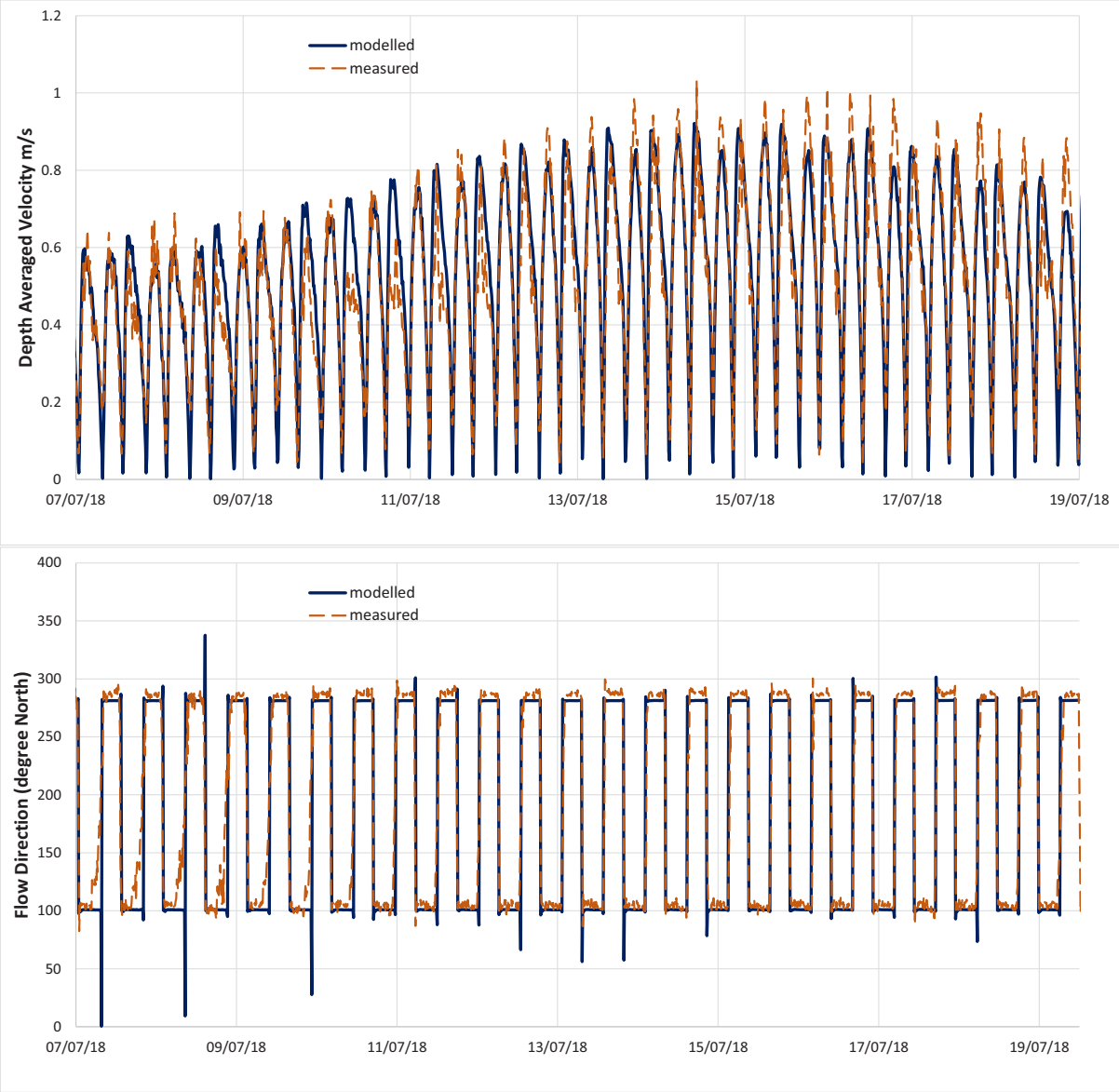


Figure 11 Measured and Modelled Depth Averaged Velocity Magnitude and Direction 7 July 2008 to 19 July 2008

2.8 Proposed Bridge Finite Element Model

For the same model reach extent as the existing model, a finite element mesh was generated modelling the support piles at the bed and also modelling, as a very conservative case the in-stream construction sheet piling at all of the pier sites, refer to Figure 13.

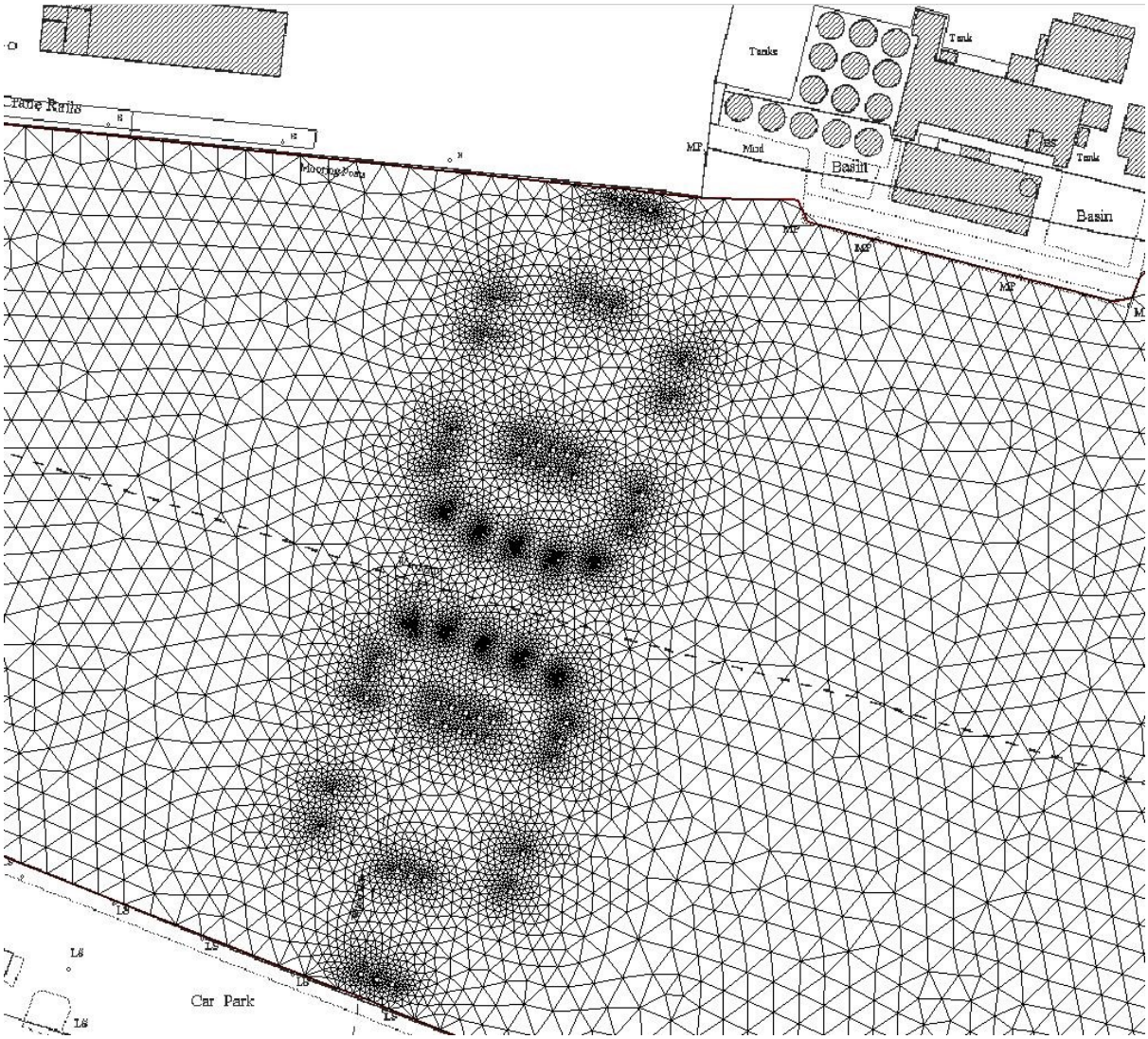


Figure 12 Bridge modelled with 1200mm diameter support Piles and Fender piles

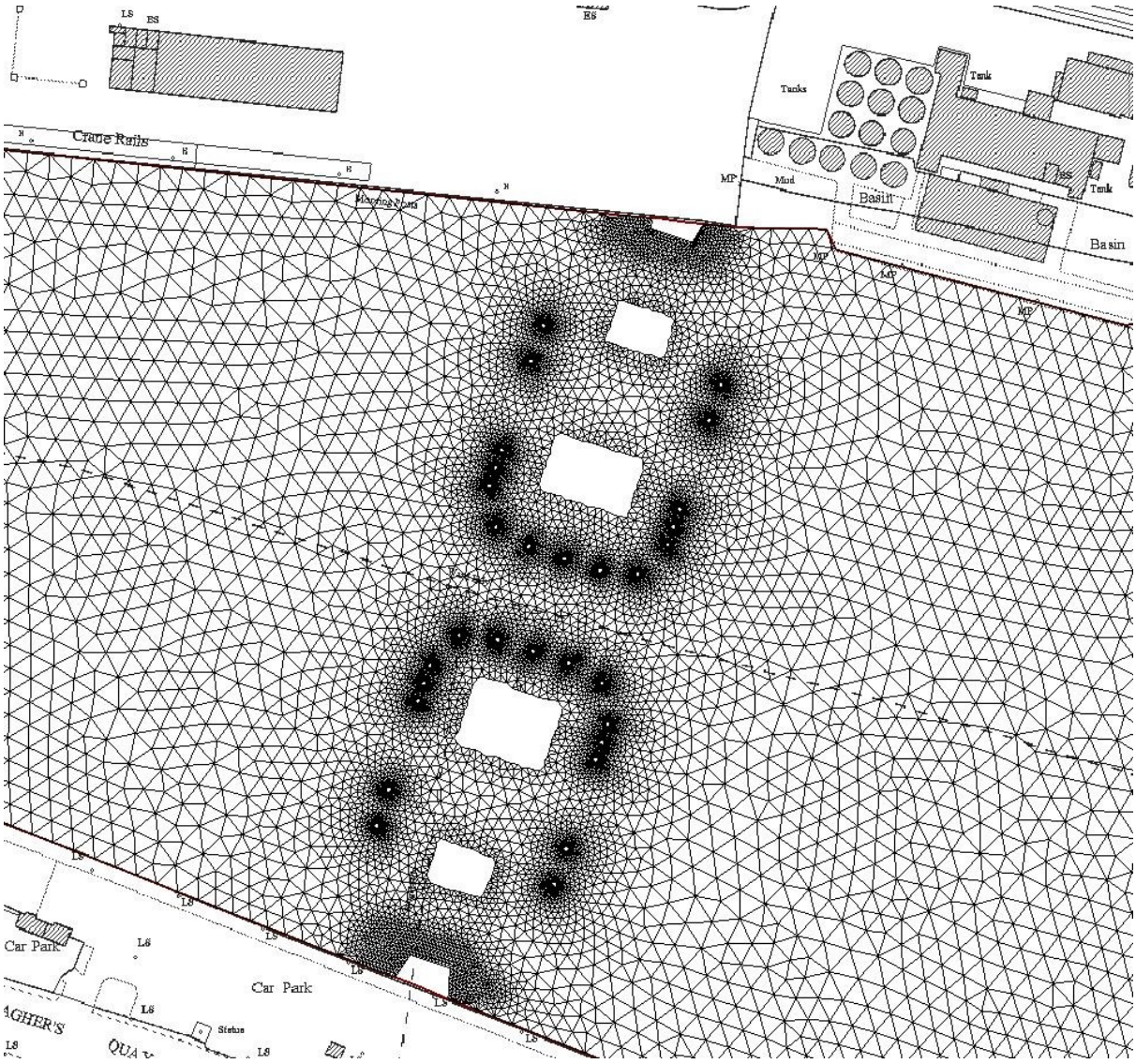


Figure 13 Bridge construction phase with temporary Cofferdams in place and Fender Piles

3. HYDRODYNAMIC SIMULATIONS

3.1 Introduction

A 24day spring – neap – spring tide using the recent tidal observations recorded from the 25th June to the 19th July 2018 was simulated so as to assess the potential change in tidal velocities and bed shear stresses within the study reach under existing and proposed conditions.

Sensitivity simulations concluded that the fluvial flow component and storm surge tide events did not have a significant effect on tidal velocities and shear stresses and that average flow conditions under normal tides were sufficient to assess the potential hydrodynamic effect and the sediment transport impacts of the proposed bridge crossing.

3.2 Model Simulation Runs

The computed neap and spring tide ebb and flood velocities for the existing (do nothing scenario) case are presented in Figures 14 to 17. These simulation results show contraction of flow and locally increased velocities around the existing piers at Edmund Rice Bridge and generally uniform flow conditions at the proposed bridge location with peak ebb and flood velocities reaching 0.6 to 0.7m/s on the neap tide and 1 to 1.1m/s on the flood towards the centre of the channel at the proposed bridge location.

The computed maximum Bed Shear Stress for the existing case is presented in Figures 18 to 21 for neap and spring flood and ebb flows respectively. These generally show 1.5 to 2 Pa for neap mid ebb and flood flows and 3 to 4 for spring mid-flood and ebb flows. Local increases are evident at sites of contraction such as the existing Edmund Rice bridge.

The tidal simulation of the proposed bridge case shows varying flow velocities caused by the contraction of flow around the pile centres and the sheltering effect and disturbance of the pile groups on velocity and local flow direction. The computed neap and spring tide ebb and flood velocities for the proposed bridge case are presented in Figures 23 to 26. These show neap ebb and flood velocities reaching 0.7 to 0.9m/s and spring velocities reaching 1.1 to 1.3m/s at the bridge.

Velocity difference plots between proposed and existing cases are presented in Figures 27 to 30 for neap and spring tides at mid-ebb and mid-flood respectively, which indicates the extent of the estuary area hydraulically impacted by the bridge structure. This represents a limited localised impact both upstream and downstream of the proposed bridge.

The computed maximum Bed Shear Stress for the existing case is presented in Figures 31 to 34 for neap and spring flood and ebb flows respectively. These plots show localised increases through the bridge and for the immediate section both upstream and downstream of the bridge with the Shear Stress increasing from 1.5 to 2.0 Pa for the existing case to 2 to 2.5Pa on neap mid-ebb and flood flows and from 3 to 4 Pa to 5 to 7Pa for spring mid-flood and ebb flows. Such increases will result in accelerated local scouring of the silts and sands.

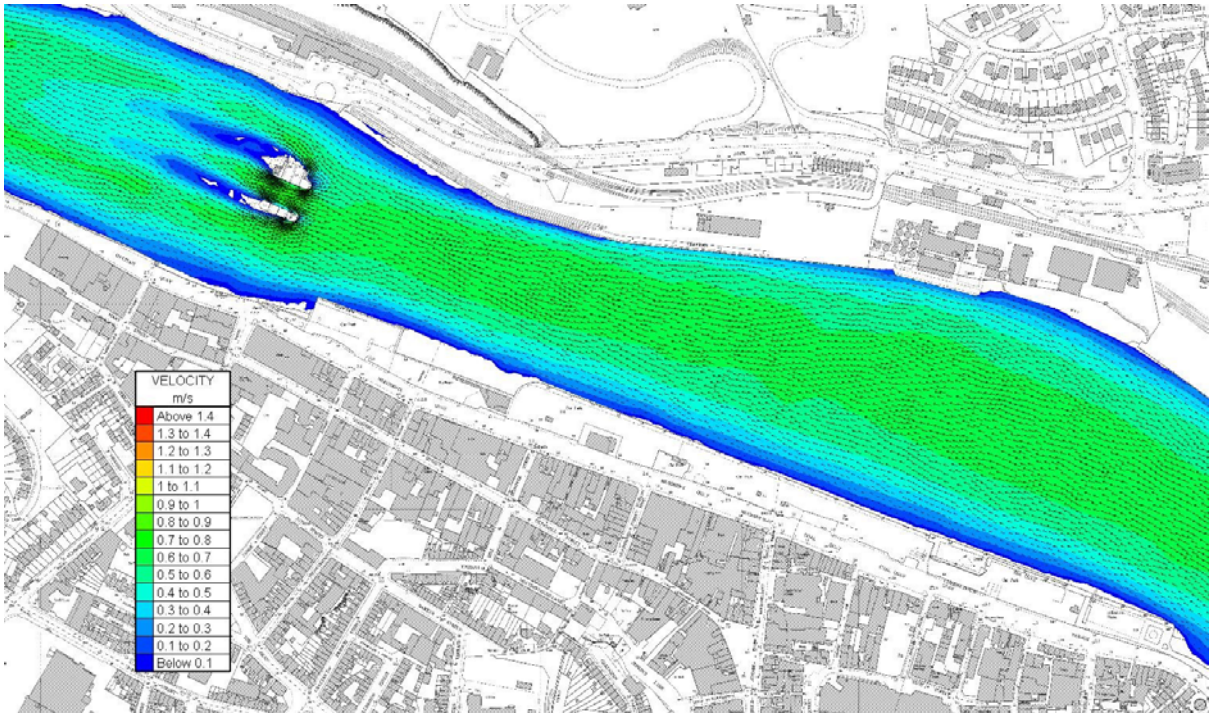


Figure 14 Neap Tide – Mid-Flood velocities under existing conditions

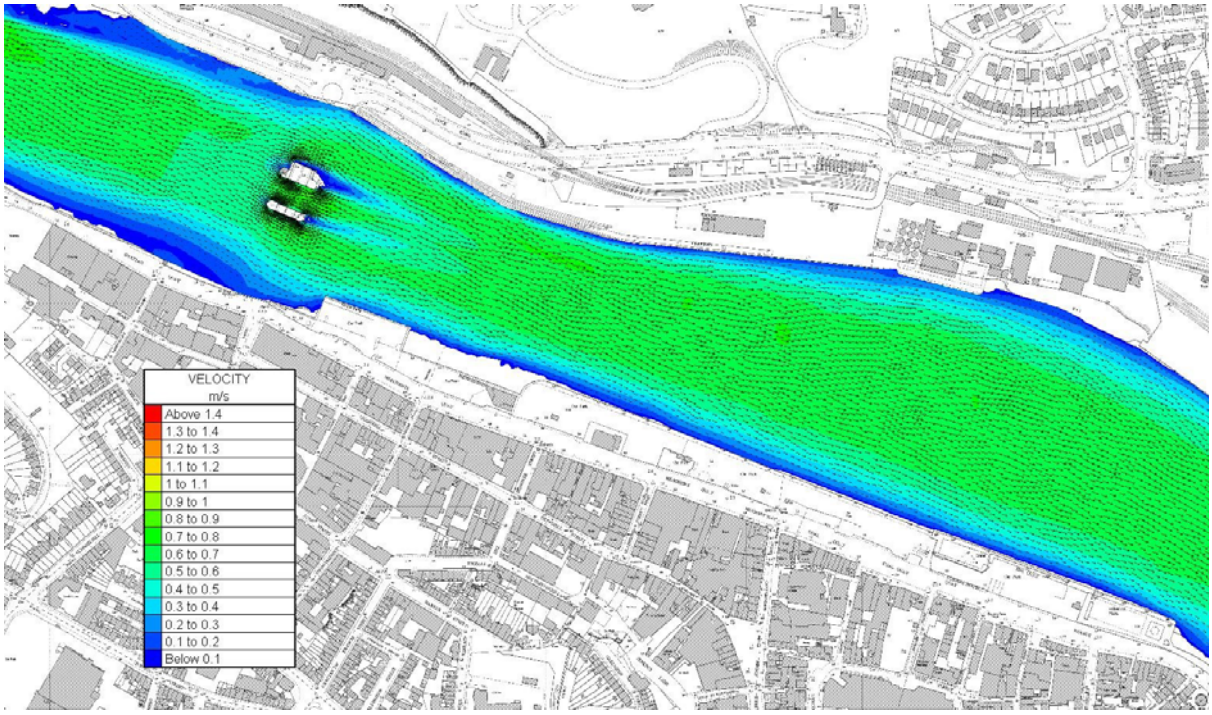


Figure 15 Neap Tide – Mid-Ebb velocities under existing conditions

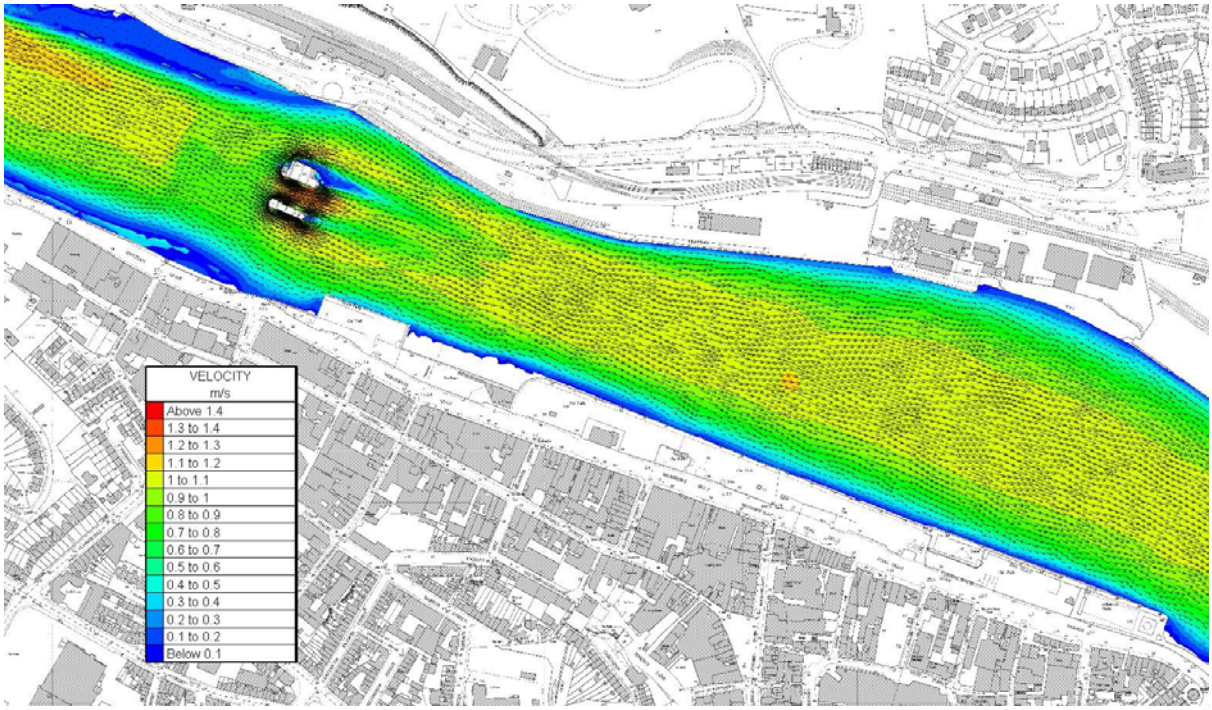


Figure 16 Spring Tide – Mid-Ebb velocities under existing conditions

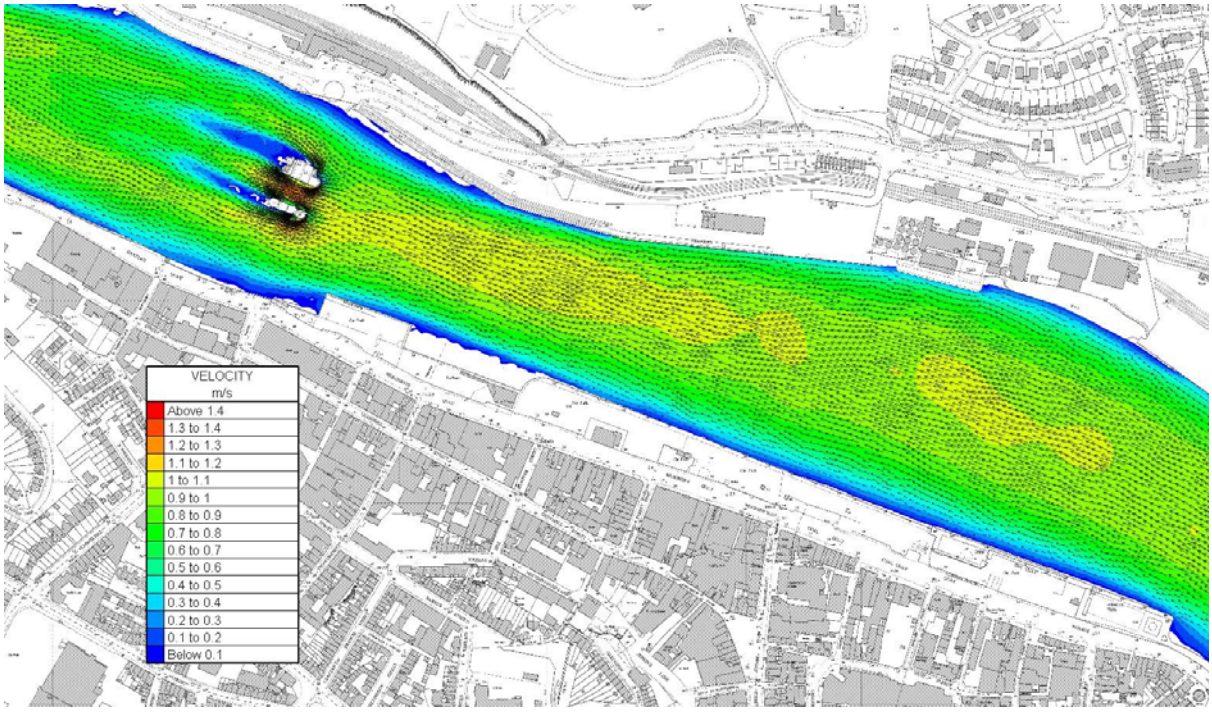


Figure 17 Spring Tide – Mid-Flood velocities under existing conditions

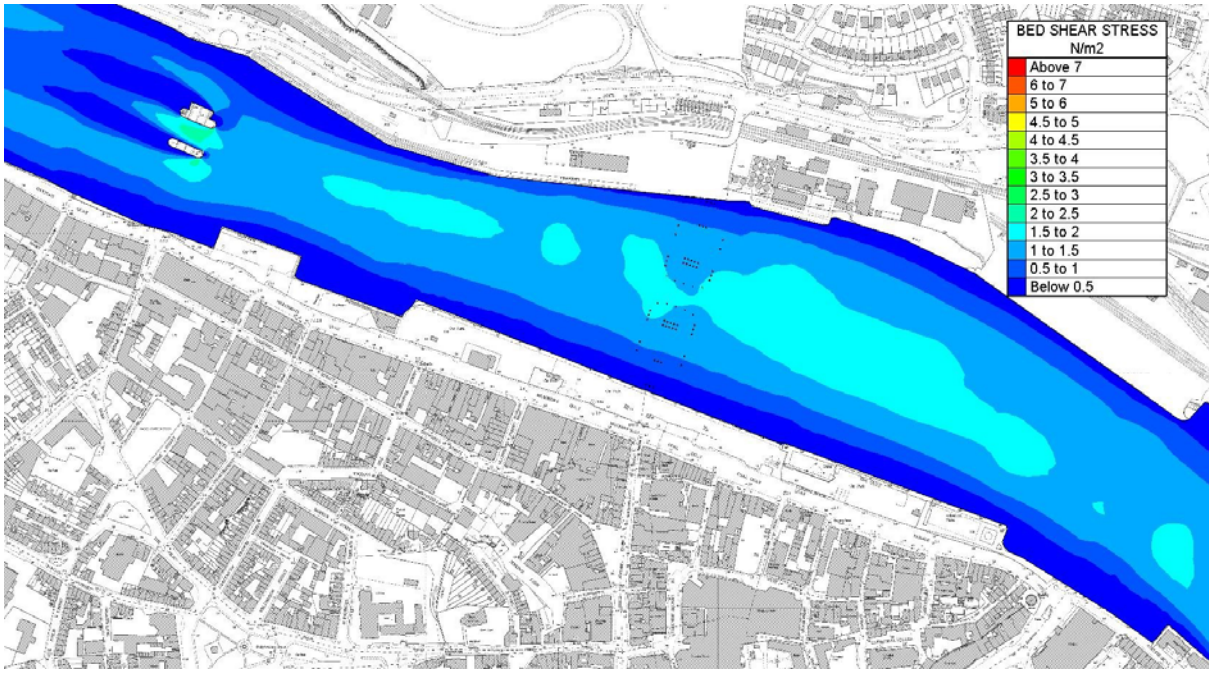


Figure 18 Computed bed shear stress Neap Tide – Mid-Flood – Existing Case

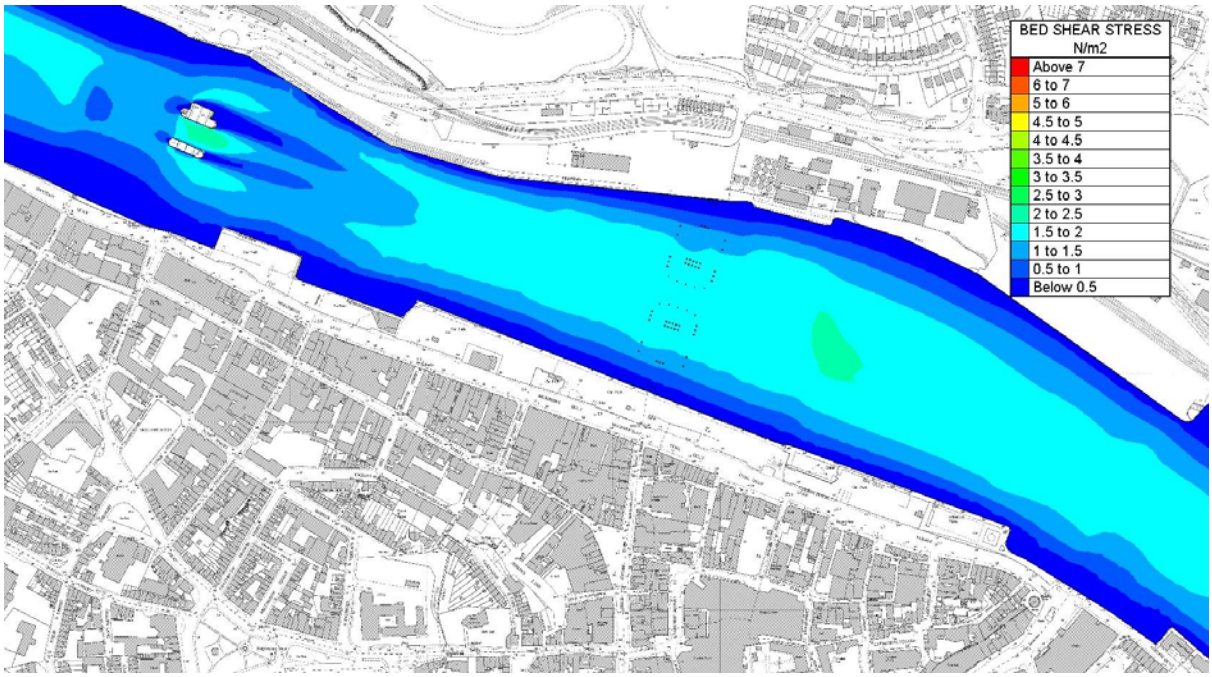


Figure 19 Computed bed shear stress Neap Tide – Mid-Ebb – Existing Case

Note Proposed Location of bridge pile foundation shown

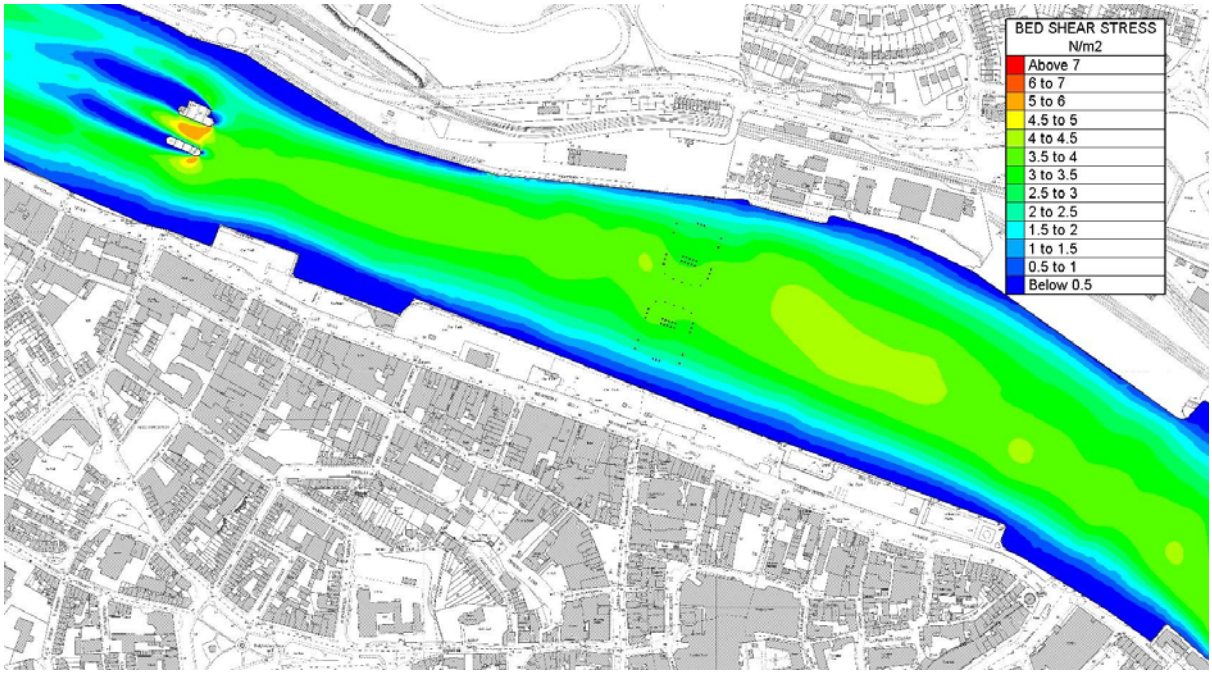


Figure 20 Computed bed shear stress Spring Tide – Mid-Flood – Existing Case

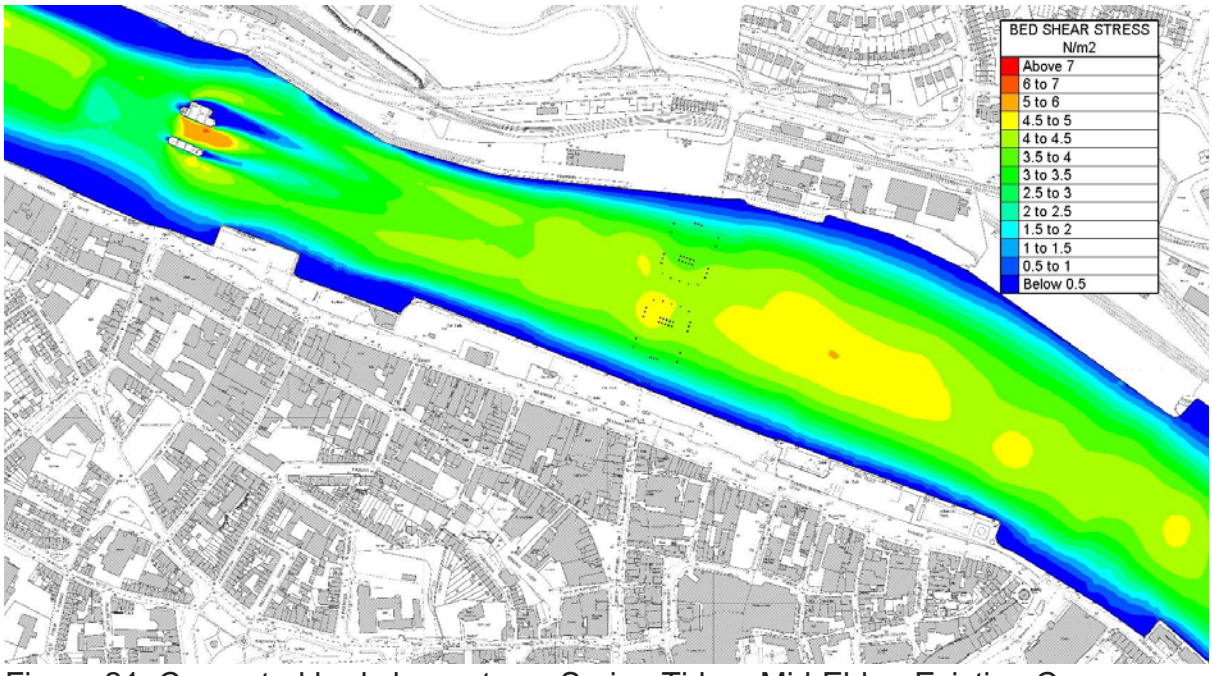


Figure 21 Computed bed shear stress Spring Tide – Mid-Ebb – Existing Case

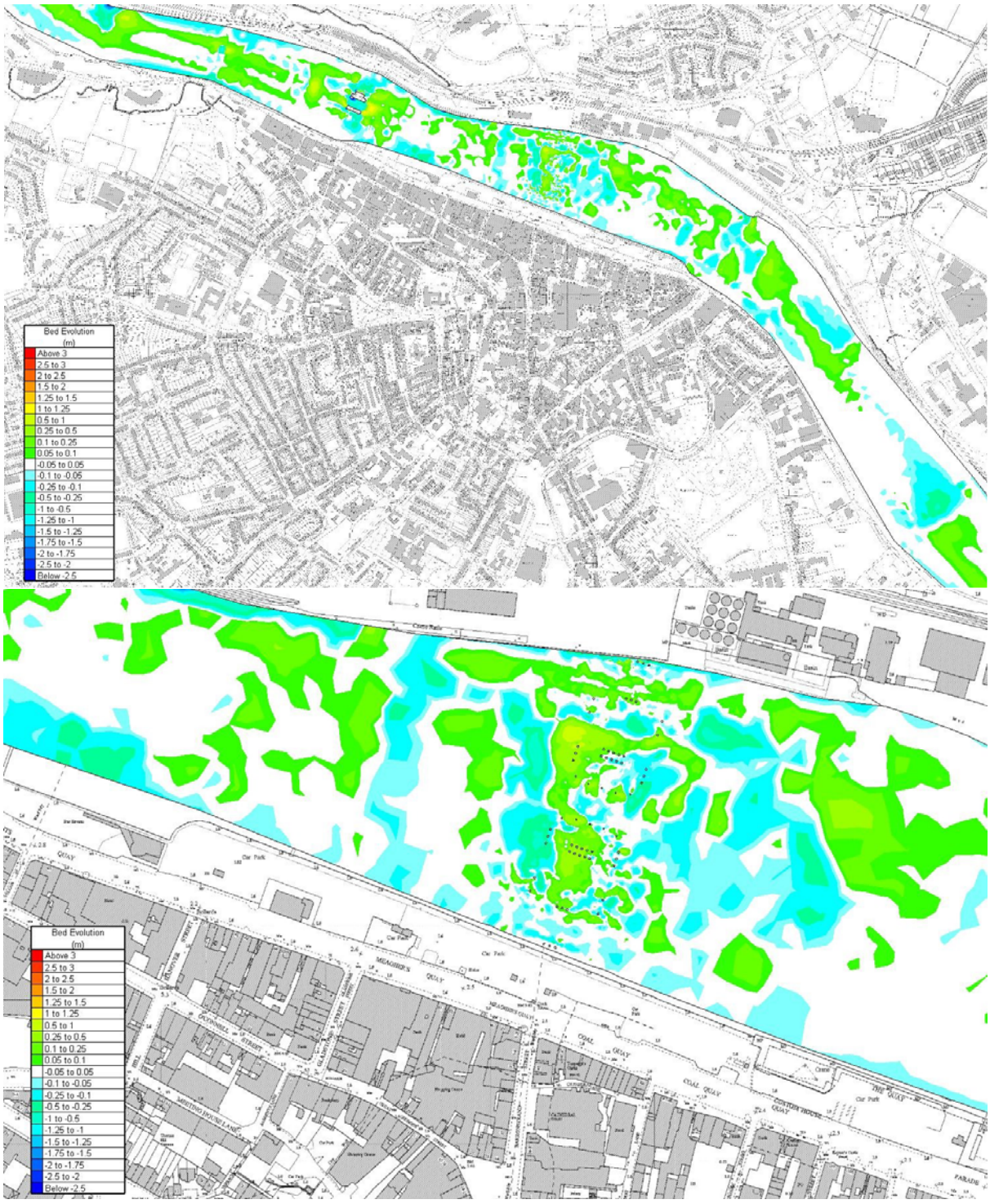


Figure 22 Computed Bed Evolution - - Existing Do-nothing Case

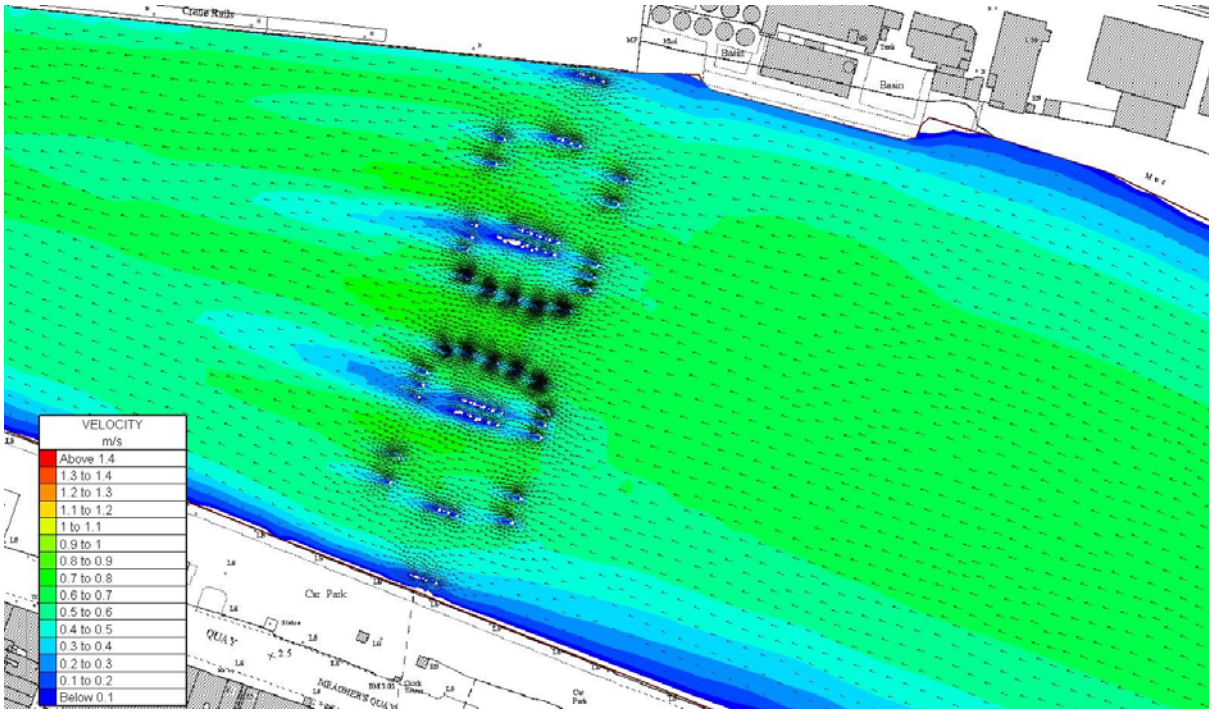


Figure 23 Neap Tide – Mid-Flood velocities for proposed bridge case

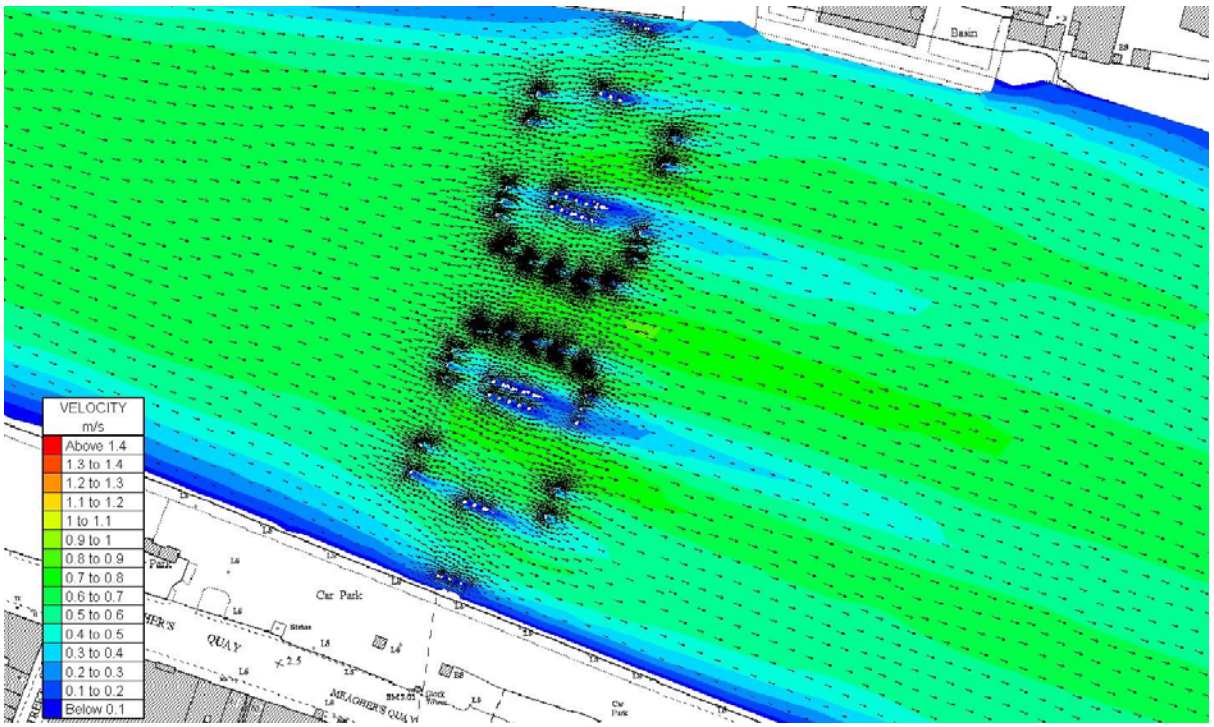


Figure 24 Neap -Tide Mid-Ebb velocities for proposed bridge case

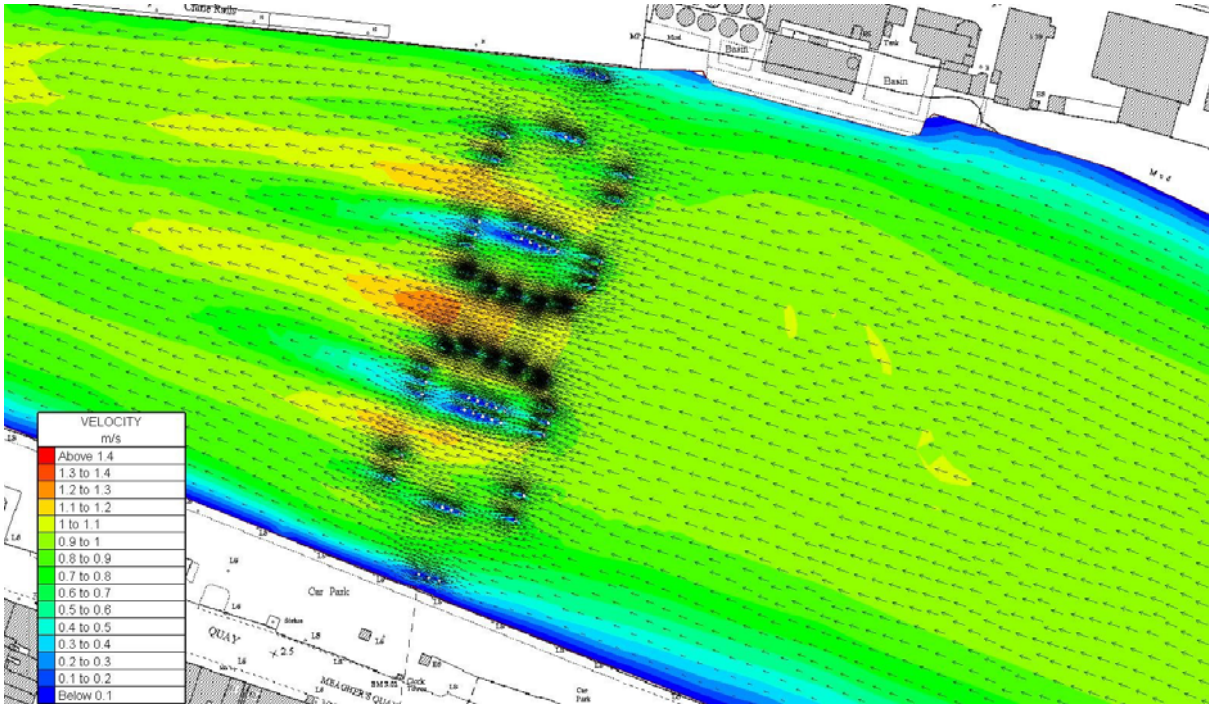


Figure 25 Spring Tide – Mid-Flood velocities for proposed bridge case

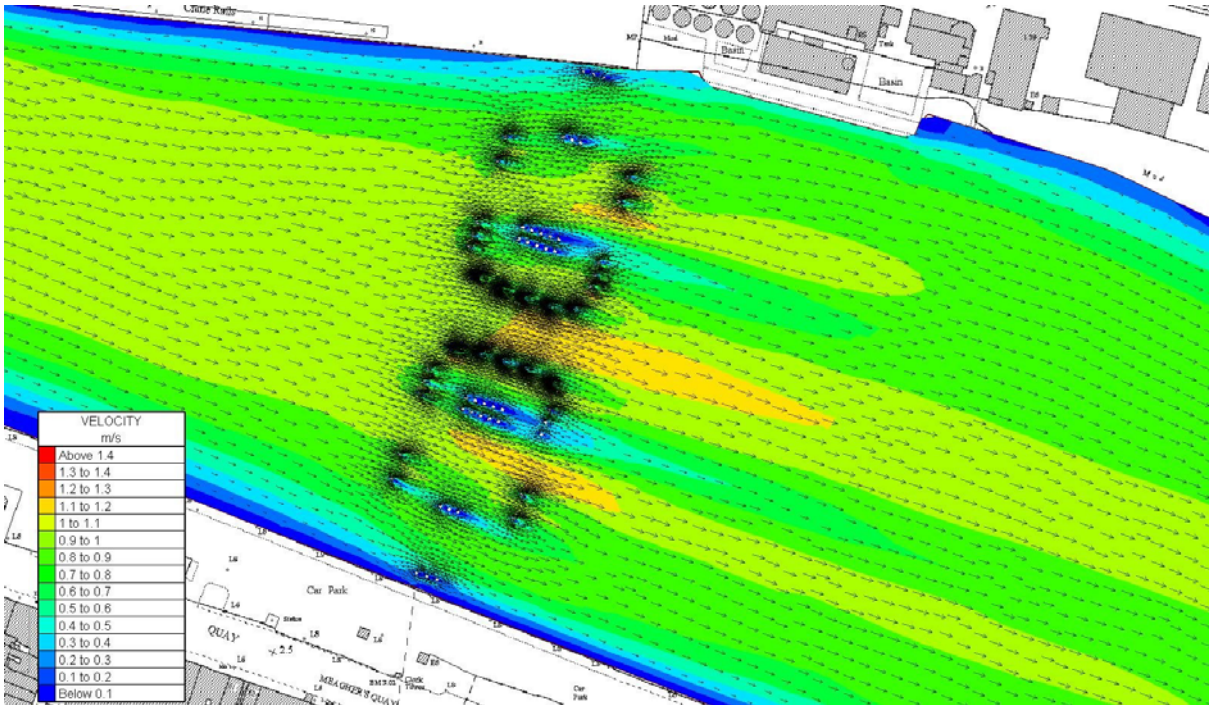


Figure 26 Spring Tide – Mid- Ebb velocities for proposed bridge case

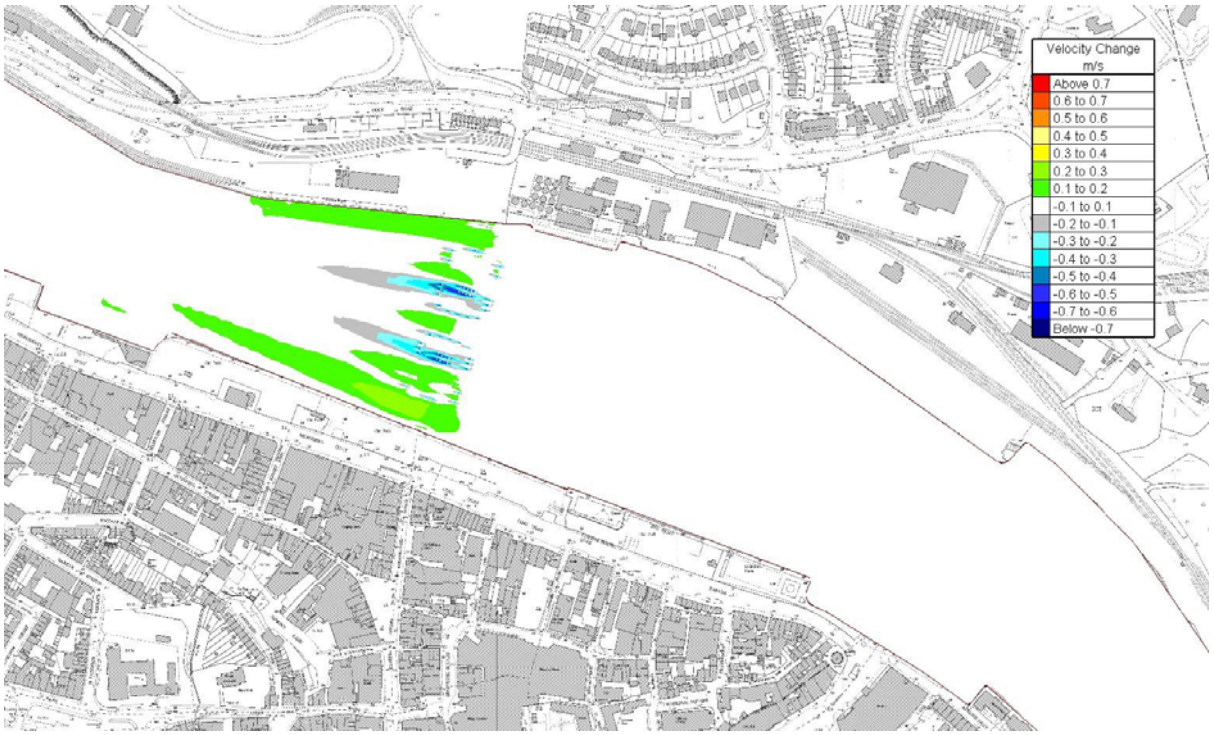


Figure 27 Computed change in velocity magnitude as a result of the proposed bridge – Neap Tide Mid-Flood

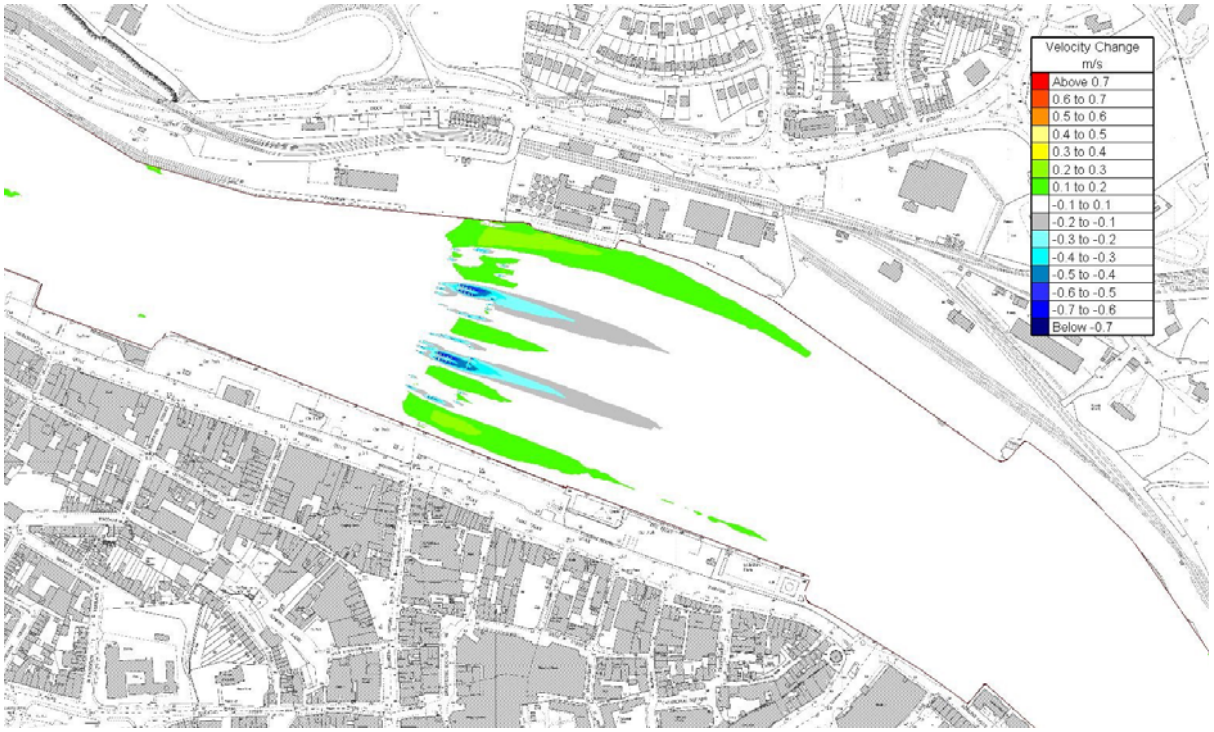


Figure 28 Computed change in velocity magnitude as a result of the bridge – Neap Tide Mid-Ebb

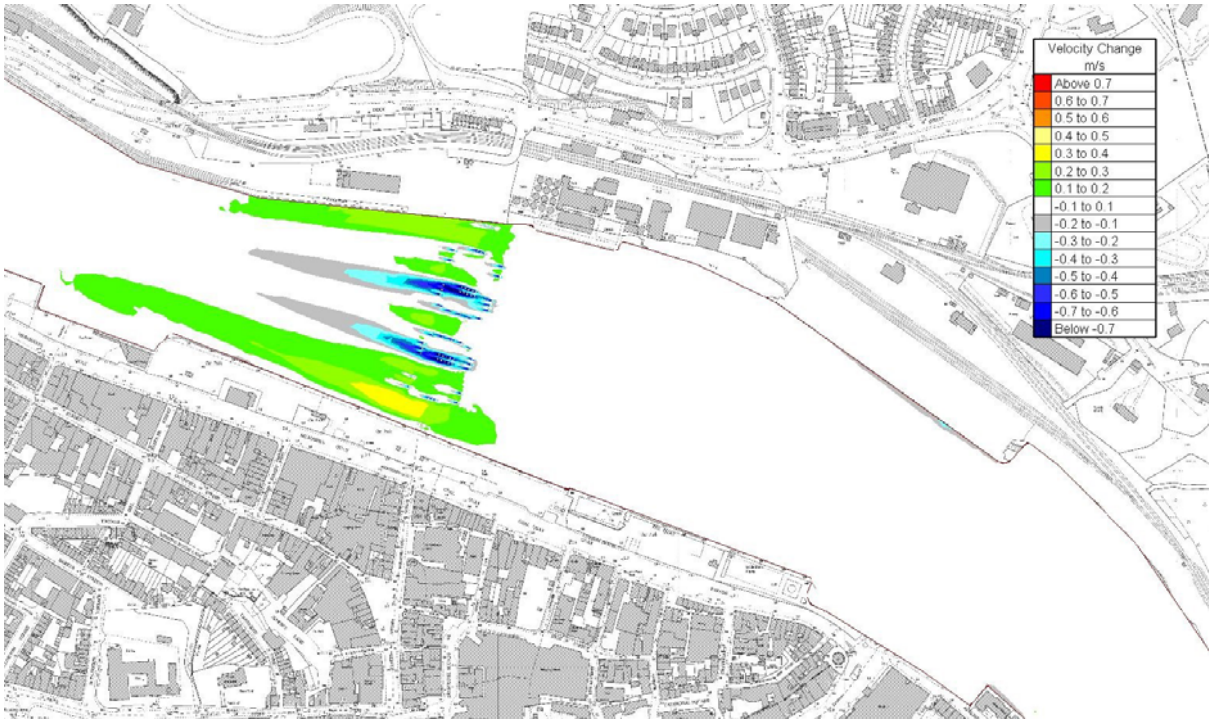


Figure 29 Computed change in velocity magnitude as a result of the bridge – Spring Tide Mid-Flood

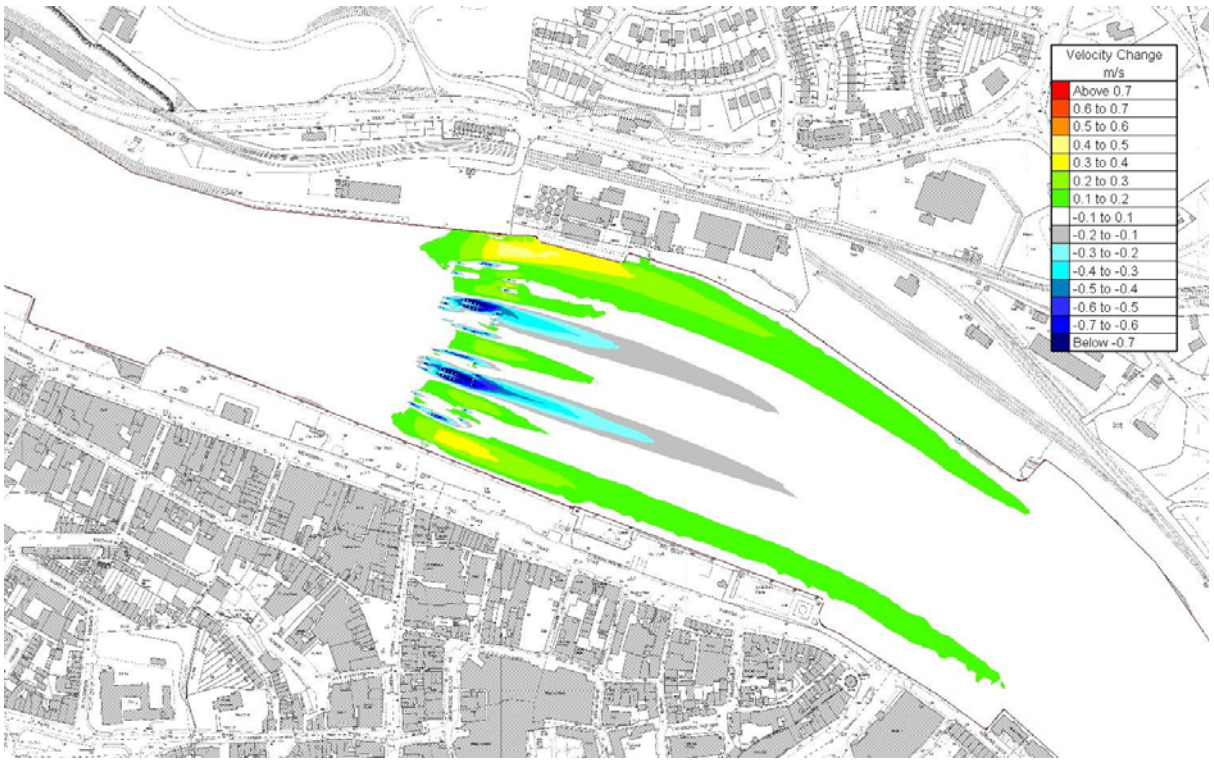


Figure 30 Computed change in velocity magnitude as a result of the Bridge – Spring Tide Mid-Ebb

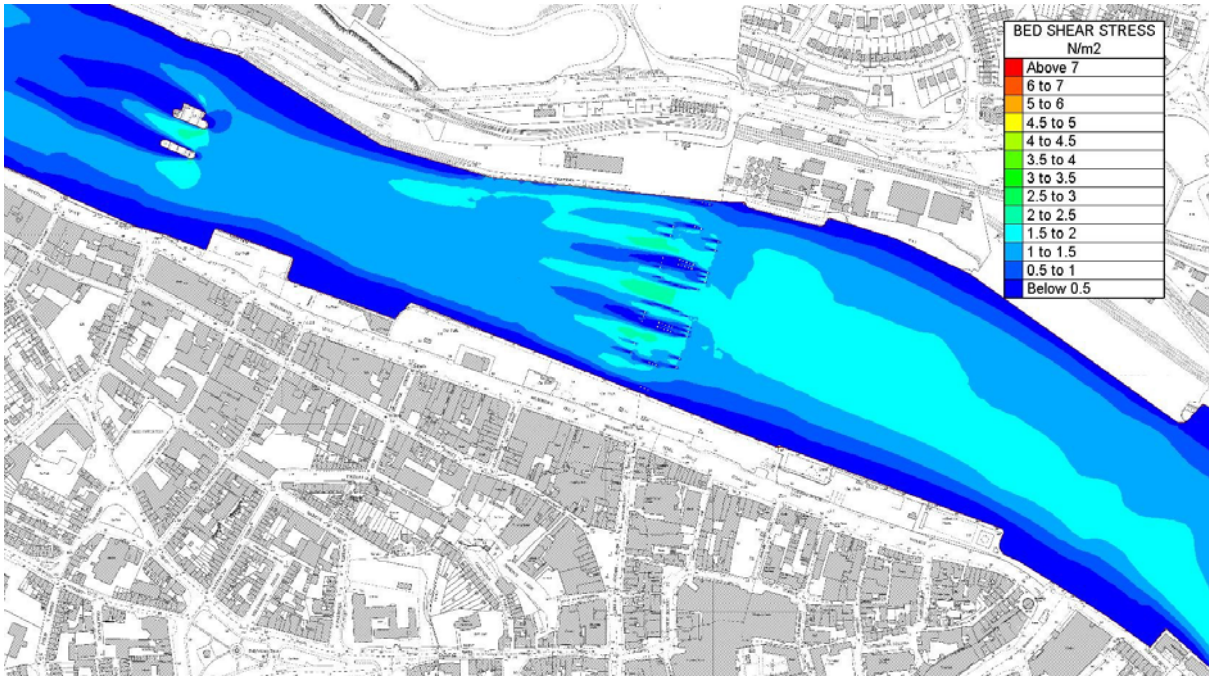


Figure 31 Computed bed shear stress Neap Tide – Mid-Flood – Bridge Case

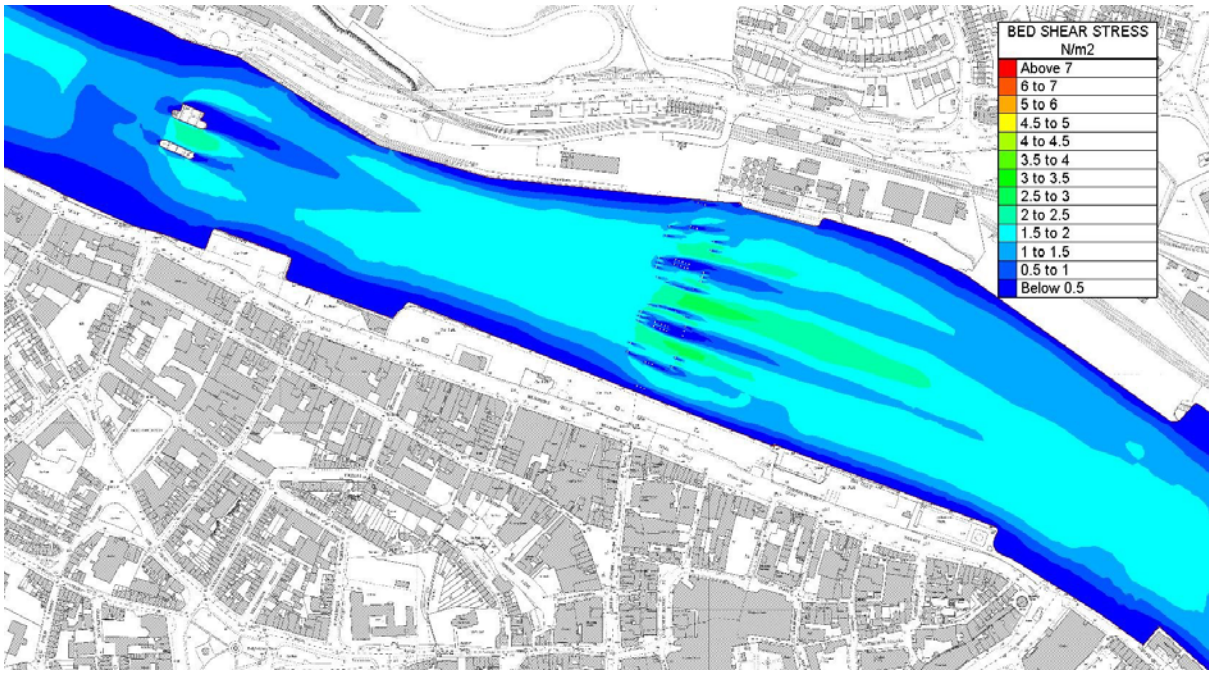


Figure 32 Computed bed shear stress Neap Tide – Mid-Ebb – Bridge Case

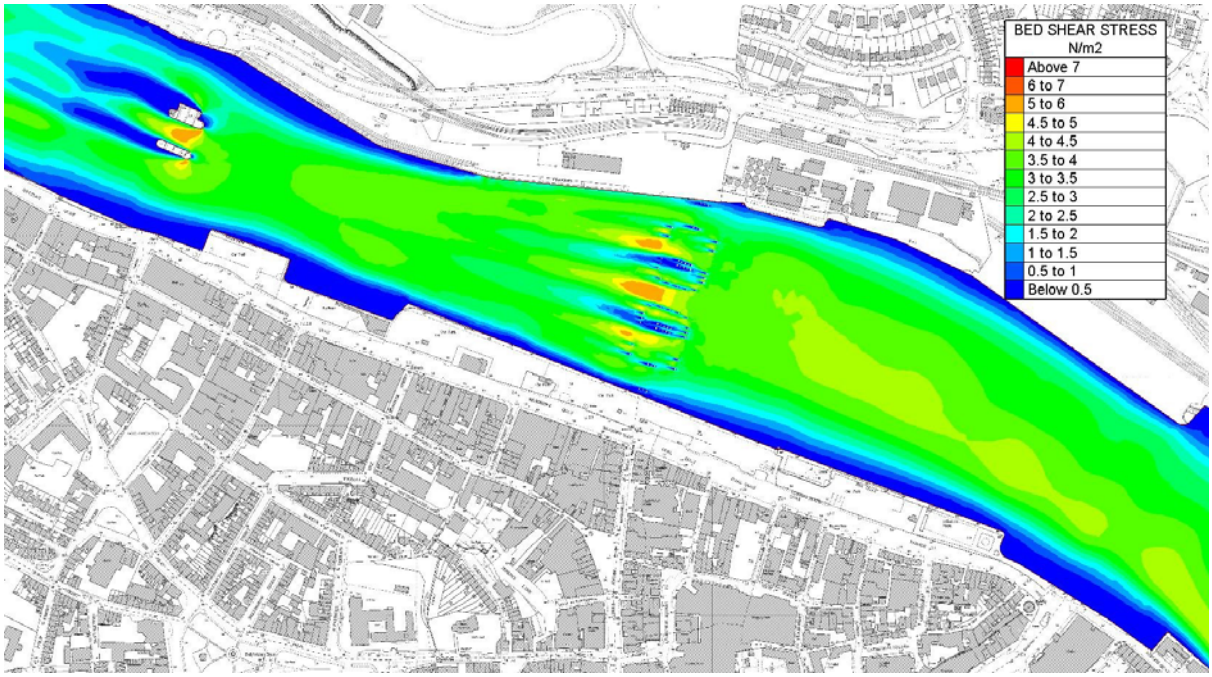


Figure 33 Computed bed shear stress Spring Tide – Mid-Flood – Bridge Case

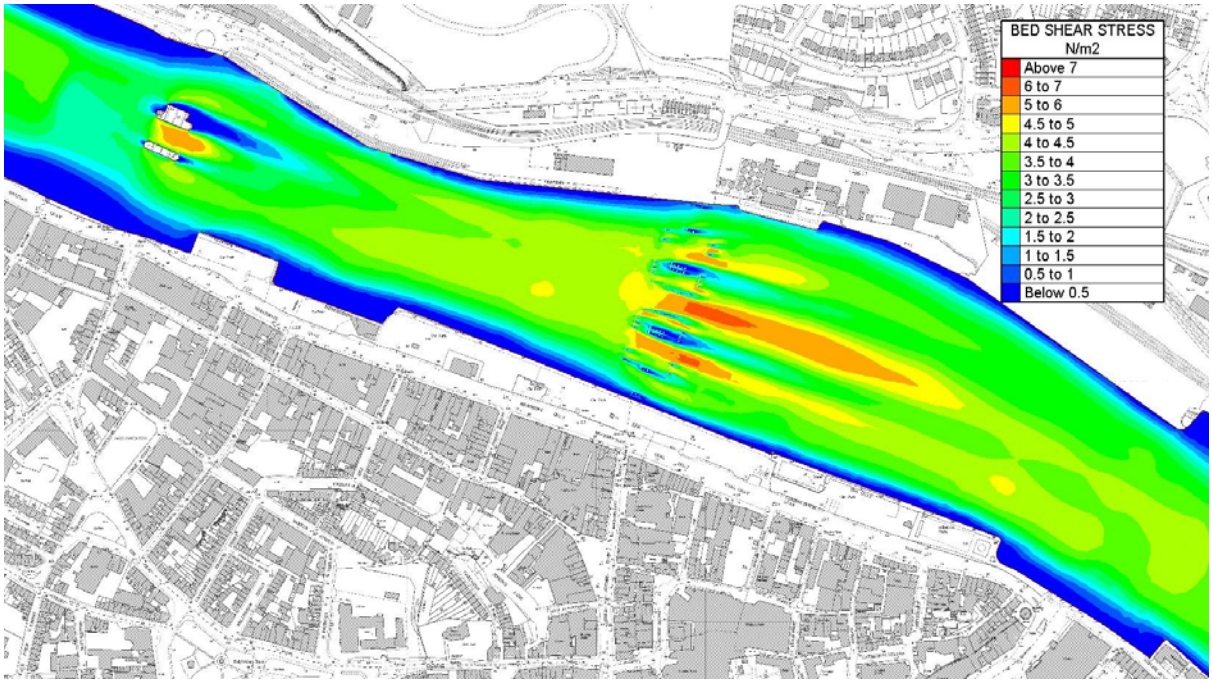


Figure 34 Computed bed shear stress Spring Tide – Mid-Ebb – Bridge Case

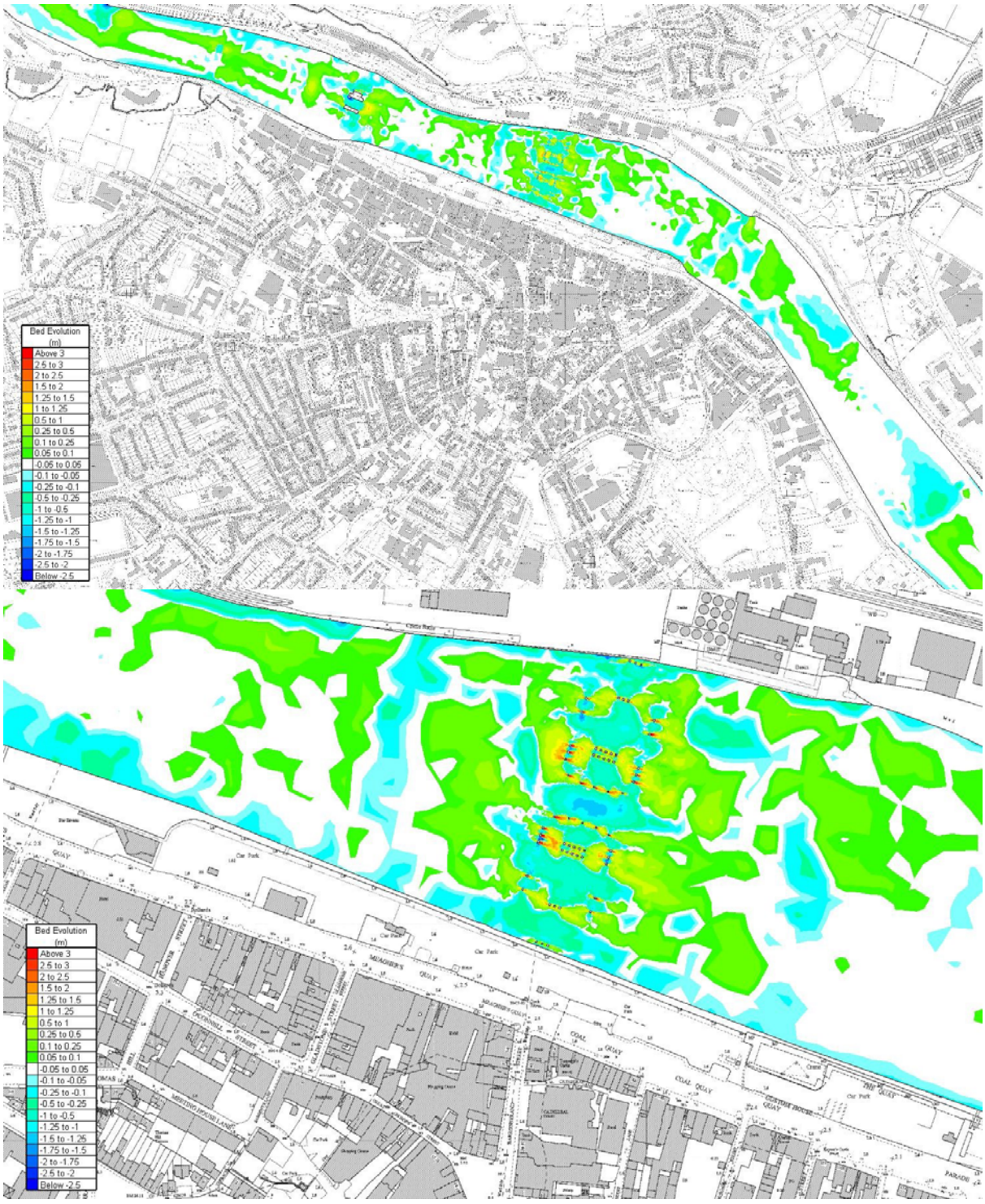


Figure 35 Computed Bed Evolution - Proposed Bridge Case

3.3 Construction Phase Simulation

A worst case scenario was examined with the proposed sheet pilling in place surrounding all bridge piers and the fender piles in place also. This scenario represents a significant contraction of the flow streamlines through the structure resulting in increased velocities.

The computed neap and spring tide ebb and flood velocities for the proposed bridge are presented in Figures 36 to 39. These show neap, ebb and flood velocities reaching 0.7 to 0.9m/s and spring velocities reaching up to 1.2 to 1.4m/s at the bridge.

Velocity difference plots between proposed and existing cases are presented in Figures 44 to 47 for neap and spring tides at mid-ebb and mid-flood respectively, which indicates the extent of the estuary area hydraulically impacted by the bridge structure during construction. This represents a limited localised impact at the bridge and both upstream and downstream of the proposed bridge.

The computed maximum Bed Shear Stress for the existing case is presented in Figures 40 to 43 for neap and spring flood and ebb flows respectively. These plots show localised increases through the bridge and for the immediate section both upstream and downstream of the bridge with the Shear Stress increasing from 1.5 to 2.0 Pa for to the existing case to 2.5 to 3Pa on neap mid-ebb and flood flows and from 3 to 4 Pa to in excess of 7Pa for spring mid-flood and ebb flows. Such increases will result in accelerated local scouring of the silts and sands.

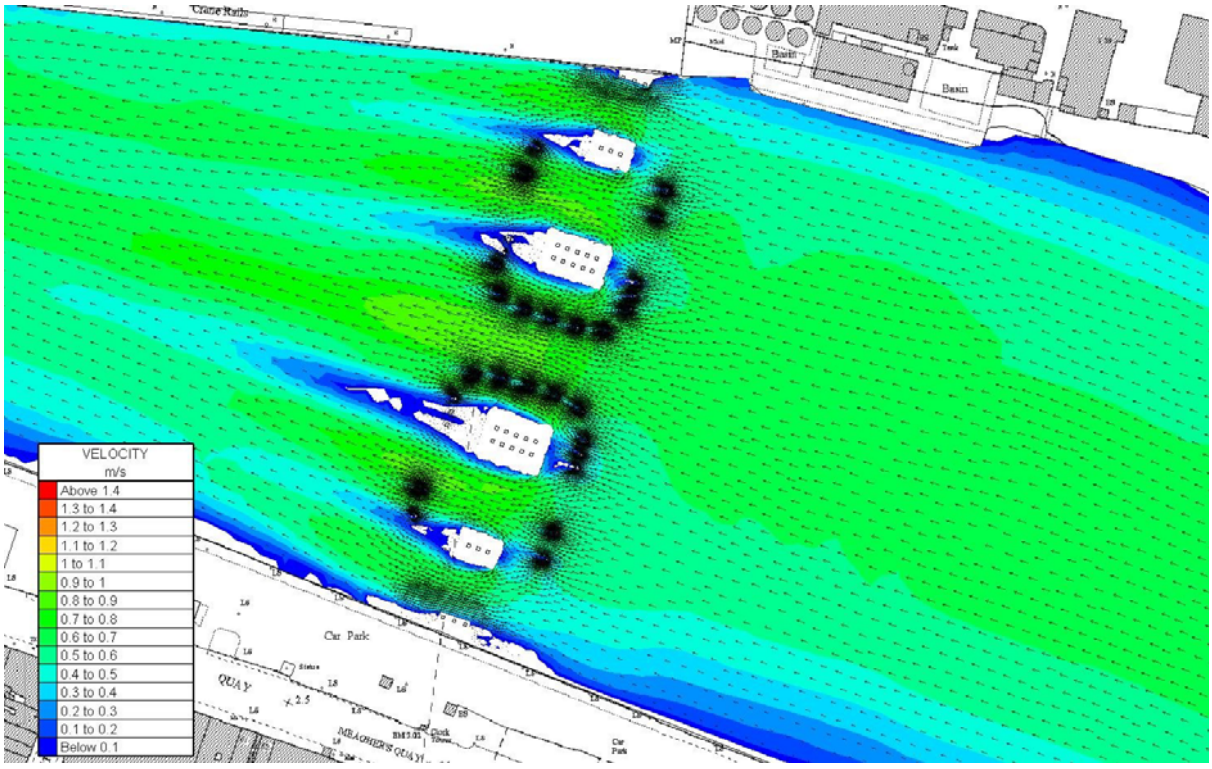


Figure 36 Neap Tide – Mid-Flood velocities for proposed Construction Phase case

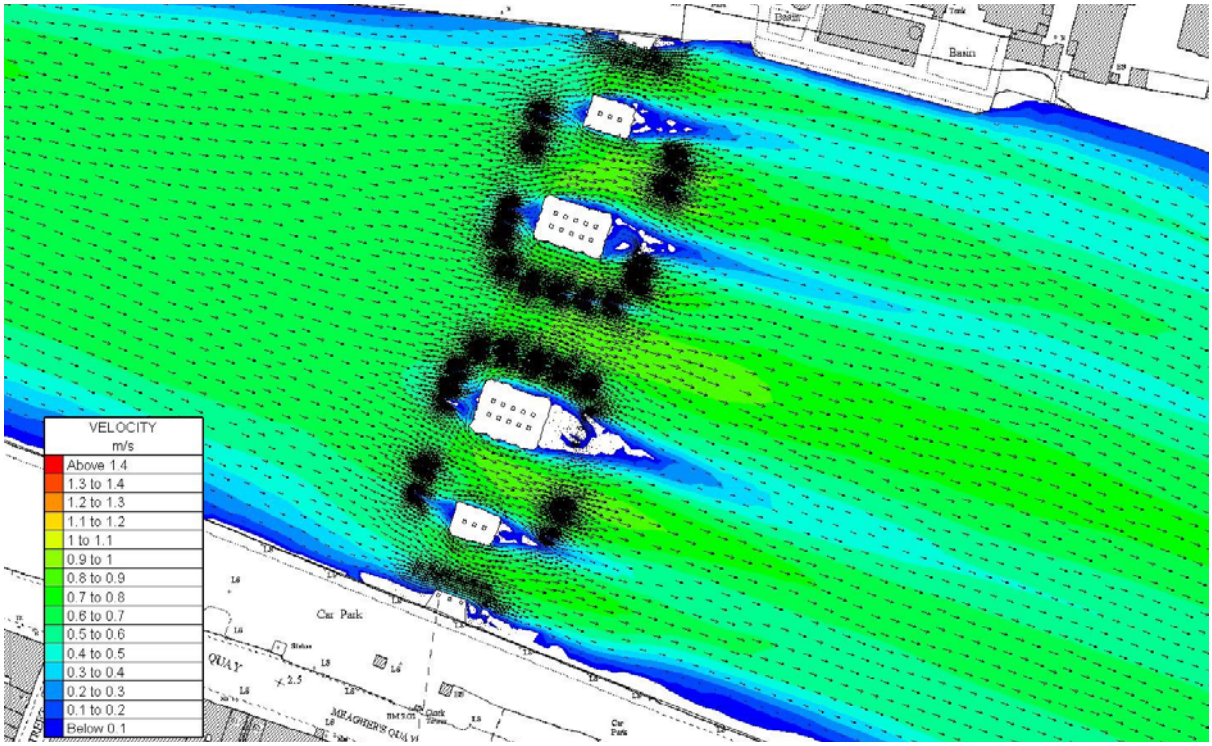


Figure 37 Neap -Tide Mid-Ebb velocities for proposed Construction Phase case

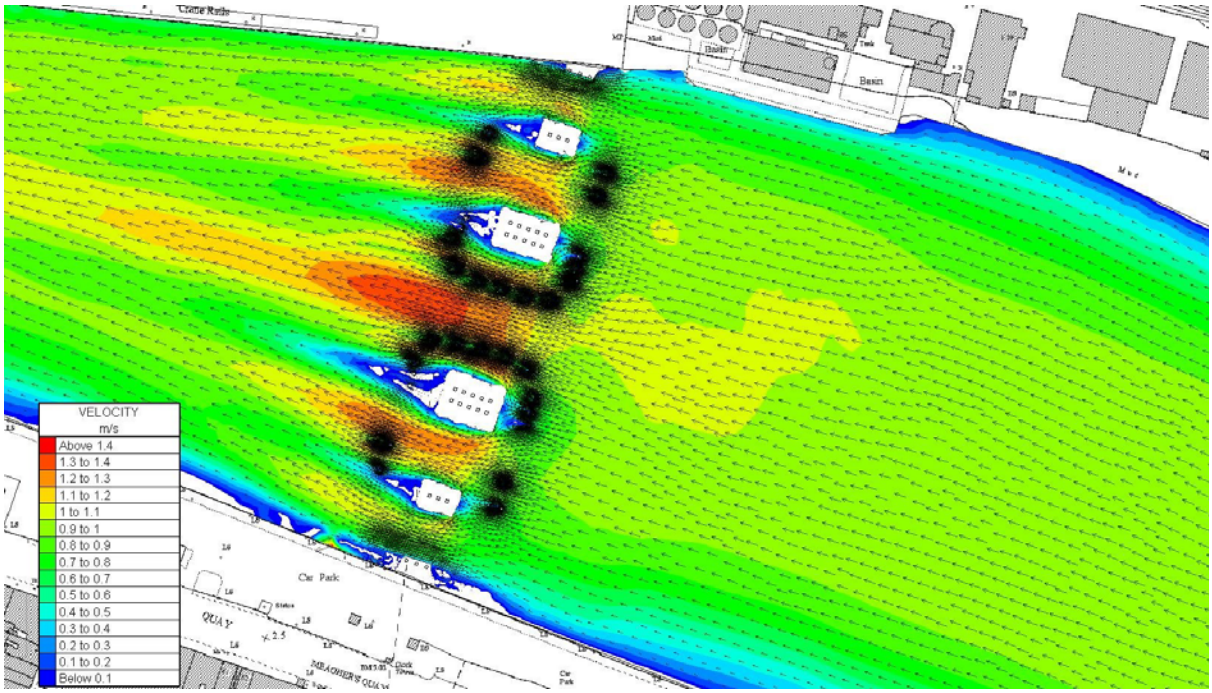


Figure 38 Spring Tide – Mid- Flood velocities for proposed Construction Phase case

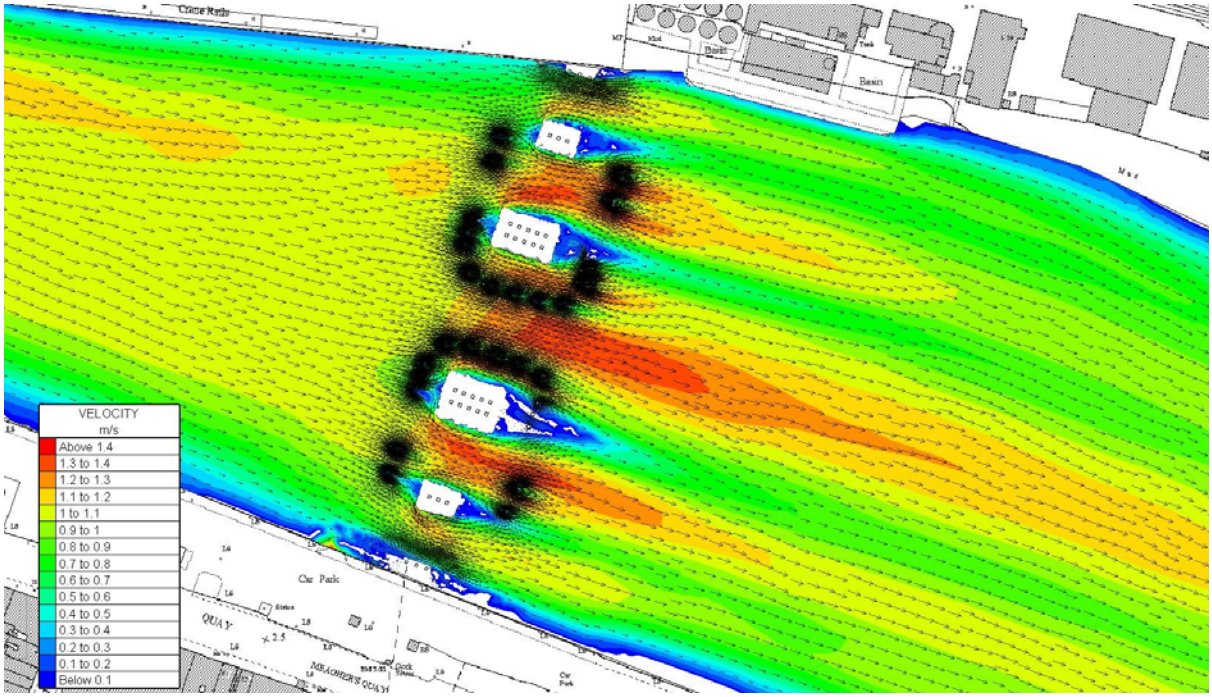


Figure 39 Spring Tide – Mid-Ebb velocities for proposed Construction Phase case

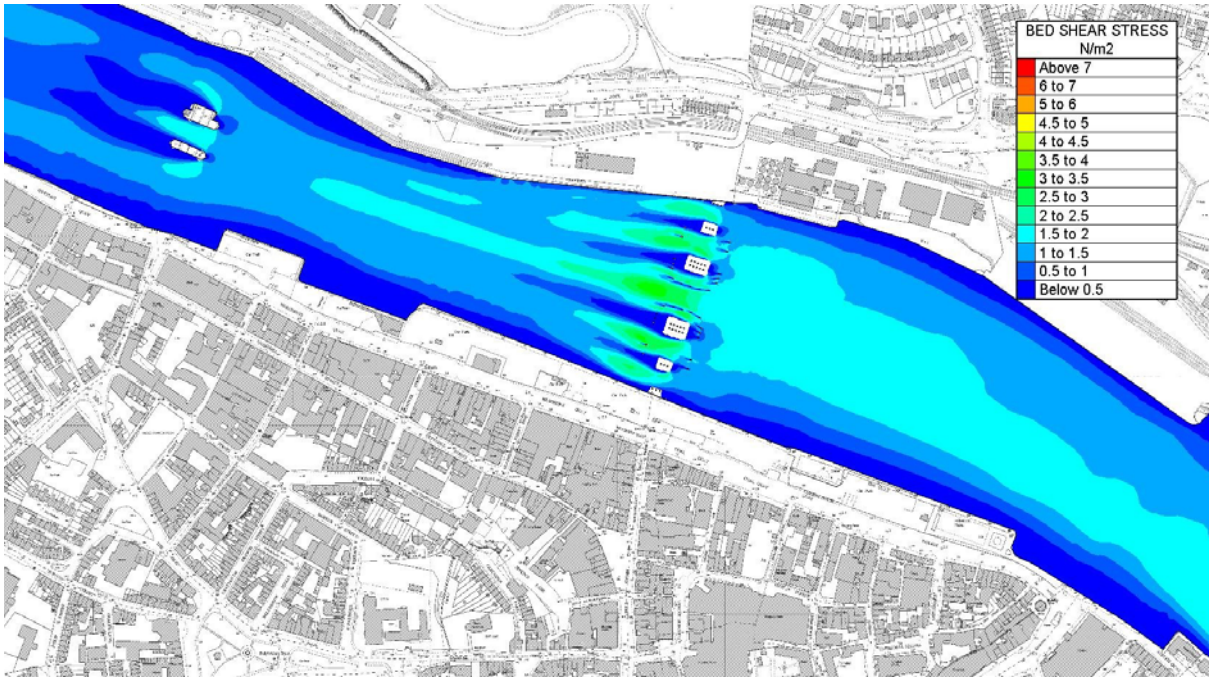


Figure 40 Computed bed shear stress Neap Tide – Mid-Flood – Construction Case

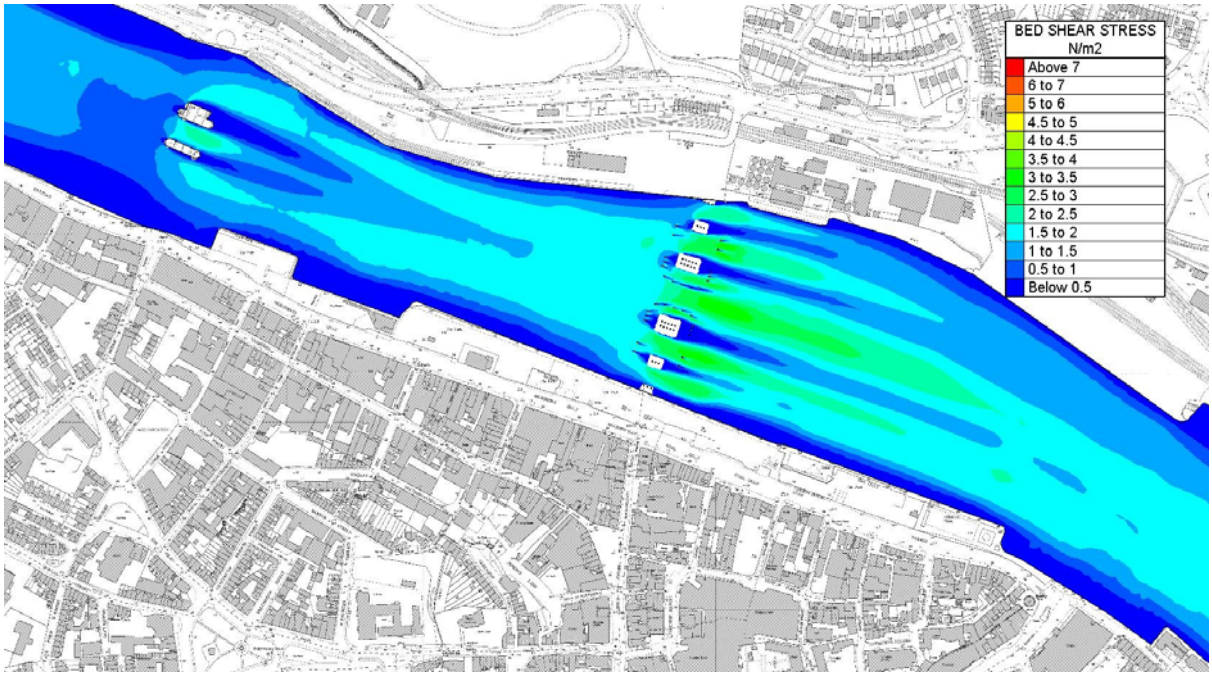


Figure 41 Computed bed shear stress Neap Tide – Mid-Ebb – Construction Case

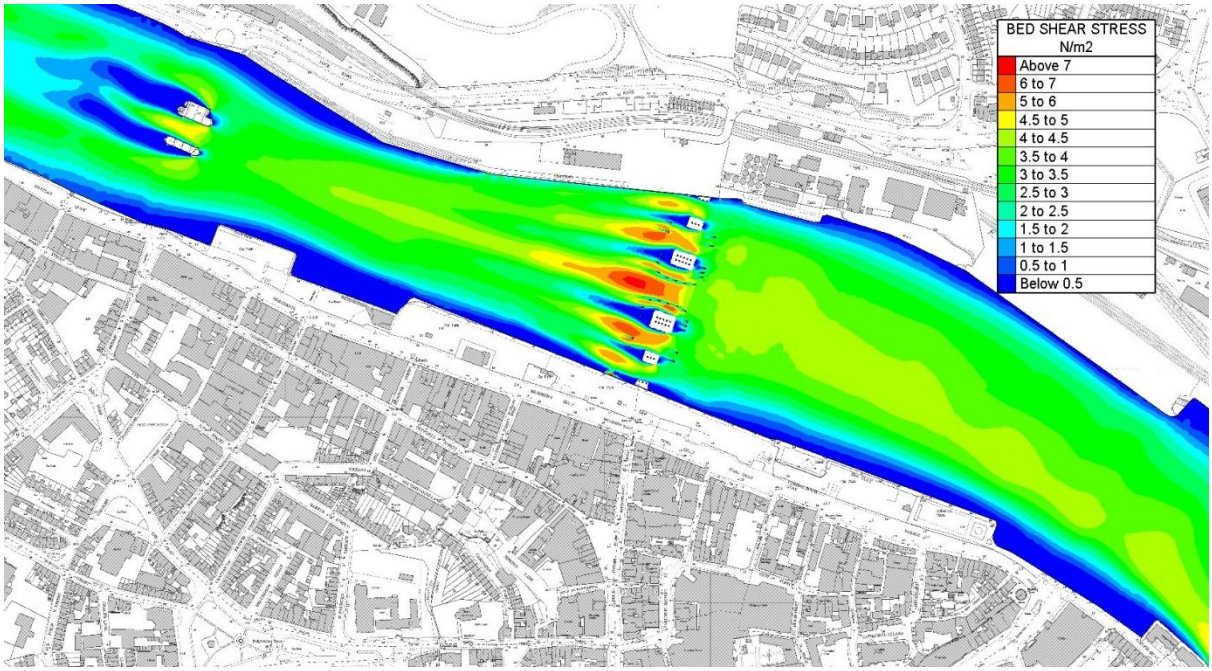


Figure 42 Computed bed shear stress Spring Tide – Mid-Flood – Construction Case

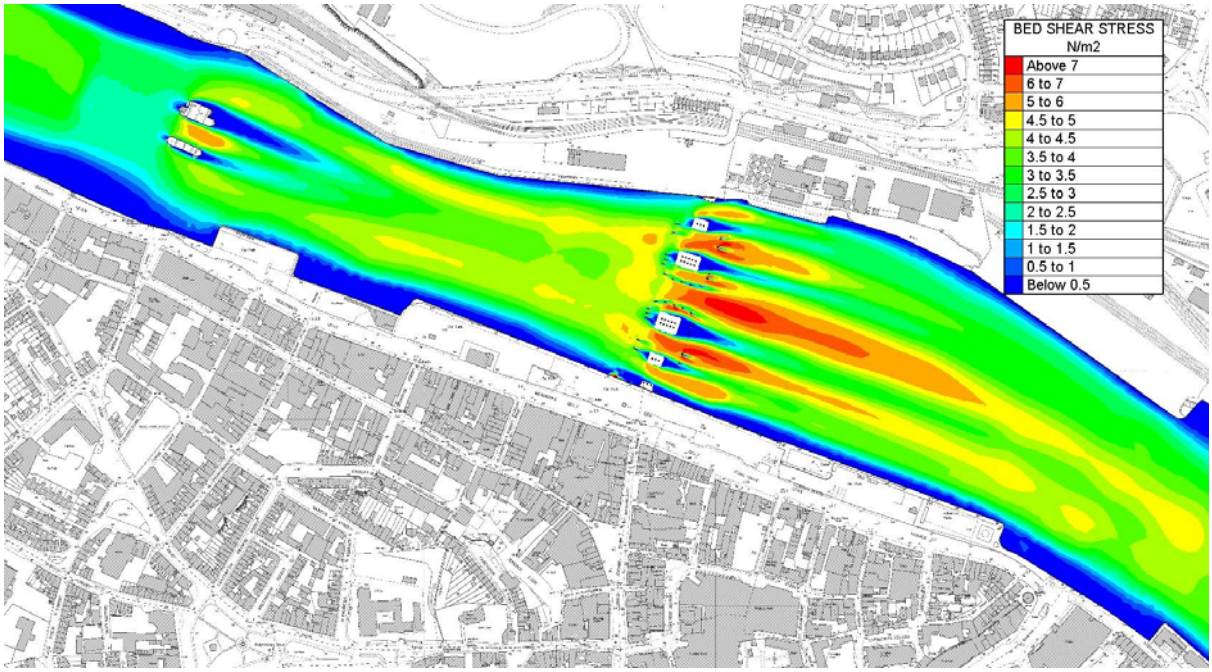


Figure 43 Computed bed shear stress Spring Tide – Mid-Ebb – Construction Case

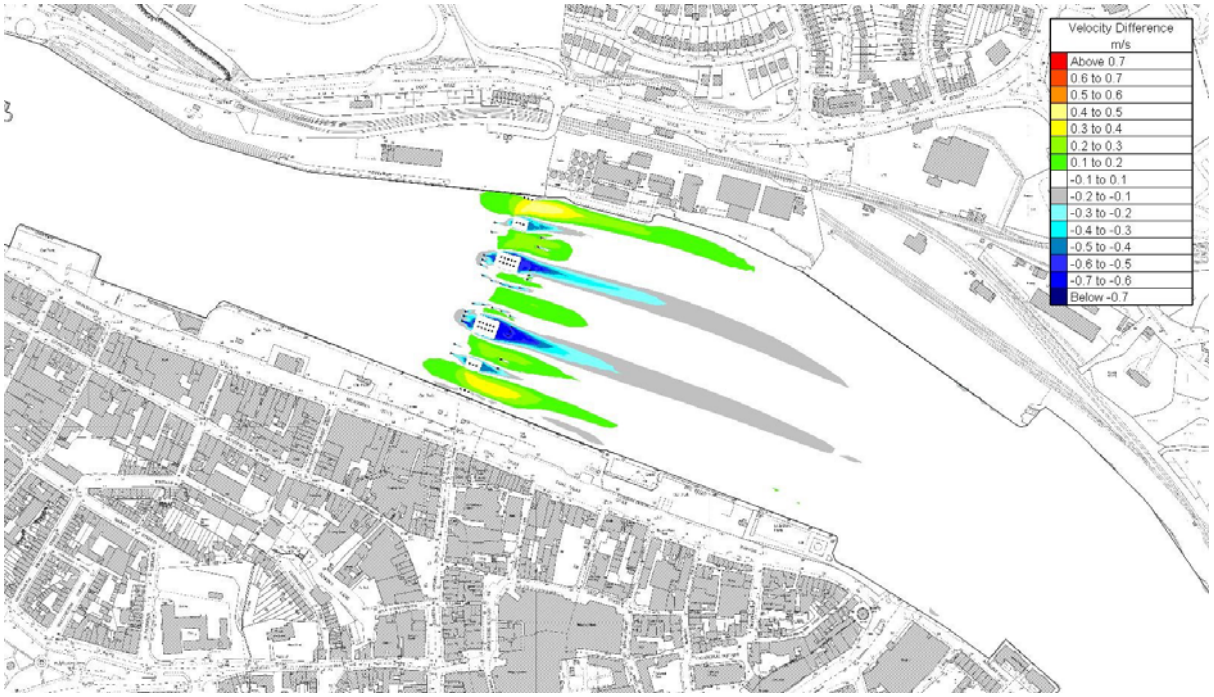


Figure 44 Computed change in velocity magnitude at Construction Phase – Neap Tide Mid-Ebb

Figure 45 Computed change in velocity magnitude at Construction Phase – Neap Tide Mid-Flood

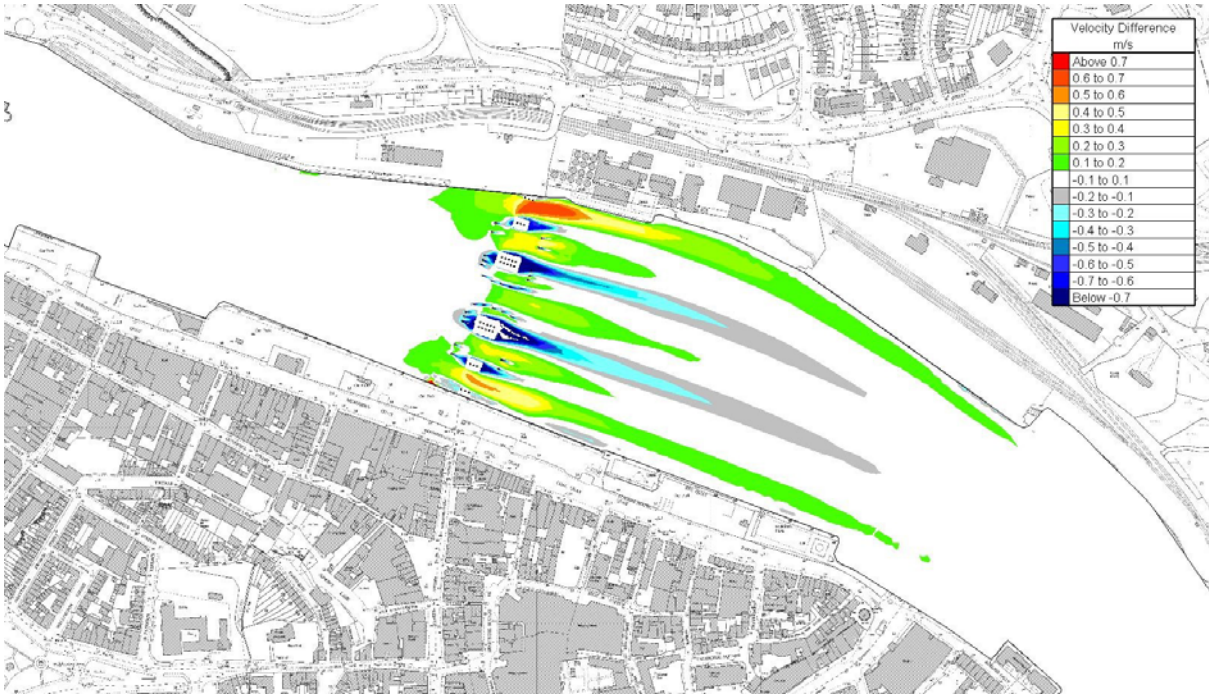


Figure 46 Computed change in velocity magnitude at Construction Phase – Spring Tide Mid-Ebb

Figure 47 Computed change in velocity magnitude at Construction Phase - Spring Tide Mid-Flood

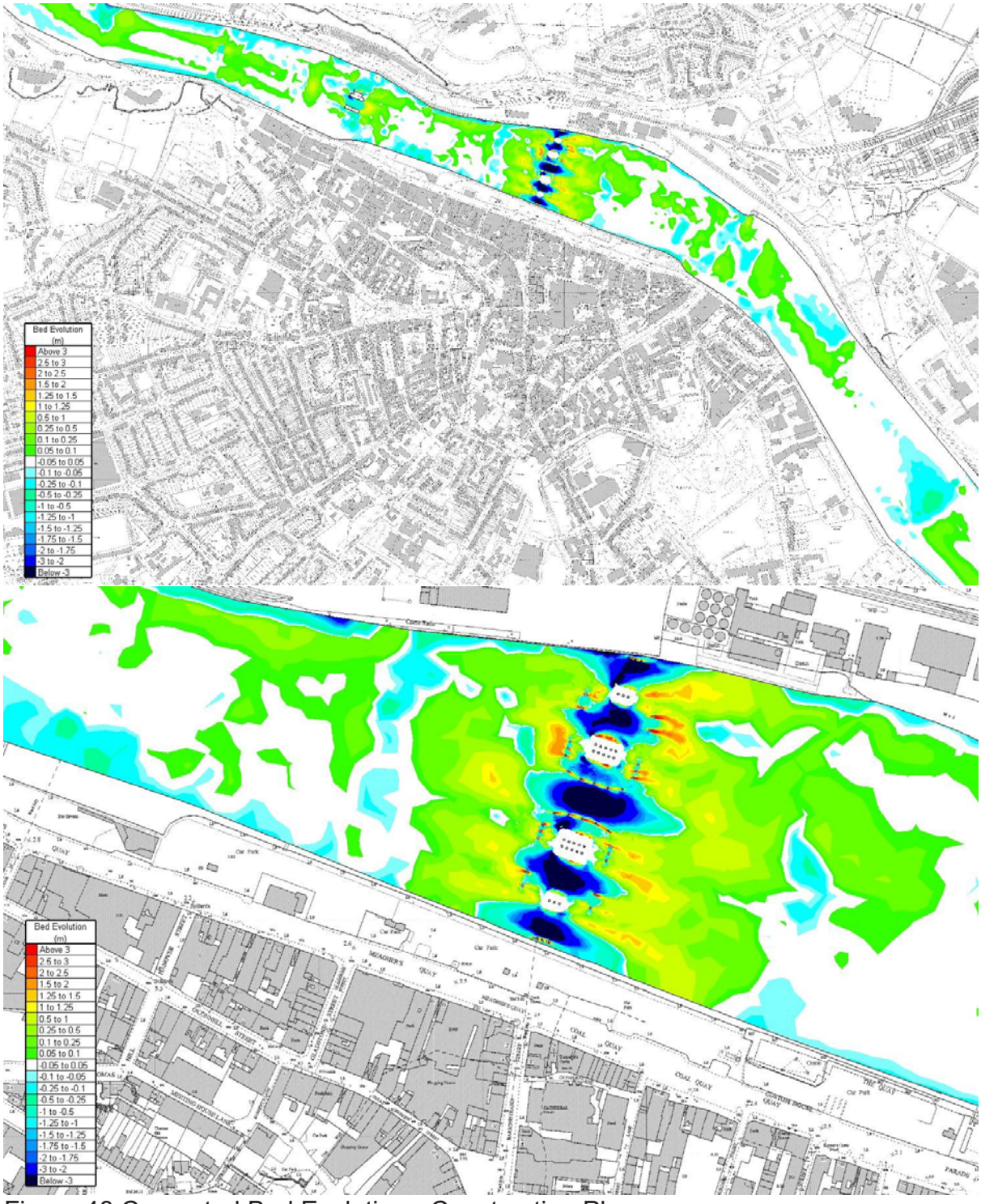


Figure 48 Computed Bed Evolution - Construction Phase

4 DISCUSSION

Sediment transport modelling of the 24day springs–neaps-springs tidal cycles was carried out to quantify the sediment transport effects of the proposed bridge. The bed evolution plot at the end of the 24day simulation is presented in Figure 22 modelling a sediment of 25% silt, 60% sand and 15% gravel for the existing "Do nothing" case. Under the existing case the silt is scoured away and transported in suspension and becoming well mixed and distributed in the downstream reach forming part of the natural dynamic suspended sediment load in the estuary. The sands and gravels are locally transported and the existing case indicated that on-going erosion and deposition is naturally occurring throughout the estuary. The existing case indicates significant erosion is taking place in the navigation channel through Rice Bridge. However it most probable at this location that the bed has naturally armoured itself overtime with the heavier gravels, and cobbles left behind forming a protective capping that prevents further erosion. It should also be noted that the timber piles from the former wooden bridge at the site may still be in place providing a degree of bed stabilisation.

Under the proposed case the silt fraction similar to the existing case is easily eroded and transported in suspension with the tidal flows and is well mixed and distributed throughout the downstream reach forming part of the natural dynamic suspended sediment load in the estuary. The simulation shows that the proposed bridge, due to the contraction effect on the velocity distribution, results in localised erosion at the structure principally away from the piles with the deposition of the eroded material occurring local to the site both upstream and downstream of the bridge. The extent of deposition from the scouring is located within 150m upstream of the bridge and 300m downstream. The scour depth at the bridge after a 24day simulation period is 1.5m and it is likely to double to 3m over time after which an armouring layer of the heavier fractions left behind will prevent further scouring of the channel at the bridge. The deposited sandy sediments is likely to slowly migrate downstream becoming more distributed spatially with distance downstream.

The construction case looks at worst case scenario with all cofferdams in place around the bridge piles and also the fender piles in place. This scenario significantly contracts flow through the bridge resulting in significantly increased velocity and shear stress over the existing case and thus giving rise to accelerated and deep scouring locally with a shear stress on the spring tides of over 7 Pa predicted. The predicted scour depth in the channel between the cofferdams is 4 to 4.5m after a 24 day simulation with the sediment deposited locally in the channel within 150m upstream and 300m downstream, refer to Figure 48.

It is recommended, given the depth of scouring predicted, that cofferdams around the support pile sites should not be in place at the same time so as to limit the degree of contraction and reduce scouring.

APPENDIX D
Marine Mammal Risk Assessment

MARINE MAMMAL RISK ASSESSMENT OF THE RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE

Prepared by
Dr Simon Berrow
April 2018

IWDG Consulting, Merchants Quay, Kilrush, Co Clare

1 | INTRODUCTION

The Irish Whale and Dolphin Group (IWDG) were contracted by the engineering and environmental consultants Roughan and O'Donovan, on behalf of Waterford City and County Council, to carry out a Marine Mammal Risk Assessment (MMRA) of the proposed River Suir Sustainable Transport Bridge to be constructed in Waterford City. The proposed construction site is not in, or adjacent to, any protected sites for marine mammals. The proposed works will take place over 20 months at a time informed by this MMRA.

Figure 1. Location of proposed bridge in Waterford City

Proposed works

The proposed works will occur on the north and south quays of the River Suir, which runs through Waterford City and in the river itself.

On the South Quay landing point, at the Clock Tower, there will be breakout required of sections of existing pavement and excavation of ground behind the south quays wall to allow for abutment construction. Bored piling will be performed behind the quay wall. The existing reinforced earth south quay wall will likely be demolished and replaced with a sheet pile wall.

On the North Quay there will be demolishing required of sections of existing North Quay structure (piles, beams and slab deck) to accommodate bridge abutment behind the existing wharf edge. Abutment piling from wharf will be achieved from a jack up barge in the water.

In the river itself, temporary works braced sheet pile cofferdams will be constructed from a jack-up pontoon or barge to allow for construction of the main span piers. Pier steel cased reinforced concrete bored piles will be installed within the confines of the cofferdams using a crane mounted drilling rig operation from the jack-up barge/pontoon. Three steel casings for bored piles will be driven, vertically, to required pile depth from a crane mounted piling rig on jack-up barge/pontoon, for each intermediate pier.

2 | METHODS

This risk assessment was based on a review of the available literature and data sources. Maps of the distribution of cetacean sightings on the approaches, and within Waterford City, were prepared using data from the Irish Whale and Dolphin Group's casual sightings database (IWDG, accessed April 2018). A site visit was not deemed necessary.

3 | LEGAL STATUS

Irish cetaceans and pinnipeds are protected under national legislation and under a number of international Directives and agreements to which Ireland is a signatory. All cetaceans, as well as grey and harbour seals, are protected under the Wildlife Act (1976) and amendments (2000, 2005, 2010 and 2012). Under the act and its amendments it is an offence to hunt, injure or wilfully interfere with, disturb or destroy the resting or breeding place of a protected species (except under license or permit). The act applies out to the 12 nml limit of Irish territorial waters.

All cetaceans and pinnipeds are protected under the European Commission (EC) Habitats Directive 1992. All cetaceans are included in Annex IV of the Directive as species 'in need of strict protection'. Under this Directive, the harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*) are designated Annex II species which are of community interest and whose conservation requires the designation of Special Areas of Conservation (SAC).

Ireland is also signatory to conservation agreements such as the Bonn Convention on Migratory Species (1983), the OSPAR Convention for the Protection of the Marine Environment of the northeast Atlantic (1992) and the Berne Convention on Conservation of European Wildlife and Natural Habitats (1979).

In 2007, the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht produced a '*Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters* (NPWS, 2007)'. These were subsequently reviewed and amended to produce '*Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters*' (NPWS, 2014) which include mitigation measures specific to dredging. The guidelines recommend that listed coastal and marine activities (including dredging) be subject to a risk assessment for anthropogenic sound-related impacts on relevant protected marine mammal species to address any area-specific sensitivities, both in timing and spatial extent, and to inform the consenting process.

Once the listed activity has been subject to a risk assessment, the regulator may decide to refuse consent, to grant consent with no requirement for mitigation, or to grant consent subject to specified mitigation measures.

4 | BASELINE ENVIRONMENT

4.1 | Ambient Noise Levels

The ambient noise levels at the site are not known. Ambient noise along this section of the River Suir at Waterford City is expected to be dominated by environmental noise (e.g. tidal movement of water and sediment) and shipping noise, especially with peaks in noise due to large vessels transiting the river to berths in Waterford City.

4.2 | Cetaceans

A review of cetacean (whale, dolphin and porpoise records) submitted to the IWDG during the period 1 January 2000 to present was accessed on 5 April 2018 and mapped. To date, 51 validated records were available of at least three species.

Table 1. Cetacean sightings (including IWDG downgrades) recorded in the approaches to and within Waterford City from 2000-2018.

Species	Number of sightings	% of total
Harbour Porpoise	27	53
Common dolphin	18	35
Bottlenose dolphin	2	4
Dolphin sp.	3	6
Dolphin possibly harbour porpoise	1	2
Total	**51**	**100**

Most sightings in or adjacent to the area of interest were reported downriver of Waterford City in the upper reaches of the estuary. Harbour porpoise were the most frequently reported species with 27 or 53% of all records, followed closely by common dolphin with 18 records (35%). Bottlenose dolphin were also identified all downriver in the estuary (Table 1). Both harbour porpoise and common dolphin were reported near Waterford city.

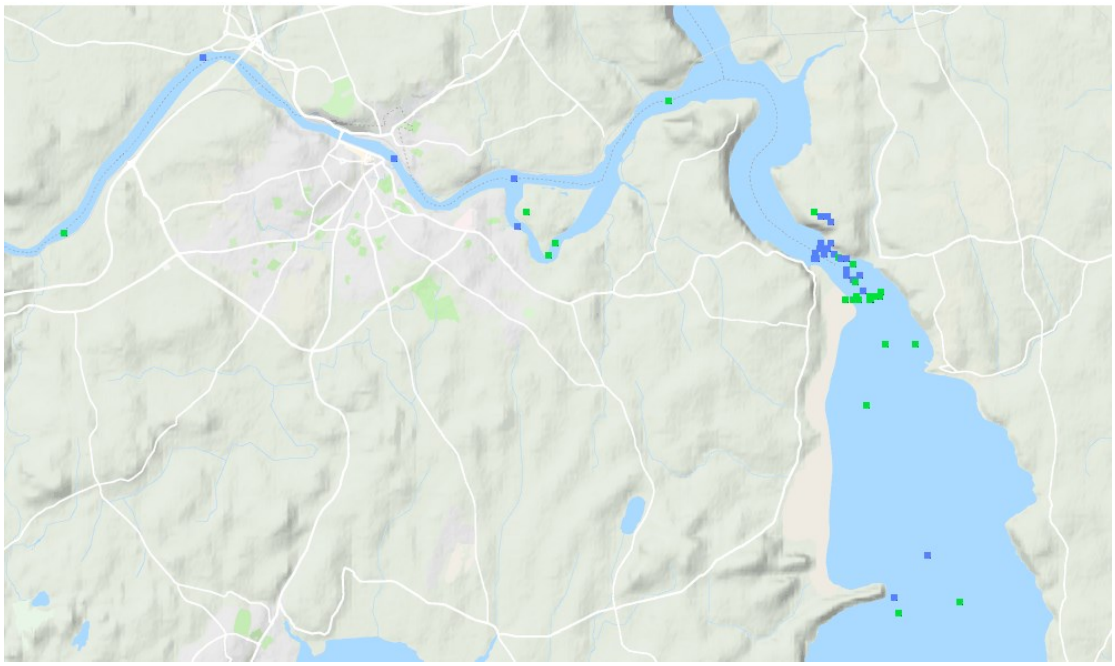


Figure 2. Map of all cetacean sightings submitted to the IWDG between 2000 to present in, and adjacent to Waterford city and downriver towards the approaches to the Celtic Sea (blue dots are harbor porpoise, green dots are dolphins)

A more detailed assessment of the most frequently recorded species is presented below:

Harbour porpoise (Phocoena phocoena)

Harbour porpoise are the most widespread and abundant cetacean in inshore Irish waters, with highest abundances in the Irish Sea (Berrow et al. 2010). Harbour porpoise have been sighted throughout the River Suir both in and down river of Waterford City. Most sightings were north of Duncannon around 6km downriver of Waterford city, but on three occasions they were sighted within the city and once upriver of Waterford City. Three of these sightings were between 26 September and 3 October 2015 and might be of the same group of 1-2 individuals.

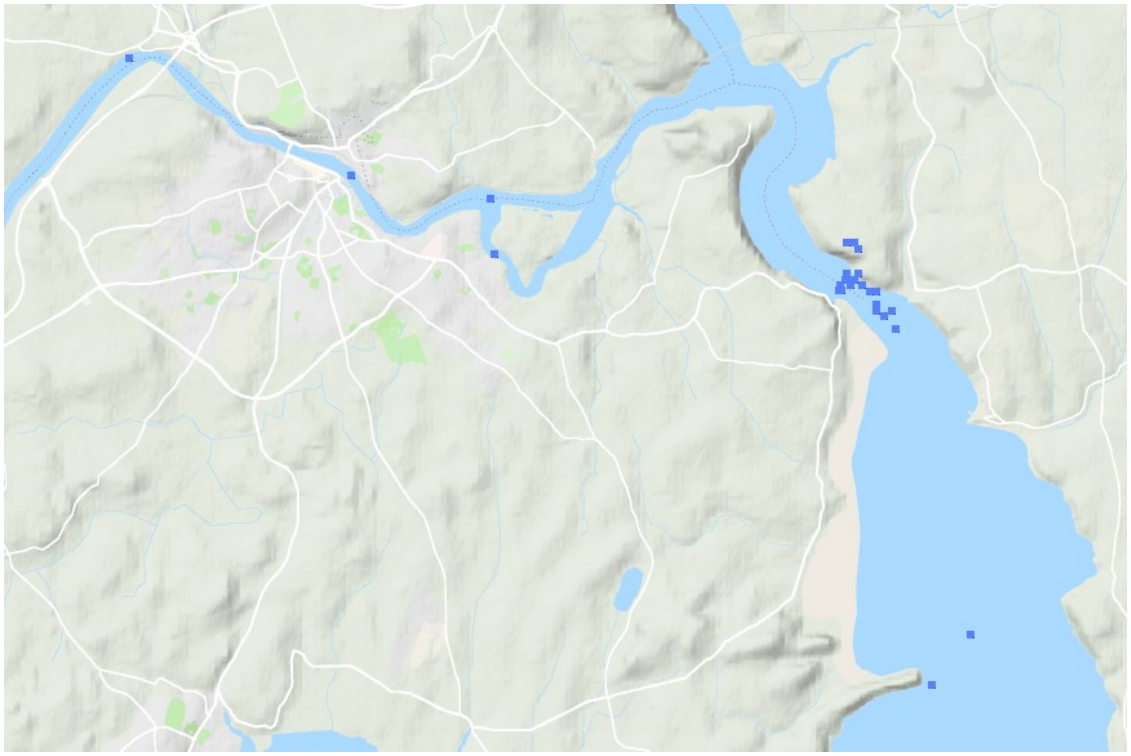


Figure 3. Sighting records of harbour porpoise (from IWDG accessed May 2017) in, and adjacent to Waterford city and downriver towards the approaches to the Celtic Sea

Harbour porpoise are known to particularly associate with areas of strong tidal currents for foraging. Sightings of harbor porpoise have occurred throughout the year with peaks in numbers during the spring and autumn, likely associated with fish moving up the river.

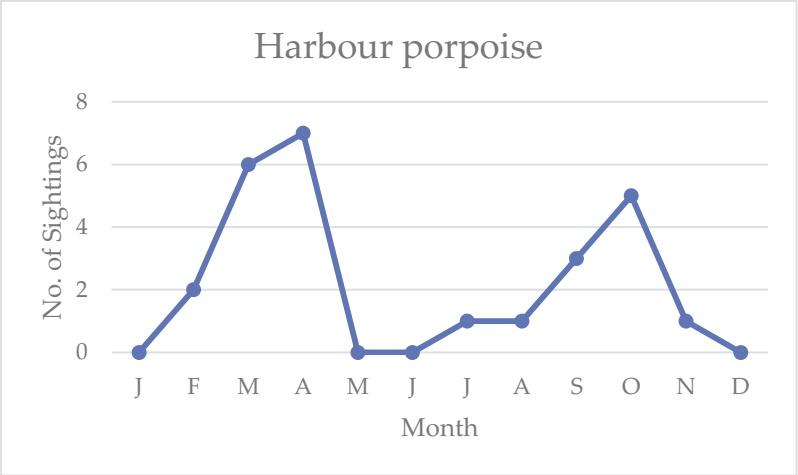


Fig. 4 Monthly distribution of Harbour Porpoise sightings in area shown in Fig 3.

Common dolphin (Delphinus delphis)

Common dolphins are distributed around the entire Irish coast but highest concentrations are off the southwest and west coasts (Berrow et al. 2010). However, in the winter large numbers of common dolphins enter the Celtic Sea to feed on schools of pelagic fish such as herring and sprat. Common dolphin were sighted throughout the River Suir both in and down river of Waterford City from 1 January 2000 to present (5 April 2018). Most sightings were north of Duncannon, around 6km downriver of Waterford city but on one occasion a group of 4 individuals were sighted within the city on 7 November 2016 and once one individual was sighted upriver of Waterford City on 30 August 2017 (Figure 5).

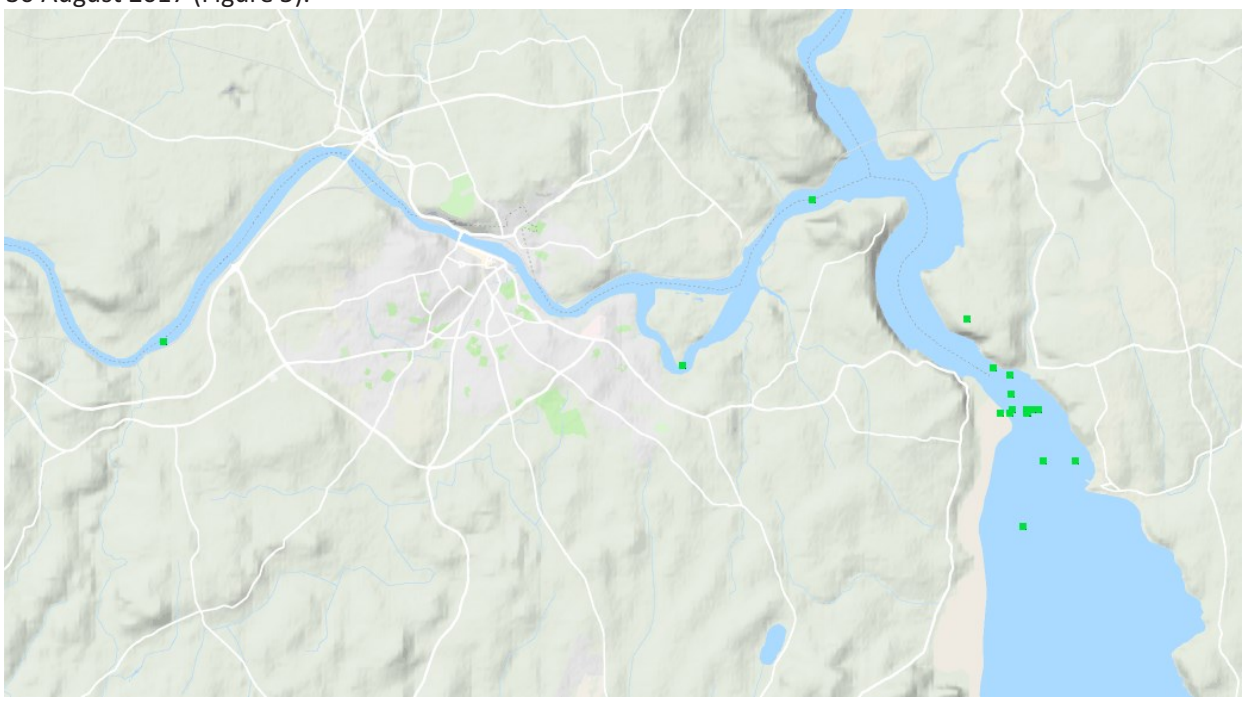


Figure 5. Sighting records of Common Dolphin (from IWDG accessed May 2017) in, and adjacent to Waterford city and downriver towards the approaches to the Celtic Sea

Sightings of Common dolphin are almost exclusively confined to the winter and is likely to be associated with fish moving up the river.

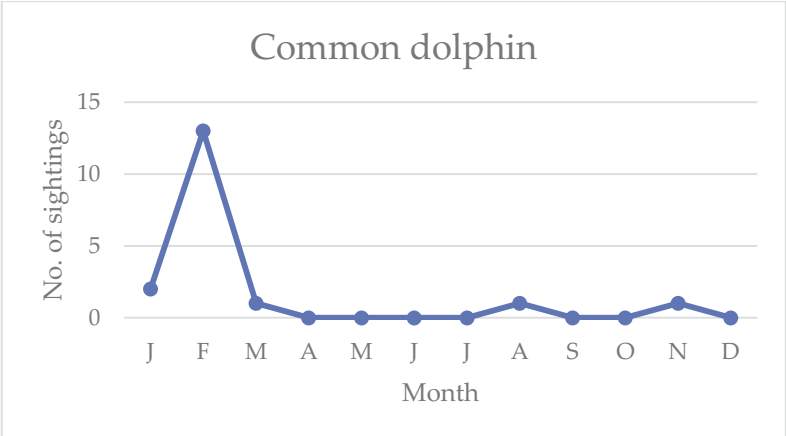


Fig. 6 Monthly distribution of Common dolphin sightings in area shown in Fig 3.

Bottlenose dolphin (Tursiops truncatus)

Bottlenose dolphins are infrequently recorded off Counties Waterford and Wexford and even more rarely up the River Suir (Figure 7). Bottlenose dolphins are widespread and relatively abundant off the Irish coast with most sightings along the western seaboard (Berrow *et al.* 2010). Recent genetic evidence (Mirimin *et al.* 2011) suggests the existence of three discrete populations of bottlenose dolphins in Ireland: the Shannon Estuary, an inshore population and an offshore population that ranges from the Bay of Biscay and the Azores (Louis *et al.* 2014). The inshore population is highly mobile and photo-identification has shown individuals recorded off Co Waterford to be part of this population (O'Brien et al. 2009).

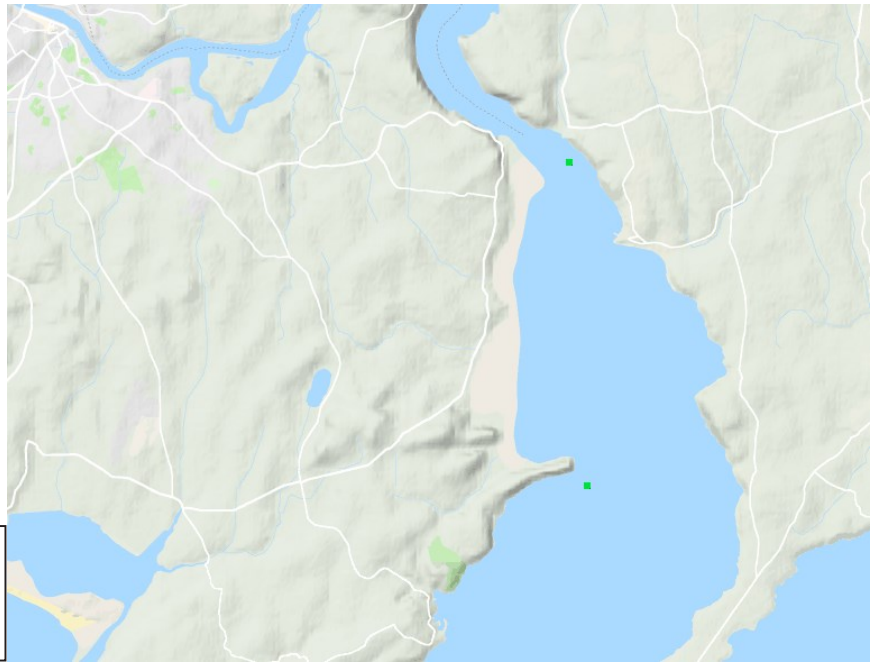


Figure 7. Sighting records of bottlenose dolphin (from IWDG accessed May 2017)

Sightings of bottlenose dolphin are rare and have occurred in January and August.

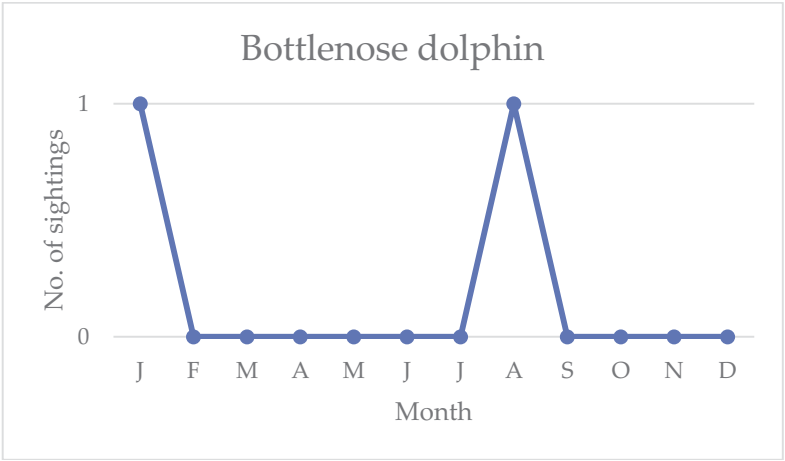


Fig. 8 Monthly distribution of Bottlenose dolphin sightings in area shown in Fig 3.

4.3 | Pinnipeds

Grey and harbour seals are distributed around the entire Irish coast with grey seals being more abundant along the western seaboard (Cronin *et al.* 2004; O'Cadhla *et al.* 2007; O'Cadhla and Strong 2008).

Harbour Seal (Phoca vitulina)

There were no harbour seal haul-out or breeding sites recorded near Waterford city during the National Parks and Wildlife Service (NPWS) surveys during 2002 or 2003.

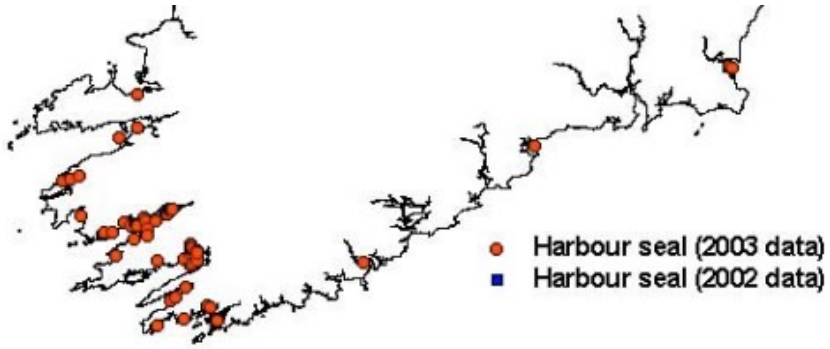


Figure 9. Map of the locations of groups of harbour seals recorded on the south coast of Ireland, August 2003 (from Cronin et al., 2004).

Grey Seal (Halichoerus grypus)

An important breeding, pupping and haul out site for grey seals occurs on Great Saltee Island (O'Cadhla *et al.*, 2007) which is 40km to the southeast and is designated as an SAC (site code 000707) with grey seal as a qualifying interest. The conservation status of grey and harbour seals in Ireland has been assessed as favourable (NPWS 2008, 2014). Grey seals forage locally and may also range long distances and may occasionally swim upriver when foraging.

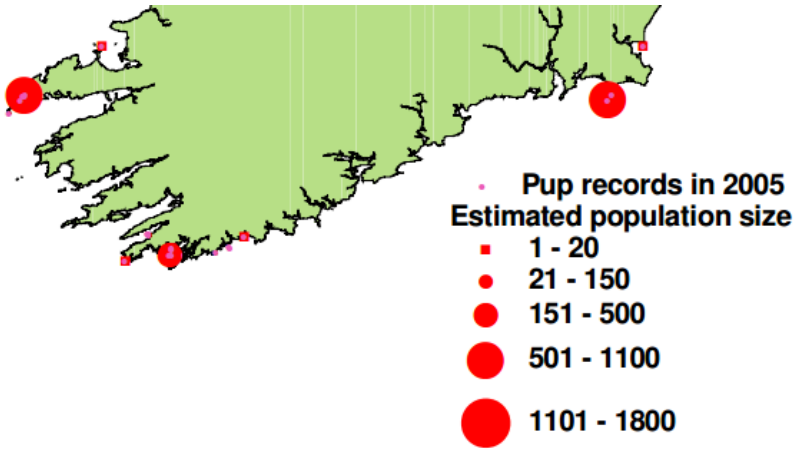


Figure 10. Map of the locations of grey seals pupping locations recorded on the south coast of Ireland in 2005 (from O'Cadhla et al., 2007).

5 | IMPACT ASSESSMENT

5.1 | Description of Activities

As part of the proposed site works the activities with potential to impact on marine mammals include:

5.1.1 Demolition of existing structures

Excavation of existing pavement, piles, beams and slab deck and ground will be limited to the banks to allow for abutment construction.

5.1.2 Piling Impacts

Most concerns of the effects of pile driving on marine mammals has been around the construction of offshore wind farms (Richardson *et al.* 1995). There has been limited work on the effects of piling during coastal and harbour works. Attenuation of sound pressure levels at coastal sites will be more rapid depending on the topography and nature of the bedrock. Recently, Graham *et al*. (2017) modelled the source levels estimated for impact piling from a single-pulse sound exposure level of 198 dB re 1 lPa2 s and, for a 192 dB re 1 lPa source level for vibration piling during harbour construction works. Predicted received broadband Sound Exposure Level (SEL) values 812 m from the piling site were markedly lower than source level due to high propagation loss of 133.4 dB re 1 lPa2 s (impact) and 128.9 dB re 1 lPa2 s (vibration). Simultaneous acoustic monitoring of bottlenose dolphins and harbour porpoises at the site showed they were not excluded from sites in the vicinity of impact or vibration piling; nevertheless, some small effects were detected with bottlenose dolphins spending a reduced period of time in the vicinity of construction works.

As the likelihood of any marine mammals being in the vicinity of the construction site is extremely low there is an insignificant risk of sound exposure and impact due to piling.

5.1.3 Increased marine traffic

Increased vessel traffic is restricted to one seagoing craft required to transport a seagoing barge to the site.

5.2 | Literature Review of Impacts and Mitigation

The NPWS (2014) '*Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters – January 2014*' recommends that listed coastal and marine activities undergo a risk assessment for anthropogenic sound-related impacts on relevant protected marine mammal species to address any area-specific sensitivities, both in timing and spatial extent, and to inform the consenting process. It is required that such an assessment must competently identify the risks according to the available evidence and consider (i) direct, (ii) indirect and (iii) cumulative effects of anthropogenic sound (NPWS, 2014). Excavation of coastal structures is not specifically listed in the NPWS (2014) guidelines but piling is covered and is of concern if large piles are to be driven and there is a risk of exposure to marine mammals.

The works are assessed for their potential to create increased noise disturbance on the receiving environment.

A risk assessment, following NPWS Guidelines, was conducted based on the published literature, data from the IWDG sightings databases and knowledge of the study area.

Construction Impacts

While sound exposure levels from such operations are thought to be below that expected to cause injury to a marine mammal, disturbance from the noise generated by the construction activities, from the physical presence of sea going barges, and possibly from the increased water turbidity in the area of operations have the potential to cause lower level disturbance, masking or behavioural impacts, for example (NPWS, 2014). The activities of a long reach excavator will lead to a very localised increase in noise levels and the use of seagoing barges to a very slight increase in vessel traffic and associated noise. Small work vessels produce low frequency sounds (Table 2). The presence of an additional small vessel and the associated noise produced, is very unlikely to have a significant impact on marine mammals, as marine mammals are only very occasionally recorded and only then for very short periods.

Table 2. Estimated noise emissions from small workboat / tug (Wyatt, 2008)

Vessel Type	Displacement Tonne	Length (m)	Propulsion	Activity	Measurement	Measurement band kHz	Extrapolation dB re 1µPa m peak to peak	Reference
Tug with Barge	Tug Gross tonnage 104	19.5 (64ft)	Main engine 1095 hp diesel	Unloaded Speed 7.4 knots	173 dB re 1µPa @1m Source level	0.01 to 20	182 Broadband 10 to 2500 Hz with broad peak between 60 and 600Hz	Zykov and Hannay 2006

5.3 | NPWS Assessment Criteria

1. **Do individuals or populations of marine mammal species occur within the proposed area?**

The likelihood of marine mammals being in the area is low. Only harbour porpoise and common dolphin have been reported up the river as far as Waterford City and common dolphin nearly exclusively in the winter. There is an important pupping and haul out site for grey seal on Great Saltee Island, but this is a 40km away and will not be affected. All are part of a larger population and very mobile.

2. **Is the plan or project likely to result in death, injury or disturbance of individuals?**

The project will not cause injury or death and is also extremely unlikely to cause local disturbance from noise associated with the project.

Noise Impact

The activities proposed during this project consist of demolition and piling operations. It is unlikely any noise generated will cause permanent or temporary hearing injury to a marine mammal as its unlikely any will be exposed to the operation due to:

- The inshore location of the site, in a narrow river; and
- The very shallow nature of the construction site.

Physical Impact

The risk of injury or mortality is considered very unlikely as marine mammals are rarely in the vicinity of the site.

3. Is it possible to estimate the number of individuals of each species that are likely to be affected?

No abundance estimates for cetaceans are available but all group sizes reported in the area are low, with the maximum of 4 common dolphins recorded in a single group.

The main span piers widen at their base (squat piers) and will have an approx. width of 3m at their base.

4. Will individuals be disturbed at a sensitive location or sensitive time during their life cycle?

It is anticipated that construction work will be 20 months in duration. Thus spans breeding times for all marine mammals but as they are rarely recorded at the site and there is no evidence of breeding or haul out sites there is no risk.

5. Are the impacts likely to focus on a particular section of the species' population, e.g., adults vs. juveniles, males vs. females?

There are no data to suggest that any particular seal or cetacean gender or age group have been reported at, or in the vicinity of the site.

6. Will the plan or project cause displacement from key functional areas, e.g., for breeding, foraging, resting or migration?

While harbour porpoise and common dolphins have been reported in the area, there are no regularly used areas in the vicinity of the construction site. Therefore, there are no important habitats.

7. How quickly is the affected population likely to recover once the plan or project has ceased?

While there may be temporary disturbance, all marine mammals in the area are accommodated to human activities and are likely to recover from any temporary disturbance within hours.

5.4 | Mitigation

No mitigation measures are required as the likelihood of any marine mammal being in the area is very low.

5.5 | Residual Impacts

No residual impacts are likely once construction is finished.

6 | SUMMARY

A number of marine mammals have been recorded in the River Suir, in and adjacent to Waterford city but their occurrence is so sporadic that it is extremely unlikely that any would be exposed to potential impacts from this development.

No mitigation is required.

7 | REFERENCES

Berrow, S.D., Whooley, P., O'Connell, M. & Wall, D. (2010). Irish Cetacean Review (2000-2009). Irish Whale and Dolphin Group, Kilrush, Co. Clare. 60pp.

Cronin, M., Duck, C., Ó Cadhla, O., Nairn, R., Strong, D. & O' Keeffe, C. (2004). Harbour seal population assessment in the Republic of Ireland: August 2003. Irish Wildlife Manuals, No. 11. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Graham, I. et al. (2017) Responses of bottlenose dolphins and harbor porpoises to impact and vibration piling noise during harbor construction. Ecosphere 8(5):e01793. 10.1002/ecs2.1793.

Louis, M., Viricel, A., Lucas, T., Peltier, H., Alfonsi, E., Berrow, S., Brownlow, A., Covelo, P., Dabin, W., Deaville, R., de Stephanis, R., Gally, F., Gauffier, P., Penrose, R., Silva, M.A., Guinet, C. and Benoit S-B. (2014) Habitat-driven population structure of bottlenose dolphins, *Tursiops truncatus*, in the North-East Atlantic. Molecular Ecology 23, 857-874.

Mirimin, L., Miller, R., Dillane, E., Berrow, S. D., Ingram, S., Cross, T. F., & Rogan, E. (2011). Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters. Animal Conservation, 14(4), 342-353.

NPWS (2007) Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters. National Parks and Wildlife Service, 7 Ely Place, Dublin 2.

NPWS (2014) Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters – January 2014. National parks and Wildlife Service, 7 Ely Place, Dublin 2.

O'Brien, J.M., Berrow, S.D., Ryan, C, McGrath, D., O'Connor, I., Pesante, P., Burrows, G., Massett, N., Klötzer, V. and Whooley, P. (2009) A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photo-identification. Journal of Cetacean Research and Management 11(1), 71-76.

Ó Cadhla, O., Strong, D., O'Keeffe, C., Coleman, M., Cronin, M., Duck, C., Murray, T., Dower, P., Nairn, R., Murphy, P., Smiddy, P., Saich, C., Lyons, D. & Hiby, A.R. (2007). An assessment of the breeding population of grey seals in the Republic of Ireland, 2005. Irish Wildlife Manuals No. 34. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

O'Cadhla, O. and Strong, D. (2008) Grey seal moult population survey in the Republic of Ireland, 2007. CMRC.

OSPAR (2008) *Draft Assessment of the Environmental Impact of Underwater No*ise. Biodiversity Series. OSPAR.

Richardson, W.J., Greene, C.R., Malme, C.I. and Thomson, D.H. (1995) *Marine Mammals and Noise*. Academic Press.

Wyatt, R., (2008) Review of existing data on underwater sounds produced by the O&G industry. Issue 1. Report to the Joint Industry Programme on Sound and Marine Life.

APPENDIX E
Outline Environmental Management Plans

River Suir Sustainable Transport Bridge

Outline Environmental Operating Plan

December 2018

Client
Waterford City and County Council
The Mall
Waterford

Consulting Engineer
Roughan & O'Donovan
Arena House
Arena Road
Sandyford
Dublin 18, D18 V8P6

River Suir Sustainable Transport Bridge

Outline Environmental Operating Plan

TABLE OF CONTENTS

1.0 INTRODUCTION

This document is a project-specific outline Environmental Operating Plan (EOP). It is presented to inform and provide practical experience of developing, submitting and maintaining an EOP for the construction and operation of the River Suir Sustainable Transport Bridge.

1.1 Purpose and Scope

This outline EOP sets out the mechanism by which environmental protection is to be achieved on the River Suir Sustainable Transport Bridge. This EOP describes the Environmental Management System (EMS) of the proposed development, which will be devised according to the criteria of ISO 14001:2004 – Environmental Management Systems and developed in line with the NRA (now known for operating purposes as Transport Infrastructure Ireland (TII)) *"Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan".* This EOP will be complemented by General Procedures, Work Procedures and Operations Instructions. These documents will be in place within the site administration offices and appropriate site locations during works.

This outline EOP covers the activities of the [*Successful Contractor Name*] and that of its sub-contractors. It outlines the environmental commitments in relation to the construction works and how these commitments are to be managed, including details of the monitoring systems and mitigation measures to be employed by the successful contractor. It also assigns responsibilities for ensuring the effective implementation of this EOP.

1.2 Environmental Policy Statement

Environmental management is fundamental to the successful operation of construction activities. Therefore, the Environmental Policy must, as a priority, be understood by all parties involved in the contract and adhered to throughout the course of the works to allow for legal compliance and continuous improvement.

[*Successful Contractor Name*] Environmental Policy Statement is detailed below.

[*Insert policy statement*]

2.0 GENERAL PROJECT DETAILS

This section will be completed by the successful contractor once appointed:

- Brief overview;
- Location of the Project;
- Location of compounds;
- Contact Sheets for site, employer and third party contacts;
- Register of all applicable legislation, including relevant standards, Codes of Practice and Guidelines;
- Organisational chart; and,
- Duties and responsibilities.

Project details which have been identified prior to appointment of the contractor are described in the subsequent subsections.

2.1 Concrete Works

2.1.1 Introduction

The use and management of concrete in or close to watercourses must be carefully controlled to avoid spillage which has a deleterious effect on water chemistry and aquatic habitats and species. Alternate construction methods have been proposed where possible, e.g. use of pre-cast units, use of cofferdams to place concrete in the dry, and permanent formwork will reduce the risks associated with concreting works. Where the use of insitu concrete near and in watercourses cannot be avoided the following control measures will be employed:

- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used;
- Any plant operating close to the water will require special consideration on the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near the River Suir;
- Placing of concrete in or near the River Suir will be carried out only under the supervision of a suitably qualified Environmental Manager;
- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials. Such spills shall be contained immediately and runoff prevented from entering the River Suir;
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of the River Suir;
- On-site concrete batching and mixing activities will only be allowed at the identified construction compound;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the construction compound (or other appropriate facility designated by the supplier);
- Chute washout will be carried out at designated locations only. These locations will be signposted. The Concrete Plant and all Delivery Drivers will be informed of their location with the order information and on arrival on site; and,
- Chute washout locations will be provided with appropriate designated, contained impermeable area and treatment facilities including adequately sized

settlement tanks. The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction stage settlement facilities) or alternatively disposed of as waste in accordance with the contractor's Waste Management Plan.

2.2 Construction Compounds

2.2.1 Introduction

It is likely that there will be a single site construction compound located on the South Quay, at the site of the bridge landing/South Quay Plaza, to service the bridge construction operations. However, these will be dependent on the appointed contractors.

The construction compound may include stores, offices, material processing areas, plant storage, parking of site and staff vehicles, and other ancillary facilities and activities.

During the construction phase, the contractor will be required to erect opaque hoarding of a minimum 2.0 metres in height around the site compound and works area on the South Quays. The hoarding shall be a high gloss printed finish with information and graphics about the project or as agreed with Waterford City and County Council. The precise hoarding type shall be agreed with Waterford City and County Council prior to works commencing.

2.2.2 Control Measures

The compound will have appropriate levels of security to deter vandalism, theft and unauthorised access.

Surface runoff from the compound will be minimised by ensuring that the paved/ impervious area is minimised. All surface water runoff will be intercepted and directed to appropriate treatment systems (settlement facilities and oil trap) for the removal of pollutants prior to discharge. The site compound will be fenced off and a silt fence erected and maintained on the site boundary.

Wastewater drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent water pollution and in accordance with the relevant statutory requirements.

The storage of all fuels, other hydrocarbons and other chemicals shall be within the construction compound only and shall be in accordance with relevant legislation and best practice. In particular:

- Fuel storage tanks shall have secondary containment provided by means of an above ground bund to capture any oil leakage;
- All hazardous materials will be stored within secondary containment designed to retain at least 110% of the storage contents. Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase;
- Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during construction; and
- Storage tanks and associated provision, including bunds, will conform to the current best practice for oil storage and will be undertaken in accordance with *Best Practice Guide BPGCS005 – Oil Storage Guidelines* (Enterprise Ireland).

The Incident Response Plan (IRP) (an outline IRP is located in Appendix A of this EOP) shall include arrangements for dealing with accidental spillage and relevant staff shall be trained in these procedures.

Mitigation measures during the construction phase will include implementing best practice to avoid sediment entering the River Suir. Runoff will be controlled and treated to minimise impacts to surface water and groundwater, (refer to Chapters 9 and 10 in Volume 2 of this EIAR).

2.3 Site Environmental Manager (SEM)

In order to ensure the successful development, implementation and maintenance of the EOP, the Contractor will be required to appoint an independent Site Environmental Manager (SEM) to provide independently verifiable audit reports.

The SEM must possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, a Level Eight qualification recognised by the Higher Education and Training Awards Council (HETAC), or a University equivalent, or other qualification acceptable to the Employer, in Environmental Science or Environmental Management, Environmental Hydrology, Engineering or other relevant qualification acceptable to the Employer. The SEM will demonstrate experience working in the protection of European Sites.

Separate from the on-going and detailed monitoring carried out by the contractor as part of the EOP; the SEM shall carry out the inspection/ monitoring regime described below, and report to the Contractor. The results will be stored in the SEM's monitoring file and will be available for inspection/ audit by the Client, National Parks and Wildlife Service (NPWS) or Inland Fisheries Ireland (IFI) staff. All inspections/ monitoring/ results will be recorded on standard forms.

(i) Control measures for works at or near the River Suir shall be inspected on a daily basis;

(ii) In-situ concrete operations at or near the River Suir shall be supervised and designated chute washing out facilities shall be inspected on a daily basis;

(iii) Site compounds shall be inspected on a weekly basis;

(iv) Vibration monitoring is recommended at the Clock Tower during piling and any demolition works required in order to ensure compliance with defined thresholds;

(v) Water quality monitoring will be undertaken at two monitoring locations in the River Suir on a monthly basis from 6 months prior to construction, on a weekly basis during construction and on a monthly basis for at least 24 months post-completion; and

(vi) Hydroacoustic monitoring will be undertaken for the full duration of the construction of the proposed development. The results will be frequently reviewed (at least fortnightly) by the Ecological Clerk of Works.

2.4 Ecological Clerk of Works (ECoW)

In order to ensure the successful development and implementation of the EOP, the Contractor will appoint an independent Ecological Clerk of Works (ECoW). The ECoW must possess training, experience and knowledge appropriate to the role, including:

- An NFQ Level 8 qualification or equivalent or other acceptable qualification in ecology or environmental biology; and,

- Demonstrable experience in the protection of European sites.

The principal functions of the ECoW are:

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

During the preparation of the Contractor's EOP, the SEM may, as appropriate, assign other duties and responsibilities to the ECoW.

In exercising his/her functions, the ECoW will be required to keep a monitoring file and this will be made available for inspection or audit by WCCC, the NPWS or IFI at any time.

3.0 PLANNING CONSENT

If planning permission is granted for the proposed development, the entire contents of the planning consent are inserted at this location.

[*Insert planning consent*]

4.0 SCHEDULE OF COMMITMENTS

The Schedule of Commitments comprises the mitigation measures as outlined in Chapter 18 Mitigation Measures of the Environmental Impact Assessment Report and any additional commitments arising during the EIA process up to and including the Oral Hearing.

The current Schedule of Commitments is as follows:

[*Insert Schedule of Commitments*]

In addition, the Contract documents, the conditions imposed by An Bord Pleanála, the Schedule of Commitments, and relevant environmental legislation all prescribe environmental performance criteria.

The following table lists the complete suite of Environmental Commitments together with the relative specification and evidence of how each commitment will be met. An example of the layout of this table and potential entries is given below.

Table 1 Environmental Commitments

Environmental Commitment	Legislation / Specific Ref.	Action Owner	Evidence	Target Date	Close Date
Noise and Vibration	EIAR Volume 2, Chapter 12 Noise and Vibration; EIAR Volume 2, Chapter 18 Mitigation Measures	Env. Manager / Noise Specialist / Env. Designer / Site Agent / Foreman	Method Statement / Site Inspections / Monitoring Data / Environmental Control Measure Sheet	Ongoing	End of contract
Biodiversity	EIAR Volume 2, Chapter 7 Biodiversity; EIAR Volume 2, Chapter 18 Mitigation Measures; Figures 7.1-7.2	Env. Manager/ specialist ecologist/ Env. Designer / Site Agent / Foreman	Method Statement / Ecological Walkover / Pre-surveys / agreement from IFI / Site Inspections	Ongoing	End of Contract

5.0 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN

A Construction and Demolition Waste Management Plan (CDWMP) is prepared to ensure that waste arising during the construction and demolition phase of the development on site will be managed and disposed of in a way that ensures the provisions of the Waste Management (Amendment) Acts, 1996-2011 and associated Regulations (1996-2011) are complied with and to ensure that optimum levels of reduction, re-use and recycling are achieved.

An outline CDWMP, consistent with mitigation measures as contained within the EIAR and the Schedule of Commitments, at this time is contained in Appendix A of this EOP.

6.0 INCIDENT RESPONSE PLAN

This document describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and appropriate to particular circumstances.

An outline Incident Response Plan, consistent with mitigation measures as contained within the EIAR and the Schedule of Commitments, at this time is contained in Appendix B of this EOP.

APPENDIX A

Outline Incident Response Plan

River Suir Sustainable Transport Bridge

Outline Incident Response Plan

December 2018

Client
Waterford City and County Council
The Mall
Waterford

Consulting Engineer
Roughan & O'Donovan
Arena House
Arena Road
Sandyford
Dublin 18, D18 V8P6

River Suir Sustainable Transport Bridge

Outline Incident Response Plan

TABLE OF CONTENTS

1.0 INTRODUCTION

This Outline Incident Response Plan (IRP) describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and appropriate to particular circumstances. It has been developed to provide the information that each employee may need in order to respond to an emergency and to handle it effectively.

2.0 OBJECTIVE OF PLAN

The primary objective of this document is to:

- Ensure the health and safety of workers and visitors at and in proximity to the site;
- Minimise any impacts to the environment and to ensure protection of the water quality and the aquatic species dependant on it;
- Protect property and operations at the proposed site and to minimise the impact on the continuity of business; and,
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort and in a manner that minimises the possibility of loss and reduces the potential for affecting health, property and the environment.

3.0 RESPONSIBILITY

It is the responsibility of the Site Environmental Manager to maintain and update this Outline IRP as required.

This Outline IRP will be reviewed on an ongoing basis and amended, as necessary, when one or more of the following occur:

- Applicable regulations are revised;
- The Plan fails in an emergency;
- The project changes in its design, construction, operation, maintenance, or other circumstance in a way that materially increases the potential for impacts on the environment, workers or visitors to the site; and/or,
- Amendments are required by a regulatory authority.

4.0 OTHER PLANS

Waterford City and County Council has a Major Emergency Plan prepared in accordance with the Government's Major Emergency Management Framework. This plan details the initial contact that should be made in the case of an emergency incident as well as those responsible for following up once an emergency event is declared. This plan will be available to the Contractor and may be referred to during both the construction and operation phases. The Plan is presented in Appendix A.

5.0 OUTLINE INCIDENT RESPONSE PLAN

Name and address of the Client:

Waterford City and County Council

The Mall, Waterford

The contact within the Client organisation is Mr Peter Keane (tel. 0761 10 2788).

Site Location:

The proposed development is located in Waterford City centre, from the Clock Tower on the South Quay to the North Quay (Appendix A Figure 1).

Overview of the activities on site:

The development comprises the following major elements:

- Construction of compound/ site setup on the south quay to facilitate the bridge and south plaza construction;
- Site clearance of the clock tower car park, paved pedestrian areas / R680 road over the extents of the south plaza works site;
- Diversion of utilities affected by the works on the south quays;
- Removal of the required sections of the existing floating jetty and existing jetty piles at the bridge location;
- Construction of permanent and temporary sheet piling in the river for the south abutment;
- Completion of north abutment piling and construction of piled abutment;
- Construction of north and south abutments;
- Construction of vessel collision protection system and fenders;
- Construction of bridge south approach ramp/steps; and
- Completion of south quay plaza approach area.

Description of the proposed development and surrounding area:

The proposed development comprises a sustainable transport bridge crossing the River Suir in Waterford City and a plaza on the South Quay. It is anticipated that the proposed bridge will provide a new pedestrian, cycle and courtesy electric bus link between the North Quays and South Quays, promoting the further development of Waterford City and facilitating the development of the North Quays Strategic Development Zone (SDZ) lands. The proposed development is termed a 'Sustainable Transport Bridge' due to the fact that it will support sustainable modes of transport including pedestrians, cyclists and electric bus users. The proposed bridge will span from the North Quays to the South Quays where it will land in the vicinity of the Clock Tower on Meagher's Quays. The bridge will be approximately 207m long and will extend the retail spine of Waterford City across to the North Quays SDZ and to Ferrybank and Belview. The north quays at present comprise an assembly of wharves consisting of disused open spaces following the demolition of the buildings along the north quays in 2016 and the Hennebique building in July 2018. The Rosslare to Waterford rail line terminates to the east of the north quay landing point. The south quay setting currently comprises an at-grade car park that is adjacent to Merchant's Quay (R680), a 19th century clock tower, a walkway along the river edge and a glass walled flood defence. A marina is also located parallel with the river at this point with access via the adjoining car park.

Potential Incidents:

Potential incidents requiring emergency response procedures include:

- Fuel and oil spills;
- Road traffic accidents involving chemical or biological spills;
- Earth slippages;
- Extreme rainfall events, causing flooding of the River Suir;
- Fires;
- Activities resulting in noise and vibration, air pollution, hazardous substances or impacts on water;

- Waste management; and,
- Discharge of effluent.

The Contractor will update the list of potential incidents based on their proposed construction methods and programme for the River Suir Sustainable Transport Bridge and include, as a minimum, the following:

- The measures to be taken to avoid or reduce the risk potential;
- Procedures to be put in place to deal with the risk;
- Person responsible for dealing with incidents;
- Procedures for alerting key staff;
- Standby/rota systems;
- Clearly defined roles and responsibilities;
- Names of staff and contractors trained in incident response;
- The types and location of emergency response equipment available and appropriate personal protective equipment to be worn;
- A system of response coordination;
- Off-site support; and,
- Particular emergency service or persons to be notified in case of incident.

Date and version of the plan: December 2018 V1	**Name or position of person responsible for compiling/approving the plan:** Christine Murphy and Barry Corrigan Roughan & O'Donovan
Review Date:	**Date of next exercise:**

Objectives of the IRP:

To ensure works are carried out in such a way as to avoid injury, health hazards or pollution incidents, however, should any such incident occur, procedures and measures will be implemented to contain, limit and mitigate the effects as far as reasonably practicable.

List of external organisations consulted in the preparation of the IRP:

TBC by Contractor when preparing IRP

Distribution of the IRP

Recipient	No. of copies	Version

6.0 EXTERNAL CONTACTS

Contact	Office Hours	Out of Hours
External Contacts		
Waterford City Fire Service	0761 10 2982	999 / 112
Gardaí: Emergency	999 / 112	999 / 112
Gardaí: Waterford Garda Station	(051) 305 300	(051) 305 300
Waterford University Hospital	(051) 848000	(051) 848000
EPA Regional Inspectorate Wexford	(053) 916 0600	-
Waterford City and County Council Emergency Planning Department	0761 10 20 20	0761 10 20 20
ESB	1850 372 757	1850 372 999

Contact	Office Hours	Out of Hours
Bord Gáis	1850 200 694 / 1850 20 50 50	1850 20 50 50
Waste Management Contractor	TBC	
Specialist Advice	TBC	
Specialist Clean up Contractor	TBC	
Waterford City and County Council	0761 10 20 20	-
Inland Fisheries Ireland		To be agreed with IFI
National Parks & Wildlife Service		To be agreed with NPWS

7.0 INTERNAL (CONTRACTORS) CONTACTS

Contact	Office Hours	Out of Hours
Internal Contacts		
Names and positions of staff authorised/trained to activate and coordinate the IRP	TBC	
Other Staff	TBC	
Managing Director	TBC	
Site Manager	TBC	
Health & Safety Manager	TBC	
Site Environmental Manager	TBC	

8.0 CHEMICAL PRODUCT AND WASTE INVENTORY

Inventory of Chemical Products and Wastes						
Trade Name / Substance	**Solid / liquid / gas or powder**	**UN number**	**Maximum amount**	**Location marked on site plan**	**Type of containment**	**Relevant health and environmental problems**

9.0 POLLUTION PREVENTION EQUIPMENT INVENTORY

Inventory of Pollution Prevention Equipment (on- and off-site resources)			

10.0 DRAWINGS

Drawings of the proposed road development are included in **Appendix A**.

Site Plan
Figure 1 - Location Plan

11.0 RESPONSE PLANNING

11.1 Incident Response Plan

The Contractor's Environmental Operating Plan (EOP) will include an Incident Response Plan, which will detail the controls to be adopted to manage the risk of pollution incidents and procedures to be followed in the event of any pollution incidents.

11.2 The Incident Response Plan will include the following, as appropriate:

- Reference to the Method Statements and Management Plans for other construction activities, insofar as they are relevant for the purposes of mitigating against health and safety and pollution incidents;
- Procedures to be adopted to contain, limit and mitigate any adverse effects, as far as reasonably practicable, in the event of a health and safety or pollution incident;
- Details of spill clean-up companies appropriate to deal with pollution incidents associated with the materials being used or stored on site.
- Procedures to be followed and appropriate information to be provided in the event of any incident, such as a spillage or release of a potentially hazardous material;
- Procedures for notifying appropriate emergency services, authorities, the Employer's Representative and personnel on the construction site;
- Procedures for notifying relevant statutory bodies, environmental regulatory bodies, local authorities and local water and sewer providers of pollution incidents, where required;
- Maps showing the locations, together with address and contact details, of local emergency services facilities such as police stations, fire authorities, medical facilities and other relevant authorities; and,
- Contact details for the persons responsible on the construction site and within the Contractor's organisation for pollution incident response.

11.3 Monitoring

The Contractor will investigate and provide reports on any health and safety or pollution incidents to the Employer's Representative, including, as appropriate:

- A description of the incident;
- Contributory causes;
- Adverse effects;
- Measures implemented to mitigate adverse effects; and,
- Effectiveness of measures implemented to prevent pollution.

The Contractor will undertake appropriate monitoring of the procedures and measures set out in the management plans for construction activities required to prevent health and safety or pollution incidents to ensure they are being adequately implemented.

The Contractor will monitor the effectiveness of the procedures and measures implemented in the event of an incident and the effectiveness of the response procedures set out in the Incident Response Plan to identify any areas where improvement is required.

APPENDIX A

Waterford City and County Council Major Emergency Plan

Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council

Waterford City & County Council

MAJOR EMERGENCY PLAN

2015

Title:	**Major Emergency Plan**
Version:	**1**
Date:	**March 2015**
Status:	**Approved**
Prepared By:	**Des Hoctor**
Approved By:	**WCCC Management Team**

Record of Issues and Amendments

Amendment No.	Version No.	Date	Section Amended	Amended By
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Contents

Section 12 Site and Event-Specific Arrangements and Plans

Section 13 The Recovery Phase

13.1 Support for Individuals and Communities
13.1.1 Supporting individuals and communities affected by the emergency
13.1.2 Managing of public appeals and external aid
13.2 Clean-Up
13.2.1 Arrangements for clean up of sites / removal of debris/decontamination of sites of emergency and the Council's role in this
13.3 Restoration of Infrastructure and Services. Specify how restoration of infrastructure and services is to be achieved, and the Council's role in this
13.3.1 Procedures and arrangements for monitoring the situation
13.3.2 Procedure for liaison with utilities
13.3.3 How the order of priorities are to be determined
13.3.4 Protection measures against continuing hazards

Section 14 Review of the Major Emergency Plan

14.1 Internal Review Process
14.2 How the MEP is to be reviewed and amended externally
14.2.1 Inter-agency Review Process at the Regional Steering Major Emergency Group
14.2.2 Review of the MEP by the Department of the Environment, Community and Local Government
14.3 After every activation, the Major Emergency Plan should reviewed and reported on
14.3.1 How the agency's performance of its functions will be reviewed and reported upon internally
14.3.2 How the co-ordination function will be reviewed and reported upon externally and jointly with other principal response agencies

Section 15 Appendices

Section 1

Introduction to Plan

1.1 An introduction to Plan

A Major Emergency is any event which, usually with little or no warning, causes or threatens death or injury, serious disruption of essential services or damage to property, the environment or infrastructure beyond the normal capabilities of the principal emergency services in the area in which the event occurs, and requires the activation of specific additional procedures and the mobilisation of additional resources to ensure an effective, co-ordinated response.

1.2 Background

In 2006 the government approved a two-year Major Emergency Development Programme 2006-2008 (MEDP) to allow for the structured migration from current arrangements to an enhanced level of preparedness via the new emergency management process. The purpose of this plan is to put in place arrangements that will enable the three principal emergency response agencies, An Garda Síochána, the Health Service Executive and the Local Authorities to co-ordinate their efforts whenever a major emergency occurs.
The systems approach to Major Emergency Management involves a continuous cycle of activity. The principal elements of the systems approach are:

- Hazard Analysis/ Risk Assessment;
- Mitigation/ Risk Management;
- Planning and Preparedness;
- Co-ordinated Response; and
- Recovery.

Fig 1.1: Five Stage Emergency Management Paradigm

1.3 The objectives

The objective of this Plan is to protect life and property, to minimize disruption to the area, and to provide immediate support for those affected. To achieve this aim the Plan sets out the basis for a coordinated response to a major emergency and the different roles and functions to be performed by the various agencies. The fact that procedures have

been specified in the Plan should not restrict the use of initiative or common-sense by individual officers in the light of prevailing circumstances in a particular emergency.

1.4 The scope of the Major Emergency Plan

The Scope of the Major Emergency Plan is such that the plan provides for a co-ordinated inter-agency response to major emergencies beyond the normal capabilities of the principal emergency services.

1.5 The relationship / inter-operability of the Major Emergency Plan with other emergency plans

An Garda Síochána, the Health Service Executive and Waterford City & County Council are the Principal Response Agencies (PRA) charged with managing the response to emergency situations which arise at a local level.
In certain circumstances, the local response to a major emergency may be scaled up to a regional level, activating the Plan for Regional Level Co-ordination. If this is so the principal response agencies are An Garda Síochána, the Health Service Executive and South East Region Local Authorities (Carlow, Wexford, Kilkenny & Waterford), members of which all sit on the Regional Steering Group.

1.6 The language / terminology of the Plan

In situations where different organisations are working together, there is a need for common vocabulary to enable them to communicate effectively. This is particularly the case where the principal emergency services and a range of other bodies are working together under the pressures that a major emergency brings. Therefore a full set of relevant terms and acronyms are provided in the *Appendices*, which should be used by **all** agencies.

1.7 The distribution of the Plan

Copies of the plan will be distributed to all departments of Waterford City & County Council appropriate Heads of Service, Emergency Planning Team members, and Emergency services. The distribution list is outlined *Appendices.*

Name / Organization

Waterford City & County Council

- Chief Executive Officer
- Director of services
- Senior Engineers
- Chief fire officer
- MEM 'Key role' holders

Other local Authorities

- Carlow
- Kilkenny
- Wexford
- Tipperary
- Cork

An Garda Síochána

- Waterford Division

Health Service Executive

Defence Forces

Volunteer Emergency Services

1.8 The status of the Plan and when and how it will be reviewed / updated

It will be reviewed and updated on an annual basis and also follow any exercises or incidents.

- Plan Implementation Date: March 2015
- Plan Review Date: March 2016

1.9 Public access to the Plan

An edited copy of the Emergency Management Plan, with contact telephone numbers and other personal information removed, will be available to the public on the Council website at www.waterfordcouncil.ie

Section 2

Waterford City & County Council and its Functional Area

2.1 Role of Waterford City & County Council

The functional area of this plan is the administrative area of Waterford City & County. In the event of a major emergency, the role of Waterford City & County Council is to ensure life safety by providing a top class emergency service in the form of the Fire Service and Civil Defence. Waterford City & County Council will ensure that danger areas are made safe in order to permit other agencies to undertake their recovery and rehabilitation operations. In the immediate aftermath of an incident principal concerns include support for the other emergency services, support and care for the local and wider community, use of resources to mitigate the effects of the emergency and co-ordination of the voluntary organisations. In the 'recovery' phase, the local authority will be responsible for leading and co-ordinating the rehabilitation of the community and the restoration of the environment.

2.2 Boundaries and characteristics of area.

Waterford City & County is located in the South-East Region of Ireland. Waterford City & County has a population of 113,795

2.3 Partner principal response agencies

Other agencies responsible for Emergency Services in this area are:-
(a) Health Service Executive: South region comprising of counties Kerry, Cork, Waterford, Wexford, Carlow and Kilkenny
(b) An Garda Síochána: Waterford Division

2.4 Regional Preparedness

Under certain specific circumstances regional level major emergencies may be declared, with a Plan for Regional Level Co-ordination activated. This will provide for mutual aid, support and co-ordination facilities to be activated in a region, the boundaries of which are determined to suit the exigencies of the particular emergency. There are eight regions in total that have been created for Major Emergency purposes. The regions are shown in the Map overleaf:

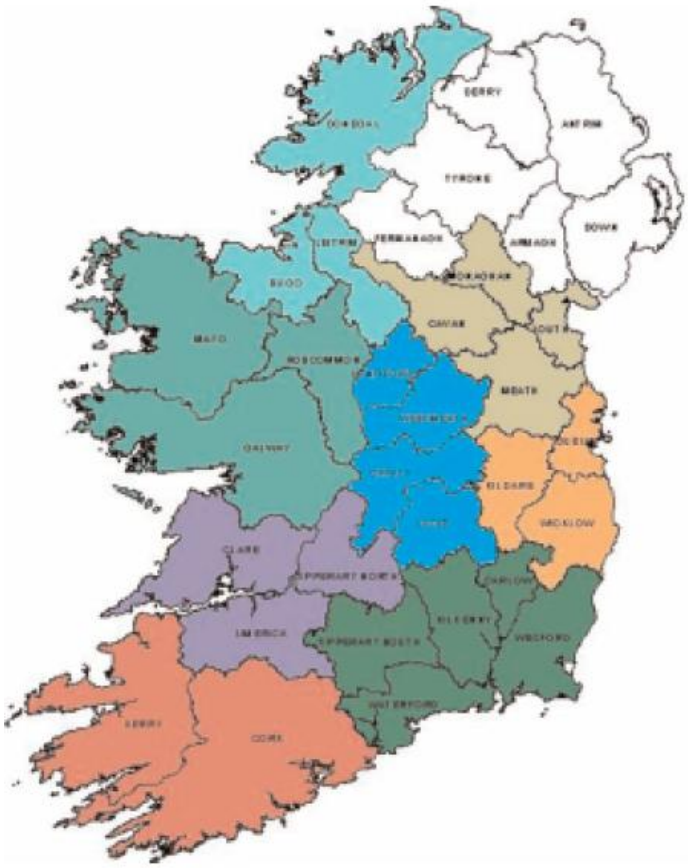


Figure 2.1: Map of the Major Emergency Management regions

Waterford City & County belongs to the South East region. This region incorporates the following counties;

- Carlow
- Kilkenny
- Wexford
- Waterford

An inter-agency Regional Steering Group and Regional Working Group has been formed for the South East Major Emergency Region. This group is representative of senior management from each of the principal response agencies (PRAs).
A Regional Working Group on Major Emergency Management has also been established to support and progress major emergency management in the South-East Region.

Section 3

Risk Assessment for the Area

3.1 History of area in terms of emergency events

To prepare effectively to deal with potential emergencies, it is necessary to have regard to specific risks faced by a community. Risk Assessment is a process by which the hazards facing a particular community are identified and assessed in terms of the risk which they pose.
Major emergencies by their very nature are few and far between. A Major Emergency has to date never been declared in Waterford City & County.

3.2 The general and specific risks that may be faced locally and regionally

A number of risk holdings were identified and risk assessments have been carried out on these premises / area. The risk assessment groups can be broken into the following areas;

1) Hazardous Sites Emergencies:

The European Communities (Control of Major Accident Hazards Involving Dangerous Substance) Regulations, 2006, apply to sites which hold specific quantities of specified dangerous substances. These sites are classified as upper tier and lower tier.

2) Critical Infrastructure Emergencies:

1. National Primary Roads e.g. N25 Rosslare to Cork
2. Iarnród Éireann: Rail line
3. Waterford Regional Hospital.

3) Flooding / Pollution / Animal disease emergencies:

1. Waterford City & County Council

4) Utility company emergencies:

1. Bord Gáis
2. E.S.B.
3. Eircom

5) Aviation & CBNR emergencies:

Following terrorist incidents in recent years, a number of Government Departments are currently involved in planning for emergencies on a national level that involve aviation and CBNR (Chemical, Biological, Nuclear & Radiological agents).
Aviation emergencies such as collisions have also been identified in the risk assessment process.

3.3 Scenarios

The following have been selected as exemplars on which preparedness for Waterford City & County is being based:

- Urban Flooding
- Aircraft Incident
- Water Contamination
- Industrial Incident
- Fire in Assembly Building
- Major RTA/ Hazmat
- Building Collapse due to Gas Explosion
- Loss of Critical Infrastructure
- Rail
- Crowd Safety
- Marine incidents
- Runaway Dyrophosphonate (MSD)
- Loss of Critical IS Infrastructure
- Severe Weather

3.4 Risk management / Mitigation / Risk reduction strategies

By carrying out a risk assessment, we can identify the risks posed to the City and mitigate for their effects. It also enables us to plan and prepare for those risks which can not be eliminated.

The risk assessment process was carried out initially by an inter-agency team, with invited members of An Garda Síochána, the HSE and the Local Authority, before being undertaken and documented by the Major Emergency Development Committee (MEDC).

The risk assessment comprises of four stages:

1. Establishing the context
2. Hazard Identification
3. Risk Assessment
4. Recording potential hazards on a risk matrix

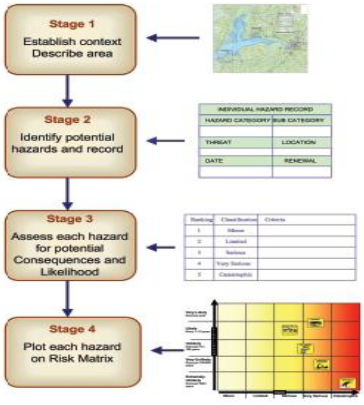


Fig 3.1: Schematic Risk Assessment Process

3.5 Associated Plans and their compatibility with the Major Emergency Plan.

Associated with this PLAN are Section Plans for *(see Appendices):*

Water Supply contamination

Section 4

Resources For Emergency Response

4.1 Structure / Resources / Services of the Council

The organisational structure of Waterford City & County Council can be divided into two parts: firstly the Elected Members and secondly, the Chief Executive Officer and his staff (details of both can be found in Waterford City & County Council Annual Reports).
There are Six Directors of Service at Waterford City & County Council who report directly to the Chief Executive Officer and are responsible for the functioning of their section within the council. These sections are;

- Planning & Corporate
- Water & Environment
- Economic Development
- Housing, Community & Culture
- Roads, HR, & Emergency Services
- Head of Finance, ICT & Cost Management

The Chief Executive Officer is responsible for supervising government operations and implementing the policies adopted by the council.
Each section of the Council may be called upon to act in the event of a Major Emergency.

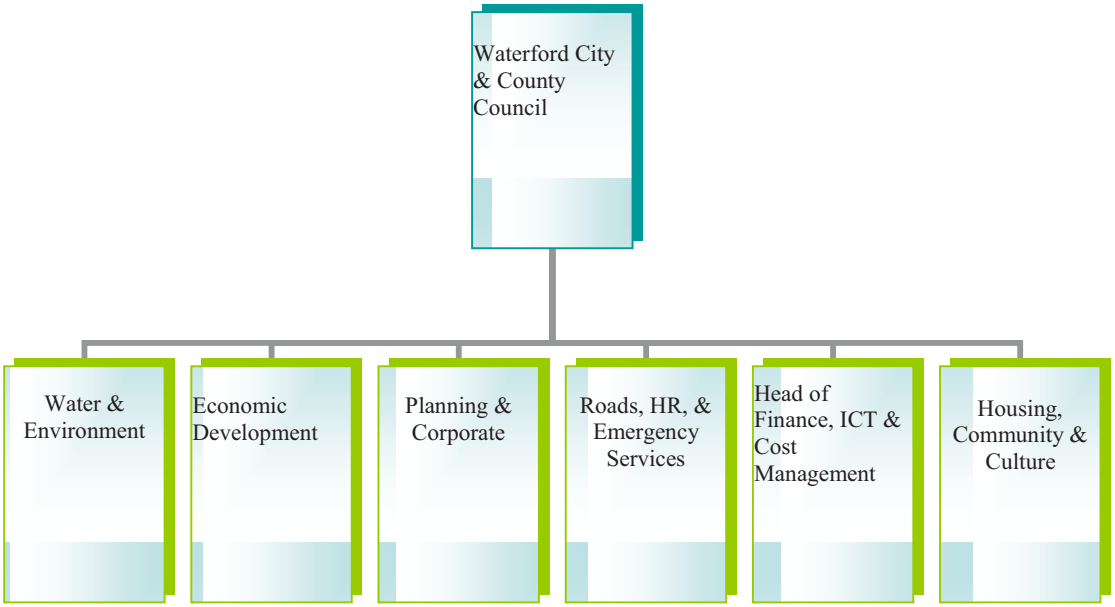


Fig 4.1 Structure within Waterford City & County Council

4.2 Special staffing arrangements during a Major Emergency

The majority of Waterford City & County Council staff requested to carry out functions in relation to a Major Emergency will be mobilised in accordance with pre-determined procedures. In addition the Civil Defence, under the Authority of Waterford City & County Council operate on a call out system, however it is worth considering that their response is completely subject to the availability of volunteers, *see section 4.4.1.*

4.3 Council resources are matched to the functions assigned to it.

Waterford City & County Council will identify, match and formally nominate competent individuals and alternates to the key roles to enable the agency to function in accordance with the common arrangements set out in its Major Emergency Plan.
Support teams will be put in place for key roles and Operational Protocols setting out the arrangements which will enable the agency's support teams to be mobilised and function in accordance with the arrangements set out in the Major Emergency Plan.
Assignment of key roles and how those roles are to be delivered are documented *please see Section 5.4 of this document (see Appendices).*

4.4 Other organisations / agencies that may be mobilised to assist

There are a number of organisations and agencies which may be called upon to assist the principal response agencies in responding to major emergencies in addition to specialist national and local organisations. These organisations may be grouped as follows;

- Defence Forces
- Civil Defence
- Irish Coast Guard
- The Irish Red Cross
- Voluntary Emergency Services (SEMRA (South Eastern Mountain Rescue), River Rescue, SRDA (Search and Rescue Dog Association), Order of Malta).
- Community Volunteers
- Utility companies (ESB, Bord Gáis, Bus Éireann etc)
- Private contractors

4.4.1 Civil Defence

Civil Defence is a body of trained volunteers in the disciplines of First Aid, Rescue, Fire Welfare, river rescue search and recovery. Call out system is in place in the event of an emergency. Civil Defence will be available to help with any area assigned to them to assist the local authority or other Statutory Service, subject to the availability of volunteers.

4.4.2 The Defence Forces

The Defence Forces can provide a significant support role in a major emergency response. However, there are constraints and limitations, and their involvement has to be pre-planned through the development of Memoranda of Understanding (MOU's) and Service Level Agreements (SLA's). Consequently, assumptions should not be made regarding the availability of Defence Forces' resources or materials to respond to a major emergency. Provision of Defence Forces' capabilities is, therefore, dependent on the exigencies of the service and within available resources at the time.
It is recognised that assistance requested from the Defence Forces should be either in Aid to the Civil Power (An Garda Síochána), primarily an armed response or in Aid to the Civil Authority (Local Authority or Health Service Executive), an unarmed response.
All requests for Defence Forces' assistance should be channelled through An Garda Síochána to Defence Forces Headquarters (DFHQ) in accordance with MOUs and SLAs.

4.4.3 The Irish Red Cross

The Irish Red Cross is established and regulated under the Red Cross Acts, 1938-54. These statutes define a role for the Irish Red Cross as an auxiliary to the state authorities in time of emergency and also provide a specific mandate to assist the medical services of the Irish Defence Forces in time of armed conflict. The main relationship with the principal response agencies in major emergency response is as an auxiliary resource to the ambulance services. Subsidiary search and rescue and in-shore rescue units of the Irish Red Cross support An Garda Síochána and the Irish Coast Guard. *(See Appendices Voluntary Emergency Resources)*

4.4.4 Voluntary Emergency Services Sector

Other Voluntary Emergency Services in the Waterford City & County area include *(See Appendices Voluntary Emergency Resources)*:

- Civil Defence
- South Eastern Mountain Rescue Association
- Order of Malta
- Red Cross
- Search and Rescue Dogs Association
- Tramore Sea Rescue Association & Tramore RNLI
- Tramore Cliff Rescue Association
- Waterford Sub-Aqua Club
- Dunmore East Life Boat

4.4.5 The community affected

It is recognised that communities that are empowered to be part of the response to a disaster, rather than allowing themselves to be simply victims of it, are more likely to recover and to restore normality quickly, with fewer long-term consequences.
At an early stage the On-Site Co-ordinator, in association with the other Controllers, should determine if ongoing assistance is required from "casual volunteers'' within the community, so that An Garda Síochána cordoning arrangements can take account of this.
Where the On-Site Co-ordinator determines that casual volunteers should be integrated into the response, it is recommended that the service tasking them, or confirming them in tasks on which they are engaged, should request volunteers to form teams of three to five persons, depending on the tasks, with one of their number as team leader. Where available, orange armbands emblazoned with the word 'Volunteer' or suitable abbreviation, e.g. 'VOL', will be issued by Civil Defence, with whom they will be offered a temporary volunteer status.

4.4.6 Utilities

Utilities are frequently involved in the response to emergencies, usually to assist the principal response agencies in making situations safe. They may also be directly involved in restoring their own services, for example, electricity supply in the aftermath of a storm.
It is important that there is close co-ordination between the principal response agencies and utilities involved in or affected by an emergency. Utilities operate under their own legislative and regulatory frameworks but, during the response to an emergency, they need to liaise with the On-Site Co-ordinator. It is also recommended that representatives of individual utilities on site should be invited to provide a representative for the On-Site Co-ordination Group. It is recommended that individual utilities be invited to attend and participate in relevant work of Local Co-ordination Groups. (*See Appendices Resource Contact Personnel and Telephone Numbers)*

4.4.7 Private Sector

Private sector organisations may be involved in a major emergency situation in two ways. They may be involved through, for example, ownership of the site where the emergency has occurred or through ownership of some element involved in the emergency e.g. an aircraft, bus, factory, etc. They may also be called on to assist in the response to a major emergency by providing specialist services and equipment, which would not normally be held or available within the principal response agencies. (*See Appendices)*

4.5 How mutual-aid will be sought from neighbours

The Local Co-ordination Group may request assistance via mutual aid arrangements from a neighbouring County or declare a Regional level emergency and activate the Plan for Regional Level Co-ordination. Support is most likely to be requested from:

- Tipperary County Council
- Kilkenny County Council
- Cork County Council
- Wexford County Council

4.6 Regional level of co-ordinated response

In the event of a Regional level response the lead agency which has declared the regional level emergency will convene and chair the Regional Co-ordination Group. Depending on the circumstances, the goal of regional co-ordination may be achieved by using a single Regional Co-ordination Centre.
The method of operation of a Regional Co-ordination Centre will be similar to that of a Local Co-ordination Centre.

4.7 National / international assistance

In the event that it is necessary to seek assistance from neighbouring or other regions of the country, or from outside the state, this decision should be made by the lead agency in consultation with the other principal response agencies and lead Government Department Liaison Officer at the Regional Co-ordination Centre.
The South-East Regional Co-ordination Group should identify and dimension the level/type of assistance likely to be required and its duration. It should also seek to identify the possible options for sourcing such assistance, be that from neighbouring Regions, elsewhere in the state, the United Kingdom or from other EU member states.
The South-East Regional Co-ordination Group may also request assistance from Government. National resources will be available in the event of a major emergency at local or regional level. Requests for assistance should be developed at local or regional co-ordination level and directed by the lead agency to the lead Government Department.
The European Community has established a Community Mechanism to facilitate the provision of assistance between the member states in the event of major emergencies. Requests for such assistance should be made by the chair of the Waterford City & County Council or South-East Regional Coordination Group to the National Liaison Officer at the Department of the Environment, Community and Local Government.

Section 5

Preparedness for Major Emergency Response

5.1 The incorporation of major emergency management into the Council's business planning process

The development of the Waterford City & County Council Major Emergency plan is part of an emergency management programme development within the Local Authorities to ensure that all necessary arrangements, systems, people and resources are in place to discharge the functions assigned to it. The plan therefore does not stand alone but is in fact incorporated into the Council's management programme. This management programme, which will be implemented on a three year cycle, is designed to maintain a continuous level of preparedness within the County.

5.2 Assignment of responsibility

The Chief Executive Officer for Waterford City & County Council (or designative alternative) is responsible for the principal response agency's major emergency management arrangements and preparedness, as well as for the effectiveness of the agency's response to any major emergency, which occurs in its functional area.

5.3 Documentation of a major emergency development programme

The responsibility for overseeing the Major Emergency Programme within Waterford City & County Council will be assigned to the Director of Services for Roads, HR & Emergency services, whom the Chief Fire Officer will support along with other staff members within the fire services.

5.4 Key roles identified in the Major Emergency Plan.

Waterford City & County Council has nominated competent individuals and alternates to the key roles to enable the agency to function in accordance with the common arrangements set out in its Major Emergency Plan. (*See Appendices).*

5.5 Support teams for key roles

Support teams will be formed to support and assist individuals in key roles and will prepare Operational Protocols setting out the arrangements which will enable the agency's support teams to be mobilized and to function in accordance with the arrangements set out in the Major Emergency Plan.

5.6 Staff development programme

The provisions of the Framework and the tasks arising from the new major emergency management arrangements involve a significant level of development activity, both within Waterford City & County Council and jointly with our regional partners.
In parallel with risk assessment, mitigation processes and the preparation of the Major Emergency Plan, Waterford City & County Council should initiate an internal programme to develop its level of preparedness, so that in a major emergency it will be in a position to respond in an efficient and effective manner and discharge the assigned functions in accordance with the Framework. It is also imperative that we not only develop within our own agency but that we also continue to work with the other PRAs through continued training and inter-agency exercises.

5.7 Training programme

All personnel involved in the Major Emergency Plan organisation will be required to participate in inter-agency training and exercises in order to ensure effective co-operation between agencies during a Major Emergency.

5.8 Internal exercises

Internal exercises will be used to raise awareness, educate individuals on their roles and the roles of others and promote co-ordination and cooperation, as well as validating plans, systems and procedures.

5.9 Joint / inter-agency training and exercise

Joint interagency training will be provided at a Local and Regional level, coordinated by the South East Regional Working group. Exercises will follow on from this training to improve awareness and to educate all involved in the roles and functions of the PRAs in the event of an emergency. Exercises will be preformed on a three yearly cycle.

5.10 The allocation of specific resources including a budget for preparedness

Waterford City & County Council and the South-East Regional Steering Group will provide a budget for major emergency preparedness, which reflects the expenditure required to meet the costs of implementing the agency's internal preparedness, as well as the agency's contribution to the regional level inter-agency preparedness.

5.11 Procurement Procedures

The arrangements to authorise procurement and use of resources (including engaging third parties) to assist in response to major emergencies are governed by the 'Local Government Act: Part 12: Section 104'.

5.12 Annual appraisal of preparedness

Waterford City & County Council will carry out and document an annual internal appraisal of its preparedness for major emergency response; it shall then be sent for external appraisal to the Department of Environment, Community and Local Government in accordance with the Appraisal Document.
An annual appraisal of the South East Regional level preparedness shall also be documented, again in accordance with the Appraisal guidance Document.

5.13 Steps taken to inform the public as to what action they should take in the event of an emergency

There may be situations where it will be crucial for Waterford City & County Council to provide timely and accurate information on an emergency situation directly to the public. This will be especially important where members of the public may perceive themselves and their families to be at risk and are seeking information on actions which they can take to protect themselves and their families.

The Local Co-ordination Group will take over the task of co-ordinating the provision of information to the public as soon as it meets. This activity should be co-ordinated by the lead agency. The Local Co-ordination Group may establish a sub-group for this purpose and use all available channels to make concise and accurate information available. This may include the use of dedicated “help-lines”, web-pages, Aertel, automatic text messaging, as well as through liaison with the media.

Section 6

The Generic Command, Control and Co-ordination Systems

6.1 Command arrangements

The Chief Executive Officer of Waterford City & County Council is responsible for the principal response agency's major emergency management arrangements and preparedness, as well as for the effectiveness of the agency's response to any major emergency which occurs in its functional area.

6.1.1 Individual services belonging to the Council

Waterford City & County Council shall exercise command over its own services in accordance with its normal command structure. At the site of an emergency, it will also co-ordinate, not only its own services, but any additional services (other than the principal response agencies) which the Local Authority mobilises to the site. Control of the Local Authority services at the site of the Emergency shall be exercised by the Controller of Operations.

6.2 Control arrangements

Waterford City & County Council shall appoint a Controller of Operations at the site (or at each site) of the emergency. The officer in command of the initial response of each principal emergency service should be the principal response agency's Controller of Operations until relieved through the agency's pre-determined process.
Please see section 6.3.4.2 for arrangements where an emergency affects an extensive area or occurs near the borders.

6.2.1 Control of all services / sections of the Council which respond.

Controller of services / sections and Controller of Operations
The controller of operations is empowered to make all decisions relating to his/her agency's functions, but must take account of decisions of the On-Site Co-ordination Group in so doing.
The roll of the Controller of Operations is set out below:

- To make such decisions as are appropriate to the role of controlling the activities of his/her agency's services at the site (Controlling in this context may mean setting priority objectives for individual services; command of each service should remain with the officers of that service);
- To meet with the other two controllers and determine the lead agency;
- To undertake the role of On-Site Co-ordinator, where the service s/he represents is identified as the lead agency;

- To participate fully in the site co-ordination activity, including the establishment of a Site Management Plan;
- Where another service is the lead agency, to ensure that his/her agency's operations are co-ordinated with the other principal response agencies, including ensuring secure communications with all agencies responding to the major emergency at the site;
- To decide and request the attendance of such services as s/he determines are needed;
- To exercise control over such services as s/he has requested to attend;
- To operate a Holding Area to which personnel from his/her agency will report on arrival at the site of the major emergency and from which they will be deployed;
- To requisition any equipment s/he deems necessary to deal with the incident;
- To seek such advice as s/he requires;
- To maintain a log of his/her agency's activity at the incident site and decisions made;
- To contribute to and ensure information management systems operate effectively;
- To liaise with his/her principal response agency's Crisis Management Team on the handling of the major emergency.

On-Site Co-ordinator

Is empowered to make decisions, as set out below. Decisions should be arrived at generally by the consensus of the On-Site Co-ordinating Group. Where consensus is not possible, the On-Site Co-ordinator should only make decisions after hearing and considering the views of the other two Controllers.

The mandate of the On-Site Co-ordinator is set out below:

- To assume the role of On-Site Co-ordinator when the three controllers determine the lead agency. Once appointed s/he should note the time and that the determination was made in the presence of the two other controllers on site;
- To inform all parties involved in the response that s/he has assumed the role of On-Site Co-ordinator;
- To determine which facility should be used as the On-Site Co-ordination Centre. Depending on the circumstance, this may be a vehicle designated for the task, a specific, purpose-built vehicle, a tent or other temporary structure or an appropriate space/building adjacent to the site, which can be used for coordination purposes;
- To ensure involvement of the three principal response agencies and the principal emergency services (and others, as appropriate) in the On-Site Co-ordination Group;
- To ensure that mandated co-ordination decisions are made promptly and communicated to all involved;
- To ensure that a Scene Management Plan is made, disseminated to all services and applied;
- To develop an auditable list of Actions (an Action Plan) and appoint an Action Management Officer where necessary;

- To determine if and what public information messages are to be developed and issued;
- To ensure that media briefings are co-ordinated;
- To ensure that pre-arranged communications (technical) links are put in place and operating;
- To ensure that the information management system is operated, including the capture of data for record-purposes at regular intervals;
- To ensure that the ownership of the lead agency role is reviewed, and modified as appropriate;
- To ensure that inter-service communication systems have been established and that communications from site to the Local Co-ordination Centre have been established and are functioning;
- To exercise an over-viewing role of all arrangements to mobilise additional resources to the site of the major emergency, and to track the status of mobilization requests, and deployment of additional resources;
- To ensure that, where the resources of an individual principal response agency do not appear to be sufficient to bring a situation under control, or the duration of an incident is extended, support is obtained via mutual aid arrangements with neighbouring principal response agencies;
- To determine, at an early stage, if ongoing assistance is required from casual volunteers, so that An Garda Síochána cordoning arrangements can take account of this;
- To co-ordinate external assistance into the overall response action plan;
- To ensure that, where appropriate, pastoral services are mobilised to the site and facilitated by the principal response agencies in their work with casualties;
- To work with the Health Service Executive Controller to establish the likely nature, dimensions, priorities and optimum location for delivering any psychosocial support that will be required, and how this is to be delivered and integrated with the overall response effort;
- To decide to stand down the major emergency status of the incident at the site, in consultation with the Controllers of Operations, and the Local Co-ordination Group;
- To ensure that all aspects of the management of the incident are dealt with before the response is stood down; and
- To ensure that a report on the co-ordination function is prepared in respect of the major emergency after it is closed down, and circulated (first as a draft) to the other services that attended.

Local Co-ordination Group:

Once the Local Co-ordination Group has been activated the mandate is as follows:

- To establish high level objectives for the situation, and give strategic direction to the response;
- To determine and disseminate the overall architecture of response co-ordination;
- To anticipate issues arising;
- To provide support for the on-site response;

- To resolve issues arising from the site;
- To ensure the generic information management system is operated;
- To take over the task of co-ordinating the provision of information for the public as soon as it meets and use all available channels to make concise and accurate information available;
- To decide and to take action to manage public perceptions of the risks involved, as well as managing the risks, during emergencies that threaten the public;
- To co-ordinate and manage all matters relating to the media, other than on-site;
- To establish and maintain links with the Regional Coordination Centre (if involved);
- To establish and maintain links with the lead Government Department/National Emergency Co-ordination Centre;
- To ensure co-ordination of the response activity, other than the on-site element;
- To decide on resource and financial provision; and
- To take whatever steps are necessary to start to plan for recovery.

Crisis Management Team

The Crisis Management Team is a strategic level management group within each principal response agency, which is assembled during a major emergency to:

- Manage, control and co-ordinate the agency's overall response to the situation;
- Provide support to the agency's Controller of Operations on site and mobilise resources from within the agency or externally as required;
- Liaise with the national head quarters of An Garda Síochána and the Health Service Executive, and relevant Government Departments on strategic issues; and
- Ensure appropriate participation of the agency in the inter-agency co-ordination structures.

The members of the Crisis Management Team are the designate of the agency, who will meet at a pre-arranged location (usually in the agency's headquarters) designated for this use. The use of Crisis Management Teams within each of the principal response agencies facilitates the mobilisation of senior staff to deal with the crisis, in light of the evolving situation, rather than leaving multiple roles to a small number of individuals who hold key positions. In this way, the objectives of prioritising and managing a protracted crisis can be dealt with effectively, while keeping the day-to-day business running.

The Crisis Management Team provides support to the principal response agency's representative at the Local Co-ordination Group, supports their own Controller of Operations on site and maintains the agency's normal day-to-day services that the community requires.

6.2.2 Control of external organisations / agencies mobilised to assist the Council during the response

There are a number of organisations and agencies, which may be called on to assist the principal response agencies in responding to major emergencies. The arrangements for this assistance should be agreed with each agency.
At the site of an emergency, Waterford City & County Council will exercise control over not only its own services but any additional services (other than the principal response agencies) which the Local Authority mobilises to the site.

6.2.3 Support arrangements for the Control function

Waterford City & County Council staff will respond to any M.E. in accordance with pre determined agreements. The Crisis Management Team will control all Local Authority personnel that respond to the emergency.

6.3 Co-ordination Arrangements

The co-ordination of the efforts of all services is recognised as a vital element in successful response to major emergencies, so that the combined result is greater than the sum of their individual efforts. S*ee section 6.2.1 of this document for Co-Ordination Arrangements.*

6.3.1 Lead Agency

The concept of the Lead Agency is accepted as the method for establishing which Agency has initial responsibility for Coordination of all Services on the site of a Major Emergency. The predetermined and default agencies for different types of emergencies are set out in the *Appendices*

6.3.2 Specify how the Council will perform the On Site Co-ordination function, including arrangements for support teams

On-site Co-ordination is facilitated by the On-Site Controller of Operations and the On-Site Co-ordination group. The roles of the On-site Co-ordinator and the On-Site Co-ordination group have been outlined in *section 6.2.1 of this document*.

6.3.3 Specify how the Council will perform the co-ordination function at the Local / Regional Co-ordination Centres

When a major emergency has been declared and the lead agency determined, the relevant personnel of the lead agency should implement a Local Co-ordination Group mobilization procedure. The representative of the lead agency will chair the Local Co-ordination Group, located in the Local Co-ordination centre, and will exercise the

mandates associated with this position. The Local Coordination Group will comprise representatives of the other two PRAs, an Information Management Officer, a Media Liaison Officer, an Action Management Officer (where considered appropriate), representatives of other agencies and specialists, as appropriate.
The Chair of the Local Co-ordination Group may declare a regional level emergency and activate the Plan for Regional Level Co-ordination and in doing so activates a "Regional Coordination Group" to maintain co-ordination of the principal response agencies involved from the extended “response region.”
Any one of the nominated Local Co-ordination Centres may be used as a Regional Coordination Centre, or a specific Regional Centre may be designated for this purpose. The choice of location will be determined in each situation by the Chair of the Local Coordinating Group declaring the regional level emergency and will depend on the location and nature of the emergency and any associated infrastructural damage.

6.3.4 Specify how co-ordination is to be achieved in other specific circumstances

When an incident occurs to which no pre-nominated lead agency has been assigned, the default lead agency will be the Local Authority.

6.3.4.1 Mutual aid and regional level co-ordination will operate

Each Controller of Operations should ensure that, where the resources of his/her individual principal response agency do not appear to be sufficient to bring a situation under control, or the duration of an incident is extended, support is obtained via mutual aid arrangements with neighbouring principal response agencies. As they are national organisations, the Crisis Management Teams of the Health Service Executive and An Garda Síochána should arrange to provide the additional support required; Local Authorities will support each other on a mutual aid basis. *See section 4.5 and 4.6 of this document.*

6.3.4.2 How incidents occurring on the Council boundaries are to be dealt with

In certain situations, e.g. where an emergency affects an extensive area or occurs near the borders of Divisions of An Garda Síochána or areas of the Health Service Executive or of the Local Authorities, there may be response from multiple units of the PRA. There should be only one Controller of Operations for each of the three PRAs and it is necessary to determine from which unit of the principal response agency the Controller of Operations should come.
In the case of Local Authorities, which are statutorily empowered in respect of their functional areas, procedures for resolving such issues may already be set out in what are referred to as Section 81 agreements. Where they are not so covered and the issue cannot be resolved quickly in discussion between the responding officers of the different units of those services, the Local Authority Controller of Operations from the Local Authority, whose rostered senior fire officer was first to attend the incident, should be the designated person

6.3.4.3 How multi-site or wide area emergencies are to be dealt with

Multi-site or wide area emergencies may require the setting up of multiple On-site Co-ordination Centres which will feed into the one Local Co-Ordination Group.

6.3.4.4 How links with National Emergency Plans will operate

The Waterford City & County MEP will operate as an integral part of any National plans developed for scenarios affecting the population on a National Level. *(See Appendices)*

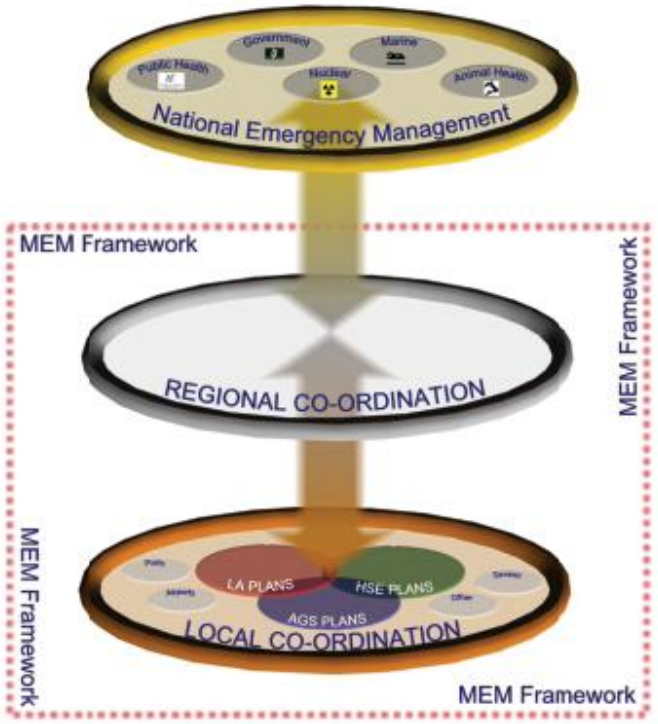


Figure 6: Linking Major Emergency Plans with National Plans and Other Plans

6.3.4.5 How links with National Government will work

In every situation where a Major Emergency is declared, each principal response agency should inform its parent Department of the declaration, as part of that agency's mobilisation procedure. The three parent Departments, should then consult and agree, which Department will be designated as Lead Department, in keeping with the directions set out in "A Framework for Major Emergency Planning".

Section 7

The Common Elements of Response

7.0 Sub-sections setting out how the following common elements of the response to any major emergency will be implemented

7.1 Declaring a Major Emergency

7.2 Initial Mobilisation

7.3 Command, Control and Communication Centres

7.4 Co-ordination Centres

7.5 Communications Facilities

7.6 Exercising the Lead Agency's Co-ordination Roles

7.7 Public Information

7.8 The Media

7.9 Site Management Arrangements

7.10 Mobilising Additional Resources

7.11 Casualty and Survivor Arrangements

7.12 Emergencies involving Hazardous Materials

7.13 Protecting Threatened Populations

7.14 Early and Public Warning Systems

7.15 Emergencies arising on Inland Waterways

7.16 Safety, Health and Welfare Considerations

7.17 Logistical Issues/ Protracted Incidents

7.18 Investigations

7.19 Community/ VIPs/ Observers

7.20 Standing-Down the Major Emergency

Section 7.1

Declaring a Major Emergency

7.1.1 Declaring a Major Emergency

The Major Emergency Plan should be activated by whichever of the following agencies first becomes aware of the major emergency:-

- Waterford City & County Council *(see Appendices for persons authorised to activate plan)*
- An Garda Síochána
- Health Service Executive

A typical message to declare a major emergency shall be in the following format:

This is …….. (Name, rank and service) ……..
A ….…. (Type of incident) ….…. has occurred/is imminent at ……
(Location) …….....……
As an authorised officer I declare that a major emergency exists.
Please activate the mobilisation arrangements in the …….. (Agency) …….. Major Emergency Plan.

7.1.2 Standard format of the information message

After the declaration is made the Officer should then use the mnemonic **METHANE** to structure and deliver an information message.

M	**Major Emergency Declared**
E	**Exact location of the emergency**
T	**Type of Emergency (Transport, Chemical, etc.)**
H	**Hazards, present and potential**
A	**Access / egress routes**
N	**Number and type of Casualties**
E	**Emergency service present and required**

Section 7.2

Initial Mobilisation

7.2.1 Major Emergency Mobilisation Procedure

Waterford City & County Council Major Emergency Mobilisation Procedure will be implemented immediately on notification of the declaration of a major emergency. When this Plan has been activated, each Local Authority service requested shall respond in accordance with pre-determined arrangements. *See Appendices*

In some situations, there may be an early warning of an impending emergency. Mobilisation within Waterford City & County Council may include moving to a standby/alert stage for some of its services or specific individuals, until the situation becomes clearer.

There may also be circumstances where the resources or expertise of agencies other than the principal response agencies will be required. In these situations the relevant arrangements outlined in the Major Emergency Plan will be invoked. No third party should respond to the site of a major emergency unless mobilised by one of the principal response agencies through an agreed procedure.

Section 7.3

Command, Control and Communication Centres

7.3.1 Command, control and communication centre(s) to be used

In the event of a Major Emergency being declared, initial mobilisation will be covered by Munster Regional Control Centre (MRCC), who will communicate with the personnel on-site until such time as the Crisis Management Team and Co-ordination Group have been established in accordance with national pre-determined arrangements. *Please refer to Section 6 of this document for further details on the functions of these Teams/Groups*.

Section 7.4

Co-ordination Centres

7.4.1 On-Site Co-ordination

An onsite co-ordination centre will be deployed in the event of a major emergency for onsite operational support and command. This may be a dedicated vehicle, tent or an adjacent building that will accommodate all Principal Reponses Agencies.

7.4.2 Crisis Management Team

PRAs within Waterford City & County have identified the following locations as suitable Local Co-ordination Centres for strategic level co-ordination:

- Waterford City & County Council Civic Offices -City Hall
- Dungarvan fire station
- Alternative: Garda Station, Ballybricken.

These buildings have been chosen to facilitate the effective working of the Local Co-ordination Group and Local Authority Crisis Management Team. Strategic level co-ordination is more usually exercised at the Local Co-ordination Centre. All co-ordination centres will follow a generic model of operation. The generic centre illustrated below has the following characteristics.

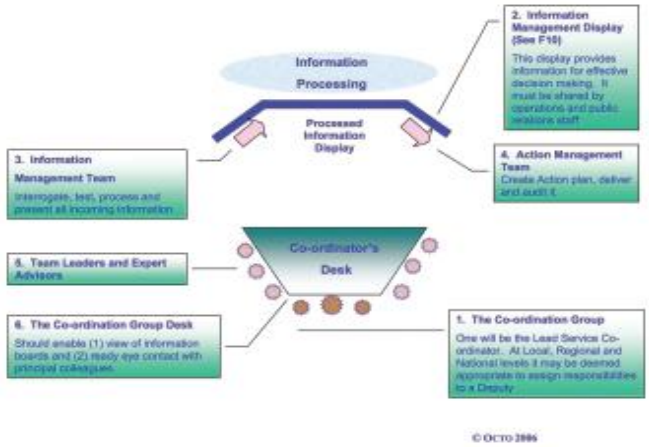


Figure 7: Generic Co-ordination Centre

Please refer to Section 6 of this document for further details.

7.4.3 Location of pre-determined Local Co-ordination Centres

The Co-ordination Centre will be established taking guidance from the document 'Guidance to setting up a Co-ordination Centre.'

7.4.4 Location of the predetermined Regional Co-ordination Centre(s)

The local co-ordination centres will have the capacity to act as a regional co-ordination centre, should the Major Emergency be scaled up to a regional level.

7.4.5 Information Management

The role of Information Manager will be assigned to senior management. The function of the information management team will be to interrogate, test, process and present all incoming information required for the decision making process.

- Action Management Officer / Team:

The function of this role is to assemble an Action Plan (from information that has come from the Information Management System) and ensure that it is communicated to all agencies responsible for delivering it, and to monitor / audit delivery, as well as reporting this back to the Co-ordination Group (a generic system which operates at all levels). At less complex incidents one Officer / Team may undertake both the information and action management functions. Where the demands of the Major Emergency require the appointment of a separate Action Management Officer, this person may be a representative from one of the agencies other than the lead agency.

- Team Leaders and Expert Advisors:

A range of specialist team leaders and expert advisers may be assigned permanent or temporary seats at the Co-ordination Group desk. They may themselves lead teams either at or remote from the centre. Generally they should advise or direct activity strictly within their mandate of Authorities. On occasion they may be invited to contribute to debate in a broader context. They need to be quite clear in which capacity they are acting at any juncture and adjust their perspective accordingly.

- Support Teams:

Each PRA should put support teams in place for key roles and should prepare Operational Protocols setting out the arrangements which will enable the agency's support to be mobilised and function in accordance with this MEP.

Section 7.5

Communications Facilities

7.5.1 Communications Systems

Waterford City & County Council relies on technical communication facilities to enable it to function and for different units to communicate, both at the site and between the site and its command, control or communications centre. Radio and other communications facilities are vital tools for the Local Authority.

- Civil Defence

The Civil Defence operate both mobile radio (VHF) for communication between vehicles and communication centres and hand-portable radio (UHF) for communication on site. A digital multi-line phone and fax service is also available at Civil Defence Headquarters.

- Fire Service

All front line appliances are equipped with radios and have the ability to communicate within the functional area of Waterford City & County. Also the fire service has hand held radios UHF available on all its appliances.

7.5.2 Inter-agency communication on site, including protocols and procedures

Communication systems serve command structures within services and it is neither necessary nor desirable that there is inter-agency radio communication at all levels. However, it is critical that robust arrangements for inter-agency communication on site(s) are provided for at Controller of Operations level as a minimum. For this purpose, the Civil Defence will bring a set of hand-portable radios, dedicated specifically to inter-agency communication, to the site.

7.5.3 Communications between site and coordination centres

All communication between the On-site Co-ordination centre and the Local Co-ordination centre shall pass between the Controller of Operations / On-site Co-ordinator to the Local Co-Ordination group, supported by the work of trained Information Management Officers at the scene and at the co-ordination centres. Communications between the site and the co-ordination centre will be facilitated by way of radio / phone system available to relevant personnel at the time.

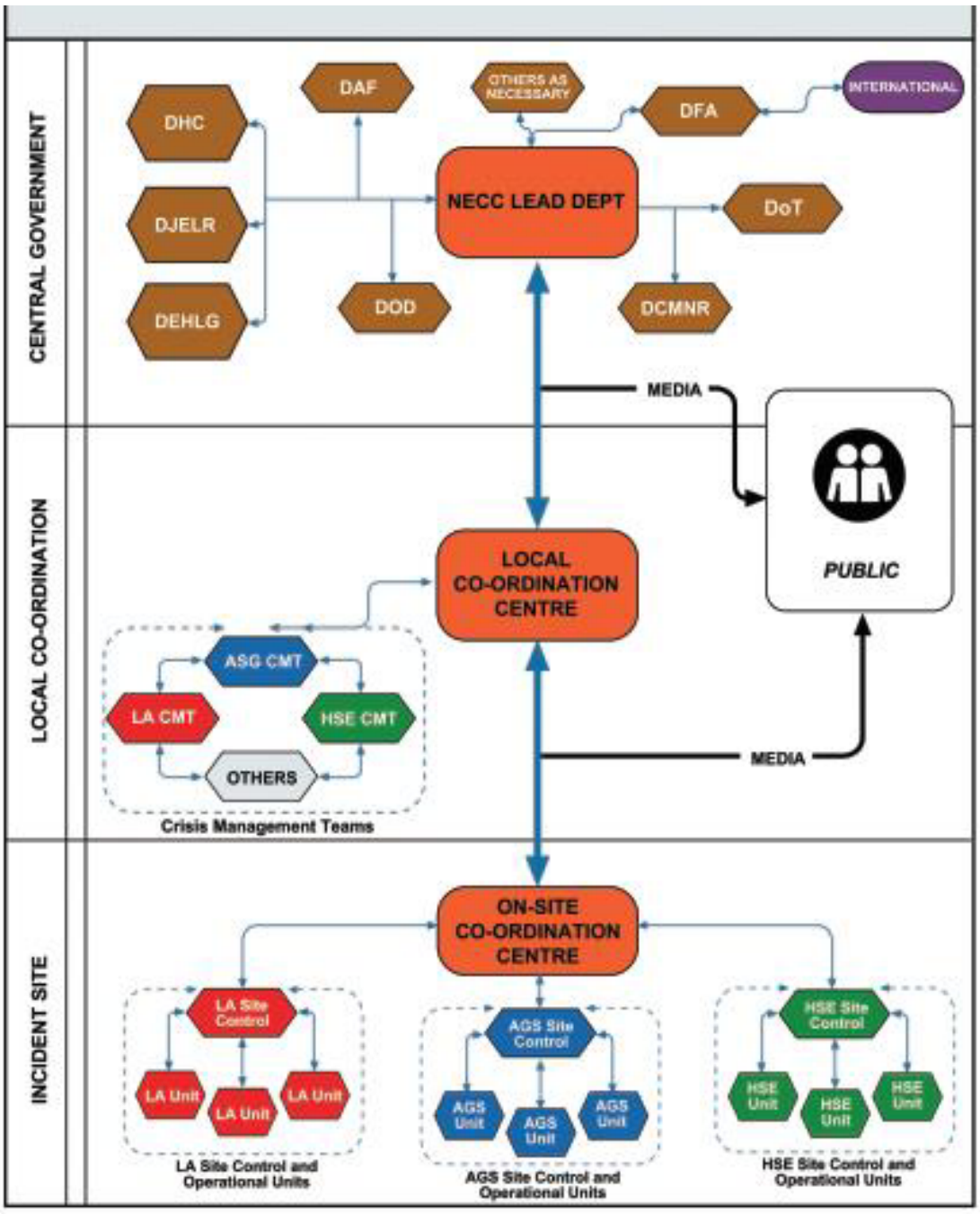


Figure 7.1: Communication

Section 7.6

Exercising the Lead Agency's Co-ordination Roles

7.6.1 Lead Agency

One of the three PRAs will be designated as the lead agency for any emergency and will assume responsibility for leading co-ordination. *See Section 6.3.1 of this Document.*

7.6.2 Review and transfer of the Lead Agency

The lead agency role may change over time, to reflect the changing circumstances of the major emergency. Ownership of the lead agency mantle should be reviewed at appropriate stages of the major emergency. All changes in lead agency designation emanating from the site, and the timing thereof, will be by agreement of the three Controllers of Operations, and should be recorded and communicated as per the initial determination, informing the Local Co-ordinating group. As the emphasis of operations may shift from the site to other areas, the Local Co-ordination Group may review the issue and determine a change in the lead agency, as appropriate.

7.6.3 Council's co-ordination function as a "Lead Agency"

In the event of Waterford City & County Council being assigned the lead agency role, it will be assigned the responsibility for the co-ordination function (in addition to its own functions) and it should lead all the co-ordination activity associated with the emergency both on-site and off-site, and make every effort to achieve a high level in co-ordination. The function of the lead agency for any emergency includes ensuring:

- involvement of the three PRAs and the principal emergency services in sharing information on the nature of the emergency situation;
- involvement of the range of organisations (other than PRAs) who may be requested to respond in co-ordination activities and arrangements;
- mandated co-ordination decisions are made promptly and communicated to all involved;
- site management issues are addressed and decided;
- public information messages and media briefings are co-ordinated and implemented;
- pre-arranged communications (technical) links are put in place and operating;
- operating the generic information management systems;
- ownership of the lead agency role is reviewed, and modified as appropriate;
- all aspects of the management of the incident are dealt with before the response is stood down;
- a report on the co-ordination function is prepared in respect of the emergency after it is closed down, and circulated (first as a draft) to the other services which attended.

Section 7.7

Public Information

7.7.1 Council's role in situations where warning arrangements are needed

There are circumstances when it may be necessary to protect members of the public who are in the vicinity of an emergency event. This protection is usually achieved by moving people temporarily to a safe area, by evacuation where appropriate or feasible, or by advising affected individuals to take shelter in an appropriate place. The On-Site Co-ordinator will take the decision on how best to protect a threatened population, after consultation with the other Controllers of Operations.
The Local Co-ordination Group should manage the task of co-ordinating the provision of information to the public as soon as it meets. This activity should be co-ordinated by the lead agency.

7.7.2 Public Notices

Early warning and special public notices shall be relayed in the event of an emergency. The Public can be kept informed by use of the following:

- Internet service, www.waterfordcouncil.ie ;
- Local broadcasters;
- Emergency helpline service.

On a national level the public shall be informed by use of the following;

- Television and Radio – arrangements exist whereby emergency announcements may be made on RTÉ television and radio channels.
- Television Text Services – not for emergency alerts, but useful for posting more information than would be communicable by emergency calls or broadcasts.

Please refer to a 'Guide to working with the Media' for further information. See Appendices for useful phone numbers.

Section 7.8

The Media

7.8.1 Arrangements for liaison with the media

The media will respond quickly to a large-scale incident and this media presence may extend into days or weeks. It is the responsibility of the lead agency to establish a Media Centre at or near the site of the emergency for use by the principal response agencies in dealing with the media at the site. The Local Co-ordination Group will be responsible for official media statements and press releases off-site. *Please refer to a 'Guide to working with the Media' for further information.*

7.8.2 Specify arrangements for media on-site

There shall be a media Liaison Officer appointed at both the Onsite and Local Co-ordination Centres.
The Media Liaison Officer must keep accurate and timely information on the emergency so that in consultation with the local Co-ordination Groups:

- He/She can be the point of contact for all media enquiries.
- He/She can answer information queries from the general public.
- He/She can obtain and provide information from/to Rest Centres, other agencies, press officers, local radio, press etc.
- He/She will be responsible for setting up an information helpline.

7.8.3 Arrangements for media at Local and / or Regional Co-ordination centres

The Local/Regional Co-ordination Group should take the lead in terms of working with the media, away from the site, during a major emergency. As with arrangements at the site, each principal response agency should designate a Media Liaison Officer at the Local Coordination Centre and the activities of the Media Liaison Officers should be co-ordinated by the Media Liaison Officer of the lead agency. All statements to the media at this level should be cleared with the chair of the Local/Regional Co-ordination Group.

7.8.4 Arrangements for media at, or adjacent to, other locations associated with the major emergency

In many situations media attention will move quickly away from the site to other locations, including the Local Co-ordination Centre, hospitals and mortuaries. The Local Co-ordination Group should take the lead in terms of working with the media, away from the site. As with arrangements at the site, each PRA should designate a Media Liaison Officer at the Local Coordination Centre and the activities of these officers should be co-ordinated by the Media Liaison Officer of the lead agency. All statements to the media at this level should be cleared with the chair of the Local Co-ordination Group.

Site Management Arrangements

7.9.1 Generic site management elements/arrangements

Waterford City & County Council shall appoint a Controller of Operations at the site (or at each site) of the emergency; *see section 6.2 of this document*. The initial important task of the Controller of Operations in association with the other two Controllers is the development of a Site Management Plan. Once agreed, the resulting site plan should be implemented and communicated to all responding groups.

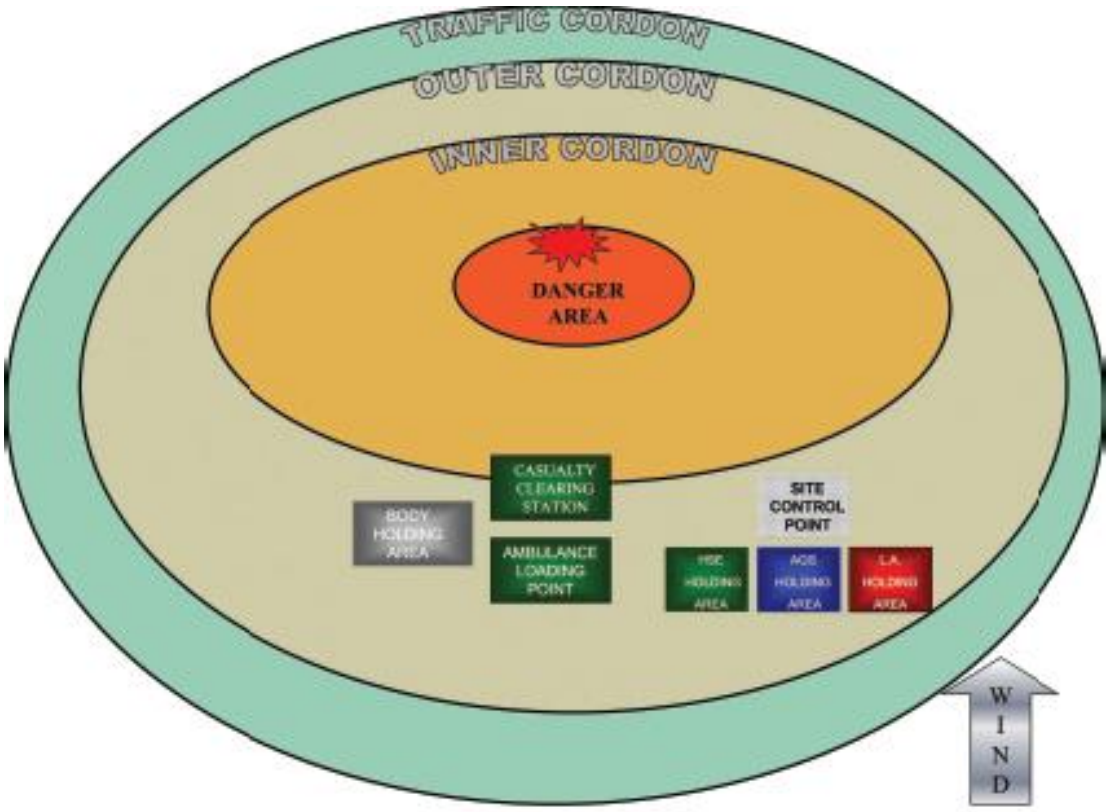


Figure 7.2: Idealised Scene Management Arrangements

The main components of a typical Site Plan should contain some or all of the following: *(See Appendices for detailed information on Scene Management)*

- Inner, Outer and Traffic Cordons;
- A Danger Area, if appropriate;
- Cordon and Danger Area Access Points;
- Rendezvous Point;
- Body Holding Area;
- Survivor Reception Centre;
- Friends and Relative Reception Centre;

- Site Access Routes;
- Holding Areas for the Different Services;
- Principal Response Agency Control Points;
- On-Site Co-ordination Centre;
- Media Centre.
- Ambulance Loading Area;
- Casualty Clearing Station;
- Site Control Point;

7.9.2 Control of access / identification of personnel and services of the Council

In order to control access to a Major Emergency site cordons will be established as quickly as possible at the site of a major emergency for the following reasons;

- to facilitate the operations of the emergency services and other agencies;
- to protect the public, by preventing access to dangerous areas; and
- to protect evidence and facilitate evidence recovery at the site.

Three cordons will be established. An Inner, Outer and Traffic Cordon, along with access cordon points.. This will be done by An Garda Síochána after a decision by, and agreement with, the On-site Co-Ordination Group.
A Danger Area may also be declared where there is a definite risk to rescue personnel, over and above that which would normally pertain at emergency operations.

➢ Identification of Personnel at the Site of a Major Emergency

All uniformed personnel, responding to the site of a major emergency, should wear the prescribed uniform, including high visibility and safety clothing, issued by their agency. The service markings on this clothing should be made known in advance to the other organisations that may be involved in the response.

Senior personnel who are acting in key roles, such as the On-Site Co-ordinator and the Controllers of Operations, should wear bibs designed and coordinated as follows:

Organisation	Bib Colour	Wording
Health Service Executive	Green and White Chequer	HSE Controller
Council	Red and White Chequer	Council Controller
An Garda Síochána	Blue and White Chequer	Garda Controller

When the lead agency has been determined, the On-Site Co-ordinator should don a distinctive bib with the words On-Site Co-ordinator clearly visible front and back.

Below is an example of how the bibs should look for each of the responding agencies.

- Non-Uniformed Personnel

Non uniformed personnel from Waterford City & County Council should attend the scene in high visibility jackets with the name Waterford City & County Council and their job function clearly displayed.

7.9.3 Air exclusion zones

Where the principal response agencies consider it appropriate and beneficial, the On-Site Co-ordinator may request, through An Garda Síochána, that an Air Exclusion Zone be declared around the emergency site by the Irish Aviation Authorities. When a restricted zone above and around the site is declared, it is promulgated by means of a "Notice to Airmen" - NOTAM - from the Irish Aviation Authorities.

Section 7.10

Mobilising Additional Resources

7.10.1 Specify the arrangements for mobilising organisations

The Voluntary Emergency Services sector can provide additional equipment and support in the event of a major emergency. Details of the local Voluntary Emergency Services, the resources they can provide and their mobilisation procedure is outlined in the Voluntary Emergency Services will link to the Principal Response Agencies in accordance with the table below.

Principal Response Agency	**Linked Voluntary Emergency Services**
An Garda Síochána	Irish Mountain Rescue Association Irish Cave Rescue Association Search and Rescue Dogs Sub-Aqua Teams River Rescue
Health Service Executive	Irish Red Cross Order of Malta Ambulance Corps St. John's Ambulance
Local Authority	Civil Defence

Each Principal Response Agency with a linked Voluntary Emergency Service is responsible for the mobilisation of that service and their integration into the overall response. The internal command of volunteer organisations resides with that organisation.

7.10.1.1 Mobilisation of Civil Defence

Please refer to section 4.4.1 of this document; details also given in the Appendices

7.10.1.2 Mobilisation of Defence Forces

Please refer to section 4.4.2 of this document; details also given in Appendices

7.10.1.3 Mobilisation of the Irish Red Cross

Please refer to section 4.4.3 of this document; details also given in Appendices

7.10.1.4 Mobilisation of Voluntary Emergency Services

Each Principal Response Agency with a linked Voluntary Emergency Service is responsible for the mobilisation of that service and their integration into the overall response. The internal command of volunteer organisations resides with that organisation

7.10.1.5 Mobilisation of Utilities

Utilities are frequently involved in the response to emergencies, usually to assist the principal response agencies in making situations safe. They may also be directly involved in restoring their own services, for example, electricity supply in the aftermath of a storm. Utilities operate under their own legislative and regulatory frameworks but, during the response to an emergency, it is important that they are involved in the co-ordination arrangements. Utilities may be requested to provide representatives and/or experts to the On-Site Co-ordination Group, the Local Coordination Group and/or the Regional Co-ordination Group, as appropriate. A list of utilities and their emergency/out of hours contact arrangements are listed in the *Appendices* *Please refer to section 4.4.6 of this document for further details.*

7.10.1.6 Mobilisation of Private Sector

Private sector organisations may be involved in a major emergency through ownership of the site where the emergency has occurred or through ownership of some element involved in the emergency e.g. an aircraft, bus, factory, etc. They may also be called on to assist in the response to a major emergency, by providing specialist services and/or equipment. Private sector representatives and/or experts may be requested to support the work of the On-Site Co-ordination Group, the Local Co-ordination Group and/or the Regional Co-ordination Group, as appropriate. A list of experts and equipment within the private sector is detailed in the *Appendices* .

7.10.2 Arrangements for identifying and mobilising additional organisations

The Local Authority Controller of Operations should ensure that, where the resources of the authority do not appear to be sufficient to bring a situation under control, or the duration of an incident is expected to be extended, the levels, types and duration of assistance/ support are identified, and that the request for support is passed to either the authority's Crisis Management Team or the Local Co-ordination Centre who will arrange to obtain the support via mutual aid arrangements with neighbouring authorities.
Where resources that are held at a national level are required, as part of the management of the incident, requests for those resources should be directed by the lead agency to the Lead Government Department.

7.10.3 Arrangements for liaison with utilities

Please refer to section 4.6 of this document; details also given in the *Appendices.*

7.10.4 Arrangements for integration of casual volunteers as appropriate

Please refer to section 4.4.5 of this document.

7.10.5 Arrangements for command, control, co-ordination and demobilisation of organisations mobilised to the site

Each Principal Response Agency with a linked Voluntary Emergency Services/Organisation is responsible for the mobilisation of that service and their disintegration into the overall response. The internal command of the organisations resides with that organisation.
Please refer to section 4.4.1 through 4.4.7 and section 7.10.1 of this document.

7.10.6 Mutual aid arrangements

Please refer to section 4.5 of this document.

7.10.7 Requests for out-of-region assistance

The decision to seek assistance from outside the region will be made by the lead agency, in association with the other principal response agencies, at the Local/Regional Coordination Centre. *Please refer to section 4.7 of this document.*

7.10.8 Requests for international assistance

A Regional Co-ordination Group may also request assistance from Government. National resources will be available in the event of a major emergency at local or regional level. Requests for assistance should be developed at local or regional co-ordination level and directed by the lead agency to the lead Government Department. *Please refer to section 4.7 of this document.*

Section 7.11

Casualty and Survivor Arrangements

7.11.1 General

The primary objective of any response to a major emergency is to provide effective arrangements for the rescue, care, treatment and rehabilitation of all of the individuals who are affected by the emergency. These individuals may be divided into two main categories as follows: Casualties, including persons who are killed or injured, and Survivors. Survivors will include all those individuals who are caught up in an emergency but not injured, such as, uninjured passengers from a transport accident or evacuees.
As well as making provision for casualties and survivors, the principal response agencies should also make arrangements for the reception, facilitation and support of the friends and relatives of some or all of these individuals.
Please refer to a 'Guide to dealing with Mass Casualties', 'Guide to setting up a friends and relative centre', 'Guide to setting up a Survival Reception Centre', for further information.

7.11.1.1 Casualties and Survivors and the Local Authority's role.

The On-Site Co-ordinator, in association with the other Controllers, will need to make an early assessment of the casualty situation and identify if there are particular aspects which may impact on casualty management, such as, significant numbers of disabled, sick or immobile persons involved, and take action accordingly.
Individuals may be divided into two main categories as follows:

- Casualties, including persons who are killed or injured,
- Survivors. These include all those individuals who are caught up in an emergency but not injured, such as, uninjured passengers from a transport accident or evacuees.

7.11.2 Injured

At the site of a major emergency, the priorities of the principal response services are to save life, prevent further injury, rescue those who are trapped or in danger, triage casualties, provide them with appropriate treatment and transport them to the appropriate hospital(s) where necessary.

7.11.2.1 Arrangements for the triage

Triage is a dynamic process of assessing casualties and deciding the priority of their treatment, using a two-stage process of triage sieve and triage sort. Following initial triage, casualties will normally be labelled, using Triage Cards, and moved to a Casualty

Clearing Station. The purpose of this labelling is to indicate the triage category of the casualty, to facilitate the changing of that category, if required, and to record any treatment, procedure or medication administered. A standard card with Red (Immediate), Yellow (Urgent), Green (Delayed) and White (Dead) sections is normally used for this purpose.

7.11.2.2 Transporting lightly injured and uninjured persons from the site

It should be noted that while some casualties will be transported to the Receiving Hospital(s) by the Ambulance Service with assistance from the Local Authority, some casualties may leave the site by other means and may arrive at the designated Receiving Hospital(s), or other hospitals, in cars, buses, etc.

7.11.2.3 Casualty Clearing

Patients must be moved to the Casualty clearing station. The Casualty clearing station will be established by the ambulance service, in consultation with the Health Service Executive. At this location the casualties are collected, further triaged, treated, as necessary, and prepared for transport to hospital. The Health Service Executive Controller will, in consultation with the Site Medical Officer and the designated receiving hospitals, decide on the hospital destination of casualties.

7.11.3 Fatalities

The bodies of casualties, which have been triaged as dead, should not be moved from the incident site unless this is necessary to affect the rescue of other casualties. The only other circumstance where bodies should be moved, before the Garda evidence collection process is complete, is if they are likely to be lost or damaged due to their location or the nature of the incident.
Bodies to be moved should be photographed first and their original position clearly marked and recorded. The recovery of the dead and human remains is part of an evidence recovery process and, as such, is the responsibility of An Garda Síochána acting as agents of the Coroner. The Local Authority can assist An Garda Síochána in this function. *The Mass Fatality Plan will be available on the website 'MEM.ie' when it is available..*

7.11.3.1 Coroners role

The Coroner is an independent judicial officer, who has responsibility for investigating all sudden, unexplained, violent or unnatural deaths. It is the task of the Coroner to establish the 'who, when, where and how' of unexplained death. All such deaths in Ireland are investigated under the Coroners' Act, 1962. *The Mass Fatality Plan will be available on the website 'MEM.ie' when it is issued.*

7.11.3.2 Arrangements for dealing with fatalities, both on and off-site, including Body Holding Areas and Temporary Mortuaries

The On-Site Co-ordinator, in association with the other Controllers, will decide if it is necessary to establish a Body Holding Area at the site. The Body Holding Area, if established, should be situated close to the Casualty Clearing Station. Members of An Garda Síochána will staff this area and they will maintain the necessary logs to ensure the continuity of evidence.
It should be noted that the Body Holding Area is not the appropriate place for the prolonged storage of the dead and appropriate arrangements should be made to ensure minimal delay in moving bodies to a mortuary (temporary or otherwise).

- Temporary Mortuaries

It is the responsibility of the Local Authorities to provide a Temporary Mortuary, if required in consultation with the coroner.
The likely commissioning time for a Temporary Mortuary is of the order of twenty-four hours, and this may extend to forty-eight hours when victim numbers are extensive. It should be noted that a Temporary Mortuary might be required to operate for weeks or months after an incident. *The Mass Fatality Plan will be available on the website 'MEM.ie' when it is issued.*

7.11.3.3 Identification of the deceased

The Coroner, with the assistance of An Garda Síochána, has overall responsibility for the identification of bodies and remains and s/he is entitled to exclusive possession and control of a deceased person until the facts about their death have been established. A full post-mortem and forensic examination will be carried out on every body from a major emergency and each death will be the subject of an Inquest. The post-mortem is carried out by a Pathologist, who acts as the 'Coroners Agent' for this purpose.

7.11.4 Survivors

A Survivor Reception Centre should be designated and established at the earliest possible opportunity. Transport from the Survivor Reception Centre to home/meet relatives/safe place will be arranged as soon as it is practicable. This responsibility will lie with Waterford City & County Council. *Please refer to 'Guide to setting up a Survival Reception Centre' for further information.*

7.11.4.1 Arrangements for dealing with uninjured survivors who require support

A Survivor Reception Centre should be designated and established at the earliest possible opportunity. The On-Site Co-ordinator, in conjunction with the other Controllers, should determine if such a centre is to be established, and its location in the site management plan. It is the responsibility of Waterford City & County Council to establish and run this centre.
Waterford City & County Council has identified the following as suitable buildings for setting up a survivor centre:

- Recreation Centre
- Local School
- Parish Hall
- Any other building that is large enough to accommodate large amounts of people.

All those who have survived the incident uninjured can be directed to the Survivor Centre, where their details will be documented and collated by An Garda Síochána. Provision should be made at this centre for the immediate physical and psychosocial needs of survivors (e.g. hot drinks, food, blankets, telephones, first aid for minor injuries, etc.).
The assistance of Civil Defence and the voluntary ambulance services may be required to provide a variety of services at the Survivor Reception Centre. The Survivor Reception Centre should be secure from any unauthorised access and provide the maximum possible privacy for survivors. *Please refer to 'Guide to setting up a Survival Reception Centre', for further information.*

7.11.5 Casualty Information

Gathering of casualty information will be the responsibility of An Garda Síochána.

7.11.5.1 The Casualty Bureau operated by An Garda Síochána

In the event of a major emergency involving significant numbers of casualties, An Garda Síochána will establish a Casualty Bureau to collect and collate the details (including condition and location) of all casualties and survivors. The release of the dedicated Casualty Bureau number will be done via the media through the Garda Press Office in conjunction with the Casualty Bureau Supervisor and Senior Officer in Charge of the incident. Closure of the Casualty Bureau will take place after consultation between the Casualty Bureau Supervisor and the Senior Garda Officer in charge of the incident and the Inspector in charge of Garda Communications Centre, Harcourt Square.

7.11.5.2 Casualty information

To facilitate this, the Casualty Bureau, a liaison/casualty officer will normally be sent by An Garda Síochána to each hospital, survivor reception centre and casualty reception centre where casualties are being treated. The local Authority may assist in the collection and collation of casualty data. This information may then be used to provide to family and friends. Any information collected on any casualty is transferred via An Garda Síochána to the Casualty Bureau, who will generally set up an information hot line, in order that concerned family and friends may inquire about 'loved ones.'

7.11.6 Friends and Relatives Reception Centres

The purpose of a reception centre is to provide a comfortable area where friends and relatives of those involved in the incident (primarily the casualties and survivors) can be

directed for information. The Local Co-ordination Group will determine the need for and arrange for the designation and operation/staffing of such centres.
A building used as a Friends' and Relatives' Reception Centre should be secure from media intrusion and contain sufficient room to afford privacy to families receiving information about relatives. There will also be a need for a reliable process to establish the credentials of friends and relatives. *Please refer to a 'Guide to setting up a friends and relative centre' for further information.*

7.11.6.1 How friends and relatives of casualties are to be provided for

A reception centre is to provide a comfortable area where friends and relatives of those involved in the incident (primarily the casualties and survivors) can be directed for information. *See section 7.11.6. Please refer to a 'Guide to setting up a friends and relative centre' for further information.*

7.11.7 Non-National Casualties

In some incidents an emergency may involve significant numbers of casualties from other jurisdictions. In such circumstances the Local Co-ordination Centre should notify the relevant embassy if the nationality of the victims is known. The Department of Justice should be approached if assistance is required in obtaining interpreters from private sector providers. The Department of Foreign Affairs (which operates an out of hours Duty Officer System) should also be approached for appropriate assistance and liaison purposes.

7.11.7.1 Foreign language communication resources

Advice may be sought from An Garda Síochána as to the use of interpreters. Generally the local Garda Station will have a list of approved interpreters which may be called upon in the event of an emergency. Advice may also be sought from the Department of Foreign Affairs.

7.11.8 Pastoral and Psychosocial Care

The On-Site Co-ordinator will ensure that, where appropriate, pastoral services are mobilised to the site and facilitated by the PRAs in their work with casualties and survivors. Similarly, individual services should make arrangements for necessary pastoral services at any other locations associated with the emergency, such as hospitals.

7.11.8.1 Responsibility of Pastoral and Psychosocial support arrangements

Pastoral and psycho-social support arrangements for casualties and other affected members of the public are the responsibility of the Health Service Executive. Requests for such care can be made through a HSE crisis management team, which will then make the appropriate arrangements.

Section 7.12

Emergencies involving Hazardous Materials

7.12.1 Arrangements for dealing with major Hazardous Materials incidents

The Local Authority is the lead agency for response to hazardous materials incidents, with the exception of those involving biological agents. Where terrorist involvement is suspected, An Garda Síochána will act as the lead agency. The Defence Forces, when requested, will assist An Garda Síochána in an Aid to the Civil Power role with Explosive Ordnance Disposal teams. Details of specific actions to be taken in the event of a CCBRN incident are contained in the Protocol for Multi-Agency Response to Suspect Chemical and Biological Agents arising from terrorist activity.

7.12.2 CCBRN incidents

Details of specific actions to be taken in the event of a CCBRN (*CCBRN meaning terrorist incidents involving C - conventional explosives; C - chemical substances; B - biological agents; R - radiological and N - nuclear material)* incident are detailed in the Protocol for Multi-Agency Response to Suspect Chemical and Biological Agents (in Draft). These protocols deal with a range of matters relevant to managing such incidents, including the identification of the materials involved. They also provide for involvement of the National Poisons Information Centre and the National Virus Reference Laboratory.
Where terrorist involvement is suspected, An Garda Síochána will act as the lead agency.

7.12.3 Biological incidents

Details of specific actions to be taken in the event of a biological incident are detailed in the Protocol for Multi-Agency Response to Suspect Chemical and Biological Agents (in Draft).

7.12.4 National Public Health (Infectious diseases) Plan

For infectious diseases such as Avian Flu, Pandemic Flu, Foot and Mouth there will be a link to the National Plan as outlined by the government. Waterford City & County Council will provide assistance under the command of the lead government department.

7.12.5 Nuclear Accidents

Details of specific actions to be taken in the event of a local radiological emergency or the activation of the National Emergency Plan for Nuclear Accidents are detailed in the Protocol for Multi-Agency Response to Radiological/ Nuclear Emergencies (in Draft)

7.12.6 Decontamination

The On-Site Co-ordinator, in association with the other Controllers of Operations, will establish the need for decontamination. The Health Service Executive has responsibility for providing clinical decontamination and medical treatment to casualties affected by hazardous materials. The Fire Services have responsibility for providing other forms of physical decontamination of persons at the site. The Health Service Executive will be responsible for decontamination where required to protect health service facilities, such as hospitals, from secondary contamination.

Where emergency decontamination of the public is required, the Local Authority Fire Service may use its fire-fighter decontamination facilities, or improvised equipment may be used prior to the arrival of dedicated equipment. Where it is decided that persons should undergo this practice, it should be carried out under the guidance of medical personnel. It should be noted that emergency decontamination carries risks for vulnerable groups, such as the elderly and the injured. It may be more appropriate in certain circumstances for outer clothing to be removed and blankets provided as a temporary measure to alleviate potential harm through surface contact with contaminants.

Section 7.13

Protecting Threatened Populations

7.13.1 Threatened Population

The On-Site Co-ordinator will take the decision on how best to protect a threatened population, after consultation with the other Controllers of Operations This protection is usually achieved by moving people temporarily to a safe area, by evacuation where appropriate or feasible, or by advising affected individuals to take shelter in an appropriate place.

7.13.2 Evacuation arrangements

The On-Site Co-ordinator will take the decision on how best to protect a threatened population, after consultation with the other Controllers of Operations. Evacuation is usually undertaken on the advice of the Local Authority or Health Service Executive. Where decided upon, the process of evacuation will be undertaken by An Garda Síochána, with the assistance of the other services. In some circumstances, personnel from all services may have to assist in carrying it out. A suitable evacuation assembly point will need to be established and rest centres set up by the Waterford City & County Council.

Personnel from the local authority and from voluntary agencies will staff rest centres. The centres will provide security, welfare, communication, catering and medical facilities. Evacuees should be documented and basic details passed to the casualty bureau. The Local Authority will assist in this role.

Temporary Accommodation may also be required.

Please see sections 7.1 and 7.17.3 for further details on evacuee welfare; also refer to 'A Guidance to Mass Evacuation'.

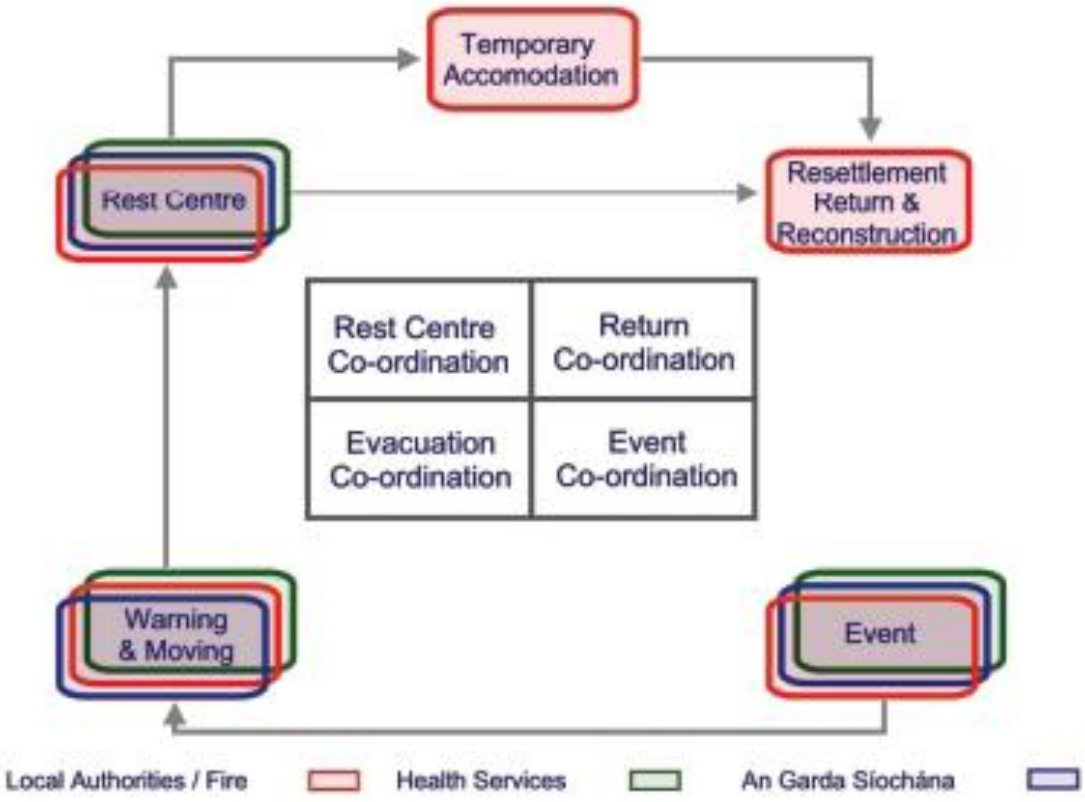


Figure 7.2: Structure of Evacuation

7.13.3 Arrangements for the involvement of The Public Health Service

Where an emergency results in a real or perceived threat to public health by, for example, the release of chemical, radioactive or biological agents, the contamination of water or food supplies, or the spread of contaminated flood water, it can be anticipated that there will be considerable concern among both the persons immediately affected and the wider public. In such situations, the Health Service Executive Controller should ensure that the local public health services are informed of the situation as soon as possible so that they can become involved in the response at the earliest possible stage.

Section 7.14

Early and Public Warning Systems

7.14.1 Monitoring potentially hazardous situations

Early warning systems are currently set in place for Severe Weather forecasts. This is a 24 hour service provided by Met Éireann. There may be a need to inform the public of the current situation or of possible evacuation. *Please refer to Section 11.1 of this document.*
Other such warning systems are in place for Flooding, detailed in the Flood Response Plan, Water contamination etc.

7.14.2 How warnings are to be disseminated.

Warnings may be disseminated to the public by use of some or all of the following mediums:

- Door to Door
- Radio and T.V. broadcasting
- Local helpline / information line
- Web services and internet services
- Automated Text services
- Social Media
- Establish site specific warning systems.

Section 7.15

Emergencies arising on Inland Waterways

7.15.1 Liaison with the Irish Coast Guard

Waterford City & County Council can provide assistance in the form of the Fire Service for water rescue / recovery. There are also some inland water rescue volunteer organisations that may be asked to provide assistance such as River Rescue. *Please refer to the Appendices for further details on resources.*

7.15.2 Receiving 999/112 calls and the mobilising of resources to inland waterway emergencies

The Irish Coast Guard has responsibility for receiving 999/112 calls and the mobilising of resources to Inland Waterway emergencies. An Garda Síochána should be the principal response agency to undertake initial co-ordination at inland waterway emergencies. After the initial response, this role may be re-assigned, following consultation between the Irish Coast Guard and An Garda Síochána.

Section 7.16

Safety, Health and Welfare Considerations

7.16.1 Safety, health and welfare of its staff

Each principal response agency (and other responding organisation) is responsible for the Safety, Health and Welfare of its staff responding to emergencies and should operate its own safety (including personal protective equipment) and welfare management procedures. *Please refer to a 'Local Authority Organisational Safety Statement' for further information.*

7.16.2 Safety of the Council's rescue personnel

When working in the environment of a Major Emergency the On-Site Co-ordinator will apply normal incident and safety management arrangements, a 'Safety Officer' will generally be appointed having responsibility for the oversight and management of the safety of the Council's rescue personnel. All other relevant officers will continue to exercise command over their own personnel working in the area.

7.16.3 Operating within the 'Danger Area'

A 'Danger Area' may be declared at the site where there is a definite risk to rescue personnel over and above that which would normally pertain at emergency operations. The Council is responsible for the health and safety of its staff when they operate within the 'Danger Area'.
Each service should establish from the On-Site Co-ordinator if a Danger Area has been defined (*see Section 7.9.1 of this document*) as part of site management arrangements and, if so, what particular safety provisions may apply.

7.16.4 Procedures and evacuation signal for the 'Danger Area'.

Where a situation deteriorates to a point where the officer in charge of the Danger Area decides that it is necessary to withdraw response personnel from a Danger Area, a signal, comprising of a repeated sounding of a siren for ten seconds on, ten seconds off, will be given. All personnel should withdraw on hearing this signal to a pre-determined safe zone.

7.16.5 Physical welfare of responders (food, shelter, toilets)

Please refer to section 7.17.3 of this document.

7.16.6 Psychosocial support for personnel.

Those who are particularly traumatized by the events of a Major Emergency may require skilled professional help; this will be provided by Waterford City & County Council. Currently a careline exists which enables employees and their immediate family to access confidential advice and support 24 hours a day 365 days a year. This type of service ensures confidentiality and overcomes the cultural resistance in the emergency services to such a step. These facilities should also be made available to support staff, even if they are not directly involved at the scene, e.g. administration staff, drivers and communications staff.

Section 7.17

Logistical Issues/ Protracted Incidents

7.17.1 Arrangements for rotation of front line rescue / field staff

Front line rescue / field staff will be relieved at protracted incidents in accordance with the Local Authority Safety, Health and Welfare arrangements. Crews from the South-East region may be called upon to assist and support the emergency.

7.17.2 Re-organising normal emergency and other services cover

Staff welfare arrangements need to be given priority in the recovery stage of an incident, so that the needs of all staff, both emergency response teams and general staff (including management), are catered for. In addition, the needs of staff that are not directly involved in responding to the incident should also be considered. Those members of staff who continue in their normal work are supporting colleagues in the emergency response and may be taking on additional work in the process. They can be as critical to the organisation's response as those involved at the 'coalface'.

7.17.3 Arrangements for initial and ongoing welfare for field staff

The Local Authority Controller should ensure that appropriate rest and refreshment facilities are provided for response personnel at the site, as well as for survivors. Staff welfare will be considered at all times. Civil Defence may be called upon to provide or aid in the administration of such needs. Welfare facilities such as toilets etc may also be required and supplied by Waterford City & County Council. The Local Authority will strive and endeavour to provide meals at all meal times to field staff or every 4/5 hours during an incident.

Section 7.18

Investigations

7.18.1 Investigations arising from the emergency

The scene of a suspected crime should be preserved until a complete and thorough examination has been made. An Garda Síochána will need to obtain evidence of the highest possible standard and will require that all evidence is left in situ, unless a threat to life or health prevents this. Statements may be required from the members of Local Authority staff on their involvement.

7.18.2 Preservation of evidence

The preservation of the site of a major emergency, which results from criminal action, is of paramount importance and should receive a priority rating from the outset by all PRA's. The first member(s) of An Garda Síochána to arrive at the site of a major emergency where a suspected crime has been committed, automatically incurs the responsibility of preserving the site. While the priority is the protection of life, the provisions of the Framework are intended to assist An Garda Síochána investigative role.

7.18.3 Other parties with statutory investigation roles

Depending on the nature of the Major Emergency, agencies other than An Garda Síochána may require access to the site for the purposes of carrying out an investigation. These agencies include the Health and Safety Authority (HSA), the Air Accident Investigation Unit (AAIU), Environmental Protection Agency (EPA) and Irish Rail. An Garda Síochána is responsible for carrying out criminal investigations.
Any agency including the Local Authority, with an investigative mandate should liaise in the first instance with the On-Site Co-ordinator, who will direct them to the Controller of Operations of An Garda Síochána.

Section 7.19

Community / VIPs / Observers

7.19.1 How links are to be established with communities affected by an emergency

Where communities are affected by a major emergency effort should be made to establish contacts/links with a community utilising established links such as Community Groups/ Public Repetitive and Community Liaison Officers within in the community.

7.19.2 Arrangements for receiving VIPs who wish to visit

All requests for visits to the site or facilities associated with it should be referred to the Local Co-ordination Group. Requests for visits to agency specific locations should be referred to the Local Authority management. Public representatives and other dignitaries may wish to attend the site of the emergency, as well as associated facilities, such as hospitals, to express sympathy on behalf of the public to the injured and bereaved, and to support the emergency response workers.
Visits by dignitaries will usually require security arrangements and liaison with the media. It is important that the organisation of such visits does not distract from the response effort. As a general rule, VIPs should be advised not to visit sites where dangers still exist or where ongoing rescues are in progress.

7.19.3 Arrangements for national / international observers

National and International observers may request to attend the incident. The presence of experts from other regions or jurisdictions, who wish to act as observers at an incident, can greatly enhance the operational debriefings and facilitate the process of learning lessons from the emergency. The Local Co-ordination Group should make arrangements for any such observers.

Section 7.20

Standing-Down the Major Emergency

7.20.1 How the status of the emergency will be stood-down

A decision to stand down the major emergency status of the incident at the site should be taken by the On-Site Co-ordinator, in consultation with the other Controllers of Operations at the site and the Local Co-ordination Group. Where organisations other than the principal response agencies have responded, they should be informed of the decision to stand them down by the Controller of Operations of the agency which mobilised them. Services operating at other locations should be stood down in a similar manner.
The plan may be stood down generally following agreement by the three principal response agencies responding to the emergency or in respect of all or certain local authority services, following consultation with the other principal response agencies.

7.20.2 Operational debriefing and reporting of activity

When the incident has ended, each agency will be obliged to give a debrief to the members of its service that were involved in the emergency. Waterford City & County Council will review the inter-agency co-ordination aspects of the response after every declaration of a major emergency.
A multi-agency debrief will then be held and lessons learned will be incorporated into this Plan. This review should be hosted by the lead agency and involve all services which were part of the response.
Multi-agency debriefs should consider the contribution provided by other, non-emergency service agencies to expand the knowledge and learning process that debriefs should collate. This is notwithstanding the potential conflict of interest that may result in later investigations. This aspect should be considered when inviting agencies other than emergency services to the debrief.

Operational debriefs should identify areas for improvement in procedures, equipment and systems. They should not be forums for criticising the performance of others.
Debriefs should not interfere with or comment on investigations into the incident carried out by investigative or judicial authorities. It is important to realise that such debriefs and related documents would be disclosed to individuals involved in legal proceedings.

Section 8

Agency Specific Elements and Sub-Plans

When planning and preparing for a major emergency it is important that the Major Emergency Plan ties in with existing plans such as Waterford City & County's Flood Response Plan and Severe Weather Plan, *See Appendices. Please refer to 'A Guide to Agency Specific Plan Interoperability' for further details.*

- Plan for the Protection of Public Water Supply
- Drinking Water Incident Management Plan' (DWIRP) (Draft)

Section 9

Plan for Regional Level Co-ordination

9.1 Regional Level Co-ordination

In some situations where a major emergency has been declared and the Major Emergency Plans of the principal response agencies have been activated, it may be appropriate to consider scaling up from a local response to a regional level response. This may occur when:

- the resources available in the local area where the incident has happened do not appear to be sufficient to bring the situation under control in an expeditious and efficient manner; or
- the consequences of the emergency are likely to impact significantly outside of the local area; or
- the incident(s) is spread across more than one Local Authority or Division of An Garda Síochána; or
- the incident occurs at or close to a boundary of several of the principal response agencies.

9.2.1 Decision to Scale up to a Regional Level Response

The decision to scale up from a local to a regional level response will be taken by the chair of the Local Co-ordination Group, in consultation with the chair of the On-Site Co-ordinating Group and the other members of the Local Co-ordination Group. This consultation may occur at a meeting of the Local Co-ordination Group, where such a group is in session or, alternatively, by means of a telephone conference call.
This decision will, by definition, involve specifying those extra principal response agencies which are to be involved in the regional response.

Note: In many Major Emergency situations, neighbouring Garda Divisions, HSE Areas and Council will provide support and resources to the Garda Division, HSE Area and Local Authority, which are primarily involved in the response. Such support is not equivalent to the activation of the Plan for Regional Level Co-ordination and, in fact, will often precede the activation of the regional plan.

9.2.2 Response Region

The areas covered by the principal response agencies which are activated under the Plan for Regional Level Co-ordination will constitute the response region for the emergency.

Note: The response region for a regional level major emergency need not coincide (and in many cases will not coincide) with one of the predetermined Major Emergency Management Regions set out in Appendix F4 of the Framework.

9.2.3 Activation

Once the decision has been taken, the chair of the Local Co-ordination Group will declare that a regional level emergency exists and will activate the Plan for Regional Level Co-ordination by:

- notifying each of the principal response agencies involved that the Plan for Regional Level Co-ordination has been activated;
- requesting that each of the principal response agencies, who has not already activated its MEM Plan, should do so;
- delivering an information message to each principal response agency using the mnemonic METHANE; and
- providing each of the principal response agencies involved with a list of the agencies which are being activated to form the regional response.

9.3.1 Command and Control Arrangements on Site

The command and control arrangements at the site(s) of a regional major emergency will be the same as those for a standard major emergency including:

- three Controllers of Operation[2];
- a lead agency determined in accordance with the Framework; and
- an On-Site Co-ordinating Group
- an On-Site Co-ordinator.

[2]In situations where more than one principal response agency from a particular service is represented at the site, Appendix F7 makes it clear that there will be only one Controller of Operations from that service and the unit from which the Controller of Operations will come should be determined in accordance with the guidance provided in Appendix F7.

9.3.2 The Regional Co-ordination Group

The mobilisation and operation of the Regional Co-ordination Group will be as per the arrangement for Local Co-ordination Groups set out in Section 5.4.5.2 of the Framework.

Regional Co-ordination Group arrangements for

- the mobilisation of other organisations/agencies;
- requesting mutual aid from neighbours;
- requesting national/international assistance where required;
- dealing with multi site or wide area emergencies;
- linkage to national emergency plans;
- links with Government;
- support for chairs by Information Managers, etc; and
- communication arrangements with the site and with other groups

will be as for a Local Co-ordination Group.

9.4 Wide Area Major Emergencies

Some major emergency events (e.g. severe storms, extensive flooding and/or blizzards) may impact over a wide area and, in such a situation, a number of Local Co-ordination Groups may be activated. Where the chair of a Local Co-ordination Group, which has been activated in response to a major emergency, becomes aware that one or more other Local Co-ordination Groups have also been activated, contact should be made with the other chair(s) with a view to considering the establishment of a Regional Co-ordination Centre.

Such a Regional Co-ordination Centre will normally be located at the Local Co-ordination Centre which, in the view of the chairs, is best positioned (in terms of resources, communications and geography) to co-ordinate the activity of the different Local Co-ordination Groups which are active. In such a situation, these Local Co-ordination Groups will continue to act as per standard arrangements and will communicate with the Regional Co-ordination Centre through their chairs.

Note: During a wide area major emergency, each Local Co-ordination Group will be in contact with the lead Government Department (in accordance with Section 5.4.5.5 of the Framework) and, in such a situation, the decision on whether the activities of a number of Local Co-ordination Groups should be co-ordinated via a Regional Co-ordination Centre or via the lead Government Department will be taken in light of the prevailing circumstances.

Section 10

Links with National Emergency Plans

10.1 National Emergency Plans:

Each principal response agency should provide for working with appropriate national bodies and responding to and activating appropriate aspects of their Major Emergency Plan following requests arising from national emergency situations. *Please refer to section 6.3.4.4/ 6.3.4.5 of this document for further details.*

10.1.1 National Emergency Plan for Nuclear Accidents

Details of specific actions to be taken in the event of a local radiological emergency or the activation of the National Emergency Plan for Nuclear Accidents are detailed in the Protocol for Multi-Agency Response to Radiological/ Nuclear Emergencies (in Draft).

10.1.2 National Public Health (Infectious Diseases) Plan

Details of specific actions to be taken in the event of an activation of the National Public Health (Infectious Diseases) Plan are detailed in the Protocol for Multi-Agency Response to Emergencies arising from Infectious Diseases Pandemics (in Draft).

10.1.3 Animal Health Plan

For infectious diseases such as Avian Flu (the Department of Agriculture and Food has an emergency plan designed to contain outbreaks of H5N1 avian influenza in poultry should the disease arrive in this country), Pandemic Flu, Foot and Mouth, there will be a link to the National Plan as outlined by the government. Waterford City & County Council will provide assistance under the command of the lead government department.

10.2 Activation on request from Irish Coast Guard

The Waterford City & County Major Emergency Plan may also be activated by any Principal Response Agency in response to a request from the Irish Coast Guard, following a threatened or actual emergency in the Irish Maritime Search and Rescue Region.

10.3 Activation on request from a Minister of Government

The Major Emergency Plans of the principal response agencies may be activated by an agency in response to a request from a Minister of Government in light of an emergency/crisis situation.

Section 11

Severe Weather Plans

11.1 Sub-Plans for responding to severe weather emergencies

Severe weather emergencies may involve significant threats to infrastructure and support may be required for vulnerable sections of the community. It has been pre-determined that Local Authorities are the lead agency for co-ordinating the response to severe weather events.

Arrangements have also been put in place by Met Éireann to issue public service severe weather warnings to the Local Authorities. The target time for the issuing of a warning is 24 hours before the start of the event, but a warning may be issued up to 48 hours in advance when confidence is high. On Fridays before a holiday period it may be appropriate to issue a preliminary warning or weather watch to Local Authorities.

Not all severe weather events will be major emergencies, but the principles and arrangements for a co-ordinated response to major emergencies should inform all response agencies of severe weather events. Local Authorities should ensure that effective arrangements are in place to receive and respond promptly to public service severe weather warnings issued by Met Éireann.

The Local and/or Regional Co-ordination Centres for Major Emergency Management may be activated to manage the response to a severe weather event, whether a major emergency is declared or not.

11.1.1 Flooding Emergencies

Waterford City & County Council in conjunction with a multi-agency collaboration are in the process of producing a 'Flood Response Plan.'

11.1.2 Severe Weather Conditions (Excluding Flooding Emergencies)

Waterford City & County Council are in the process of producing a 'Emergency Plan for Severe Weather.'

Section 12

Site and Event Specific Arrangements and Plans

12.1 Site and Event Specific Emergency Plans

There are both legislative and procedural arrangements, which require that emergency plans be prepared for specific sites or events (e.g. SEVESO sites, airports, ports, major sports events, etc). Arising from the risk assessment process described in *Section 3*, Waterford City & County Council's Major Emergency Plan has not identified any sites/events where specific plans/ arrangements exist for responding to emergencies.

The response arrangements set out in *Section 7*, will govern the principal response agencies' response to such sites/events, whether a major emergency is declared or not.

12.2 Seveso Sites

Waterford City & County functional area does not have any Seveso Sites.

Section 13

The Recovery Phase

13.1 Support for Individuals and Communities

Although the emergency response stage may have passed, the recovery stage is also important and includes consideration of many strategic issues, which need to be addressed, at both individual principal response agency and inter-agency level. The recovery phase can typically include:

- Assisting the physical and emotional recovery of victims;
- Providing support and services to persons affected by the emergency;
- Clean-up of damaged areas;
- Restoration of infrastructure and public services;
- Supporting the recovery of affected communities;
- Planning and managing community events related to the emergency;
- Investigations/inquiries into the events and/or the response;
- Restoring normal functioning to the principal response agencies; and
- Managing economic consequences.

A structured transition from response to recovery is critical for agencies, both collectively and individually. The recovery stage may be as demanding on the Local Authority resources and staff of the individual agencies as the emergency itself, as work may extend for a considerable time after the incident.

13.1.1 Supporting individuals and communities affected by the emergency

Following an emergency incident, assistance may be required by the victims of the emergency – not only those directly affected, but also family and friends, who may suffer bereavement or anxiety. A major emergency will have a serious effect on a community. The recovery phase should provide support and long term care for individuals involved in the incident and the communities affected by the incident.

It is imperative that the Local Authority restores its critical service to a pre-emergency state as quickly and efficiently as possible.

The services and staff that the Local Authority may be able to provide, are based upon a wide range of skills and resources drawn from its day-to-day operations such as:

- Technical and engineering support
- Building control
- Road services
- Public health and environmental issues
- Provision of reception centres
- Re-housing and accommodation needs
- Transport
- Social services
- Psychosocial support

- Help lines
- Welfare and financial needs

There are specific requirements for each agency in the recovery process. These requirements are:

Local Authority

- Clean-up;
- Rebuilding the community and infrastructure;
- Responding to community welfare needs (e.g. housing); and
- Restoration of services.

An Garda Síochána

- Identification of fatalities;
- Preservation and gathering of evidence;
- Investigation and criminal issues;
- Dealing with survivors;
- Dealing with relatives of the deceased and survivors; and
- Provision of an appropriate response to the immediate public need.

Health Service Executive

- Provision of health care and support for casualties and survivors;
- Support for relatives of casualties and survivors;
- Responding to community welfare needs; and
- Restoration of health services.

13.1.2 Managing of public appeals and external aid

There is a need for the co-ordination of emerging recovery issues, such as managing public appeals and external aid, from the earliest stages of the response phase. For this reason, the arrangements for co-ordination of response should continue to operate during the transition from response stage to recovery stage. At a point when the issues on the agendas of Co-ordination Groups are largely recovery focussed, it may be appropriate to re-title the group as the Local, Regional or National Recovery Co-ordination Group. From the earliest stage, it may be appropriate also for the Local, Regional or National Co-ordination Group to appoint a Recovery Working Group to plan ahead.

It is recommended that Waterford City & County's Local Authority Crisis Management Team will continue to function until the issues arising in the response phase are more appropriately dealt with by the agency's normal management processes. In future such aid will be dispensed through established support networks under the guidance of the Department of Social and Family Affairs or the Health Authority.

13.2 Clean-Up

In the aftermath of an emergency the clean-up operation has been assigned to the Local Authority. The removal of debris and contaminated waste is one of the principal concerns for Waterford City & County Council. In consultation with the EPA and specialist companies the Local Authority will commence clean up of a site as soon as possible but

without hindering the investigation process. Careful consideration must be provided for the removal of decontaminated debris to locations that will not affect communities.

13.2.1 Arrangements for clean up of sites / removal of debris / decontamination of emergency sites and the Council's role in this

The holder of waste material or polluting matter shall be responsible for the clean up of the site, the removal of debris and decontamination of the site.

13.3 Restoration of Infrastructure and Services. Specify how restoration of infrastructure and services is to be achieved, and the Council's role in this

The Local Authority must ensure that its critical services are restored as quickly as possible. A Business Continuity Plan has been drawn up to meet these demands.

13.3.1 Procedures and arrangements for monitoring the situation

At a point when the issues on the agendas of Co-ordination Groups are largely recovery focussed, it may be appropriate to re-title the group as the Local, Regional or National Recovery Co-ordination Group. From the earliest stage, it may be appropriate also for the Local, Regional or National Co-ordination Group to appoint a Recovery Working Group to plan ahead. These groups will be responsible for the co-ordination of the recovery phase, managing resources and monitoring the situation until the issues arising are more appropriately dealt with by the normal management processes.

13.3.2 Procedure for liaison with utilities

The utility companies may need to be mobilised in the recovery phase in order to provide essential services such as gas, water and electrical supplies and communications facilities. The IS Section will also have a roll to play in the recovery phase and will need to liaise with utilities in order to bring services back on line, such as communication links etc.

13.3.3 How the order of priorities are to be determined

It is the responsibility of the Local, Regional or National Recovery Co-ordination Group together with the Recovery Working Group to prioritise events during the recovery phase. It should be noted that staff welfare arrangements need to be given priority in the recovery stage of an incident, so that the needs of all staff, both emergency response teams and general staff (including management), are catered for. In addition, the needs of staff that are not directly involved in responding to the incident should also be considered. Those members of staff who continue in their normal work are supporting colleagues in the emergency response and may be taking on additional work in the process. They can be as critical to the organisation's response as those involved at the 'coalface.'

13.3.4 Protective measures against continuing hazards

Following an incident, the holder of waste material or polluting matter shall take all measures to reduce and eliminate any risks from hazards resulting from an incident. The Risk Assessment shall quantify the level of risk associated with the site and shall recommend remedial/protective measures which shall be approved by Waterford City & County Council. The selection of remedial measures is dependent on the results of the quantitative risk assessment that will be site specific. It should be noted that prior to the Risk Assessment it should be assumed that the waste material or polluting matter (i.e. the hazard) should be removed from the site unless it can be demonstrated that an alternative provides greater protection to public health and the environment.

Section 14

Review of the Major Emergency Plan

14.1 Internal Review Process

An internal review of the Major Emergency Plan will be undertaken by Waterford City & County Council on a yearly basis, the review should be held every year on the annual date of implementing the plan and also follow any exercises or incidents. The review should

- Update the roles of individuals that hold key positions
- Update the risk holders within the functional area of Waterford City & County LA
- Update names and numbers of utility companies, private companies etc
- Review current risk assessments and update as required.
- Plan exercises

Please Refer to section 1.8 of this document.

14.2 How the MEP is to be reviewed and amended externally

Waterford City & County Council's appraisal will be reviewed and validated by the South-East Regional Steering Group on Major Emergency Management. This appraisal should also be reviewed and validated by the Department of the Environment, Community and Local Government. Any issues arising from the review should be referred back to Waterford City & County Council for appropriate action. In cases of disagreement between the Local Authority and the Regional Steering Group, the National Steering Group should be consulted and should decide on the issue.

14.2.1 Inter-agency Review Process at the Regional Steering Major Emergency Group

Each principal response agency's Major Emergency Plan should be reviewed and validated annually by the relevant Regional Steering Group on Major Emergency Management. This will include updating and amending the plans as mentioned in *section 14.1* of this document.

Each agency's appraisal should also be reviewed and validated by the relevant parent Department in the case of the Local Authorities and by the national headquarters, in consultation with the parent Department, in the case of Divisions of An Garda Síochána and Health Service Executive Areas, in accordance with the normal appraisal/reporting relationships within that sector. Any issues arising from the review should be referred back to the principal response agency for appropriate action. In cases of disagreement between a principal response agency and a Regional Steering Group, the National Steering Group should be consulted and should decide on the issue.

The regional level report will also be reviewed and validated by the National Steering Group. Any issues arising from the review should be referred back to the Regional Steering Group on Major Emergency Management for appropriate action.

14.2.2 Review of the MEP by the Department of the Environment, Heritage and Local Government

In addition to Waterford City & County Council's Major Emergency Plan being reviewed locally and regionally on an annual basis, it must also be reviewed and validated by the Department of the Environment, Community and Local Government. Any issues arising from the review should be referred back to Waterford City & County Council for appropriate action.

14.3 After every activation, the Major Emergency Plan should be reviewed and reported upon

Once the Major Emergency Plan has been stood down, each of the services and agencies involved in the incident will hold a series of operational hot-debriefs. Initially these will be confined to each particular service, but later a multi-agency cold-debrief will be held, (multi-agency debriefs should consider the contribution provided by other, non-emergency services) and lessons learned will be incorporated into this Plan and other service plans, as appropriate.

14.3.1 How the agency's performance of its functions will be reviewed and reported upon internally

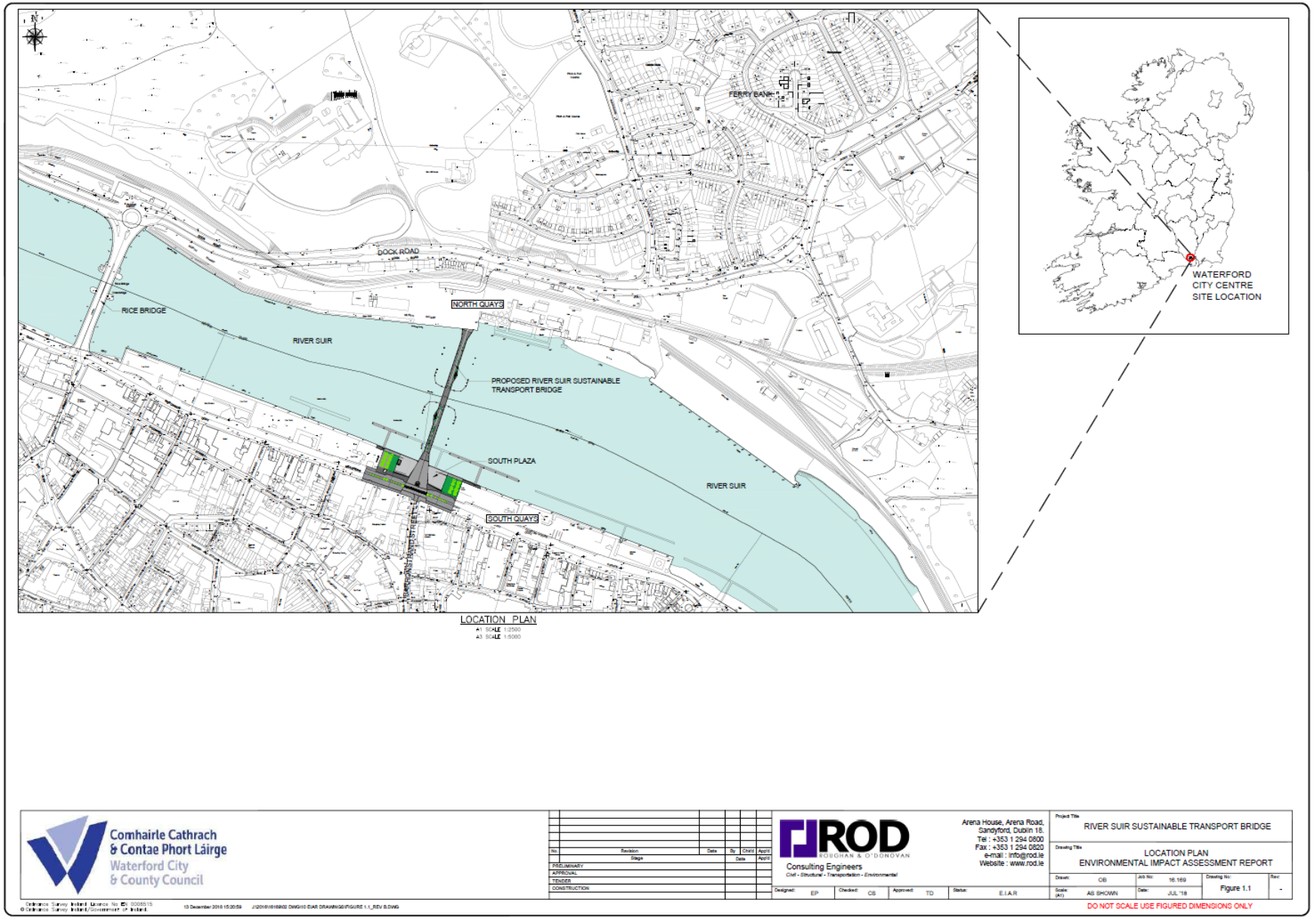
In addition to the review process outlined in the sections above, which takes place annually on a local, regional and national level, the Major Emergency Plan for Waterford City & County and the performance of the Local Authority as a principal response agency will also be reviewed after a major incident within the City/ region or even nationally, when there is learning to be gained. Should any new risks become apparent in the City, the plan will be reviewed to reflect this.

14.3.2 How the co-ordination function will be reviewed and reported upon externally and jointly with other principal response agencies

Multi-agency debriefs should consider the contribution provided by not only each other but also other, non-emergency service agencies. This is notwithstanding the potential conflict of interest that may result in later investigations. This aspect should be considered when inviting agencies other than emergency services to the 'debrief'.
Multi agency reviews must also be conducted on an annual basis between the principal response agencies on both a local and regional level basis. This will include reviewing and reporting on the co-ordination function of the agencies.
Please refer to 'A Guide to Agency Specific Plan Interoperability' for further details.

APPENDIX B

Figure 1


FERRY BANK
DOCK ROAD
RICE BRIDGE
NORTH QUAYS
RIVER SUIR
PROPOSED RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE
SOUTH PLAZA
RIVER SUIR
SOUTH QUAYS
WATERFORD CITY CENTRE SITE LOCATION
LOCATION PLAN
Comhairle Cathrach & Contae Phort Láirge
Waterford City & County Council
ROD
ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie
PRELIMINARY
APPROVAL
TENDER
CONSTRUCTION
RIVER SUIR SUSTAINABLE TRANSPORT BRIDGE
LOCATION PLAN
ENVIRONMENTAL IMPACT ASSESSMENT REPORT
Figure 1.1
DO NOT SCALE USE FIGURED DIMENSIONS ONLY

APPENDIX B

Outline Construction Environmental Management Plan

River Suir Sustainable Transport Bridge

Outline Construction Environmental Management Plan

December 2018

Client
Waterford City and County Council
The Mall
Waterford

Consulting Engineer
Roughan & O'Donovan
Arena House
Arena Road
Sandyford
Dublin 18, D18 V8P6

River Suir Sustainable Transport Bridge

Outline Construction Environmental Management Plan

TABLE OF CONTENTS

1.0 INTRODUCTION

This document sets out the Outline Construction Environmental Management Plan (OCEMP) for the construction of the River Suir Sustainable Transport Bridge Project ("the Project") on behalf of Waterford City and County Council.

This OCEMP applies to all works associated with the construction of the proposed civil works, marine works and buildings works including the pre-construction site clearance works.

As a contractor has not yet been appointed the Construction Environmental Management Plan (CEMP) has not been formally adopted and further development and commitment to the OCEMP will be undertaken following selection of Contractors and before commencement of site works.

The OCEMP provides the environmental management framework for the appointed Contractors and Sub Contractors as they incorporate the mitigating principles to ensure that the work is carried out with minimal impact on the environment. The construction management staff as well as Contractors and Sub Contractors staff must comply with the requirements and constraints set forth in the OCEMP in developing their CEMP. The key environmental aspects associated with the construction of the River Suir Sustainable Transport Bridge Project, the appropriate mitigation and monitoring controls, are identified in the OCEMP and its supporting documentation.

The implementation of the requirements of the OCEMP will ensure that the construction phase of the project is carried out in accordance with the commitments made by Waterford City and County Council in the planning application process for the development, and as required under the conditions of the planning approval. Once commenced the CEMP is considered a living document that will be updated according to changing circumstances on the project and to reflect current construction activities. The CEMP will be reviewed on an ongoing basis during the construction process and will include information on the review procedures.

1.1 Roles and Responsibilities

The Contractor is responsible to ensure that all members of the Project Team, including sub-contractors comply with the procedures set out in the CEMP. The Contractor will ensure that all persons working on site are provided with sufficient training, supervision and instruction to fulfil this requirement.

The Contractor will ensure that all persons allocated specific environmental responsibilities are notified of their appointment and confirm that their responsibilities are clearly understood. The principal environmental responsibilities for key staff can be identified as follows:

1.1.1 Site Manager

The Site Manager's environmental management responsibilities include but are not limited to:

- preparation and implementation of the CEMP;
- close liaison with the Site Environmental Manager (SEM) to ensure adequate resources are made available for implementation of the CEMP;

- ensuring that the risk assessments for control of noise and environmental risk are prepared and effectively monitored, reviewed and communicated on site; and
- managing the preparation and implementation of method statements; and
- ensuring that the Site Environmental Manager reviews all method statements and that relevant environmental protocols are incorporated and appended.

1.1.2 Site Environmental Manager (SEM)

The responsibilities of the Site Environmental Manager (SEM) include, but are not limited to:

- maintaining environmental records;
- providing guidance for the site team in dealing with environmental matters, including legal and statutory requirements affecting the works;
- reviewing environmental management content of method statements;
- reporting environmental performance to the Site Manager;
- liaison with statutory and non-statutory bodies and third parties with an environmental interest in the scheme; and
- collection and collation of CEEQUAL evidence.

1.1.3 Engineering Staff

The engineering staffs' environmental management responsibilities include but are not limited to:

- reporting any operations and conditions that deviate from the CEMP to the Site Manager;
- taking an active part in site safety and environmental meetings; and
- ensuring awareness of the contents of method statements, plans, supervisors' meetings or any other meetings that concern the environmental management of the site.

1.1.4 Supervisors

The supervisors' environmental management responsibilities include but are not limited to:

- ensuring all personnel affected by a method statement are briefed and fully understand its content. Monitor operatives for compliance, including sub-contract operatives;
- implementation of environmental management activities required by the CEMP and works method statements; and
- ensuring that all inspections are carried out as prescribed in the CEMP.

1.2 Training and Induction

1.2.1 Site Induction

All personnel involved in the proposed bridge development will receive environmental awareness training. The environmental training and awareness procedure will ensure that staff are familiar with the principles of the CEMP, the environmental aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures.

1.2.2 Specific Training and Awareness Raising

A project specific training plan that identifies the competency requirements for all personnel allocated with environmental responsibilities will be produced by the Contractor. Training will be provided by the Contractor to ensure that all persons working on site have a practical understanding of environmental issues and management requirements prior to commencing activities. A register of completed training is to be kept by the SEM. The Site Manager will ensure that environmental emergency plans are drawn up and the SEM will conduct the necessary training/inductions.

2.0 DESCRIPTION OF THE PROPOSED BRIDGE

2.1. Project Description

The proposed River Suir Sustainable Transport Bridge comprises a 5-span, 8m wide bridge with a segregated space for pedestrians and a shared space for cyclists and an electric shuttle bus service. The bridge location will be approximately in line with Barronstrand Street, in front of the Clock Tower, and will land on the North Quay at the former industrial brownfield site. The sustainable transport bridge crossing point is approximately 550m downriver of Rice Bridge. A paved and landscaped plaza on the South Quay at the Clock Tower is also proposed. Two plant rooms will be required within the vicinity of the north abutment and the south abutment to house the plant and machinery used to operate the twin leaf bascule, whilst noting that the operating room will be in the control tower of the existing Rice Bridge. The plant room / buildings which will be located on the north and south quays will be of the order of 5m x 10m.

2.2. Construction Stage

It is anticipated that the construction of the proposed development will be progressed as a single construction contract with the construction phase lasting approximately 18-24 months.

2.3. Construction Procurement

It is envisaged that the construction of the proposed development will be tendered under a Public Works Contract for Civil Engineering Works Designed by the Employer.

3.0 OUTLINE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

The CEMP will be developed by the contractor to meet the requirements of ISO 14001 and all site works will be undertaken in compliance with the CEMP. The CEMP shall include details of the topics listed below, further information on which is given in the following section.

- Environmental Policy;
- Environmental Aspects Register;
- Project Organisation and Responsibilities;
- Project Communication and Co-ordination;
- Training;
- Operational Control;

- Checking and Corrective Action;
- Environmental Control Measures;
- Complaints Procedure.

The Construction Environmental Management Plan (CEMP) details all the environmental aspects and impacts associated with this contract such as waste management, pollution prevention and protection of flora and fauna with particular emphasis on the Special Area of Conservation (SAC), Special Protection Area (SPA), proposed Natural Heritage Area (pNHA) and Water Quality in the watercourses. The Register of Impacts provides the framework for identifying the potential environmental impacts generated by construction and the associated works. The Environmental Operational Control Procedures and activity specific method statements will detail the working methods necessary for managing and mitigating these impacts, whether it is by prevention or mitigation. Prior to the commencement of construction activities, the Environmental Operational Control Procedures and activity specific method statements will be completed so as to conform to precise site-specific requirements at the bridge location.

3.1 Environmental Policy

The contractor will complete an Environmental Policy with consideration for impacts on the natural and built environment. All project personnel will be accountable for the environmental performance of the project and will be made aware of the Environmental Policy at induction. The environmental policy will consider and make commitments with regard to the protection of Natura 2000, pNHA and NHA sites, emissions to the atmosphere, maintenance of water quality, resource usage energy consumption and waste management.

3.2 Environmental Aspect Register

Once appointed, the Contractor will prepare a register of all sensitive environmental features which have the potential to be affected by the construction works, together with details of commitments and agreements made within the Environmental Impact Statement, the Contract Documentation, Planning conditions imposed by the local authority, and conditions identified by Statutory Authorities with regards mitigation of potential impacts.

The Environmental Aspects Register provides the relevant information for the preparation of construction method statements and will be regularly updated during the works.

The Environmental Aspects Register will consider sensitive environmental features as listed below (please note this list is not exhaustive and will be amended and expanded upon as required by the contractor).

The Environmental Aspects Register will consider sensitive environmental features as listed below (please note this list is not exhaustive and will be amended and expanded upon as required by the contractor).

- Identification off all waterways for the protection against ingress of suspended solids or any pollutant;
- Air emissions;
- Noise emissions;
- Light emissions;

- Waste generation;
- Use hazardous materials;
- Energy usage;
- Water usage;
- Discharge of waste water;
- Traffic generation;
- Terrestrial ecology;
- Aquatic ecology;
- Visual impacts;
- Hydrogeology;
- Archaeology and Cultural Heritage.

3.3 Project Organisation and Responsibilities

The CEMP will define the roles and responsibilities of the project team. The overall responsibility lies with the Project Manager whose responsibility it will be to approve key personnel required for employment on the project. He/She will liaise with the SEM.

The Project Manager will lead the works on site. He/She will be responsible for the management and control of the activities and will have overall responsibility for the implementation of the CEMP. He/She will be assisted by the Site Environmental Manager who will act as his/her deputy.

The Site Environmental Manager will prepare and implement all aspects of the CEMP.

Project Manager

The Project Managers main duties and responsibilities in relation to the CEMP include liaising with the Project Team in assigning duties and responsibilities in relation to the CEMP to individual members of the main contractor's project staff.

Site Environmental Manager

The main duties and responsibilities of the Environmental Manger include and are not limited to the following:

- Liaise with the Construction Manager during the finalisation of the CEMP to assign individual duties and responsibilities bearing in mind the overall organisational structure, the nature of the Environmental Commitments and Requirements and the proposed bridge development specific characteristics;
- Ensuring that the CEMP is finalised, implemented and maintained
- Liaising with Waterford City and County Council's (WCCC's) Environmental Manager on all Method Statements, any alternations to live documents and any other works to ensure protection of water quality
- Being familiar with the information in the pre-construction surveys, construction Requirements, An Bord Pleanála and Planning Service decision and all relevant Method Statements;
- Being familiar with the contents, environmental commitments and requirements continued within the reference documentation listed in this CEMP;

- Being familiar with the baseline data collated during the compilation of the EIAR;
- Assisting Management in liaising with the Engineers and WCCC and the provision of information on environmental management during the construction of the Project;
- Liaising with the Project Team in assigning duties and responsibilities in relation to the CEMP, to individual members of the main contractor's project staff;
- Overseeing, ensuring coordination and playing a lead role in third party consultations required statutorily, contractually and in order to fulfil best practice requirements;
- Liaising with Management in agreeing site specific Method Statements with Third Parties;
- Ensuring that all relevant woks are undertaken in accordance with the relevant legislation in the Republic of Ireland;
- Bring any legal constraints that may occur during certain tasks to the attention of management;
- Hold copies of all permits and licenses provided by waste contractors;
- Ensuring that any operations or activities that require certificates of registration, waste collection permits, waste permits, waste licences, etc have appropriate authorization;
- Gathering and holding documentation with respect to waste disposal;
- Keeping up to date with changes in environmental practices and legislation and advising staff of such changes and incorporating them into the CEMP;
- Liaising with contactors and consultants prior to works;
- Procuring the services of specialist environmental contactors when required;
- Ensuring that all specialist environmental contactors are legally accredited and proven to be competent;
- Coordinating all the activities of the specialist environmental contractors;
- Ensuring that Environmental Induction Training is carried out on all personnel on site and ensuring that tool box talks include aspects of Environmental Awareness and Training;
- Respond to all environmental incidents in accordance with legislation, the CEMP and company policy/procedures;
- The SEM is responsible for notifying the relevant statutory authority when environmental incidents occur and producing the relevant reports as required;
- Ensuring that all relevant works have (and are being carried out in accordance with) the required permits, licenses, certificates and planning permissions;
- Liaising with the designated licence holders and specific agent defined in the licence with respect to licences granted pursuant to the European Commission (EC) (Natural Habitats) Regulations 1997;
- Carrying out regular documented inspections of the site to ensure that work is being carried out in accordance with the Environmental Control Measures and relevant site-specific Method Statements;
- The SEM should prepare and be in readiness to implement at all times the Emergency Incident Response Plan;

- Responsible for reviewing all environmental monitoring data and ensuring that they all comply with stated guidelines and requirements; and
- Liaising with management in preparing and inspection of site-specific method statements for activities where there is a risk of pollution or adverse effects on the environment.

Design Manager

The main duties and responsibilities of the Design Manger having regard to the implementation of the Construction Environmental Management Plan (CEMP):

- Be familiar with the CEMP and relevant documentation referred to within;
- Participate in Third Party Consultations and liaising with third Parties through the SEM;

Section Managers and Agents

The Section Managers and Agents are responsible for the following:

- Ensuring Forepersons under his/her control adhere to the relevant Environmental Control measures and relevant site-specific Method Statements, etc.
- Ensuring that the procedures agreed during third party consultations are followed;
- Reporting immediately to the Site Environmental Manager any incidents where there has been a breach of agreed environmental management procedures, where there has been a spillage of a potentially environmentally harmful substance, where there has been an unauthorised discharge to ground, water or air, damage to habitat, etc.
- Attending Environmental review Meeting and preparing any relevant documentation as required by Management.

Forepersons

The forepersons on site are responsible for the following:

- Ensuring personnel under his/her control adhere to the relevant environmental control measures and relevant site-specific Method Statements;
- Reporting immediately to the site agents and SEM any incidents where there has been a breach of agreed procedures e.g. spillages and discharges.

All Project Personnel

All project personnel have the following responsibilities:

- Attend environmental training as required;
- Reporting immediately to the Forepersons/Agents or Site Environmental Manager any spillage incidents or observations regarding adverse effects to the Environment.

3.4 Project Communication and Co-ordination

Environmental issues and performance aspects will be communicated to the workforce on a regular basis. Weekly project meetings, which follow a set agenda incorporating Environment, will be held alongside overall management meetings.

All staff and sub-contractors involved in all phases of the project will be encouraged to report environmental issues.

3.5 Training

All employees and subcontractors involved on site will be given a comprehensive induction prior to commencement of the works. This environmental training can be run concurrently with safety awareness training.

Training will include:

- Overview of the Environmental Policy and Environmental Management Plan, goals and objectives;
- Awareness in relation to risk, consequence and methods of avoiding environmental risks as identified within the Register of Aspects and with the planning conditions;
- Awareness of roles and individual environmental responsibilities and environmental constrains to specific jobs;
- Location of and sensitivity of Special Area of Conservations, Special Protection Areas, protected monuments, structures etc.
- Location of habitats and species to be protected during construction, how activities may affect them and methods necessary to avoid impacts.

A record will be kept of a signed register on the project files of all attendee of the environmental induction.

Toolbox talks based on specific activities being carried out will be given to personnel by the nominated project representative. These will be based on specific activities being carried out and will include environmental issues particular to the Project, including the impact on bird populations and water quality namely:

- Oil/Diesel spill prevention and safe refuelling practice;
- Storage of materials including oil/diesels and cement;
- Emergency response processes used to deal with spills;
- Minimising disturbance to wildlife;
- Emergency response to include water pollution hotline to the EPA/WCCC for regulator response. Identification of registered / accredited spill cleanup company for oil etc.; and
- Consideration of importance of containment of vehicle washing, containments of concrete /cement / grout washout etc, bank protection using hessian to prevent excessive scour and mobilisation of suspended solids, maintenance of vegetation corridors etc.

3.6 Operational Control

Site works will be checked against the CEMP requirements. Any mitigation measures that have been agreed with the Statutory Authorities, or are part of planning conditions, will be put into place prior to the undertaking of the works for which they are required and all relevant staff will be briefed accordingly.

Method statements that are prepared for the works will be reviewed / approved by the Client Project Manager and were necessary the relevant Environmental Specialist. All method statements for works in, near or liable to impact on a waterway must have prior agreement with IFI and NPWS.

A Quality Management System (QMS) will also be put into operation for the project. Document control will be in accordance with this QMS and copies of all audits, consents, licences, etc will be marinated by the Site Environmental Manager and his team and kept on site for review at any time.

3.7 Checking and Corrective Action

Daily inspections of the site and the works will be undertaken to minimise the risk of environmental damage and to ensure compliance with the CEMP. Any environmental incidents are to be reported immediately to the Site Foreman. The Site Environmental Manager will undertake periodic inspections and complete an assessment of the project's environmental performance with regard to the relevant standards/legislation and the contents of the CEMP. Following these inspections, the Site Environmental Manager will produce a report detailing the findings which will be provided to the Client Project Manager and reviewed at the monthly project meeting.

3.8 Environmental Control Measures

Licensing requirements will be in place and Specific procedures to manage the key environmental aspects of the project will be developed by the contractor prior to work commencing.

3.9 Complaints Procedure

A liaison officer will be available to allow for member of the pubic or interested parties to make complaints about the construction works. The CEMP will contain details of the complaints procedures and a monitoring system will be implemented to ensure that any complaints are addressed and satisfactory outcome is achieved for all parties.

3.10 Compliance with Project Consents

If planning permission is granted for the proposed development, the entire contents of the planning consent as well as the foreshore licence/lease, and other consents and conditions, shall be appended as received.

4.0 SUMMARY

This Outline CEMP is indicative only, however, it is expected that the final CEMP to be prepared by the Contractor will incorporate the items outlined above and ensure that all requirements identified as part of the planning consents will be included in the CEMP.

APPENDIX C

Outline Construction and Demolition Waste Management Plan

River Suir Sustainable Transport Bridge

Outline Construction and Demolition Waste Management Plan

December 2018

Client
Waterford City and County Council
The Mall
Waterford

Consulting Engineer
Roughan & O'Donovan
Arena House
Arena Road
Sandyford
Dublin 18, D18 V8P6

River Suir Sustainable Transport Bridge

Outline Construction and Demolition Waste Management Plan

TABLE OF CONTENTS

1.0 INTRODUCTION

This outline Construction and Demolition Waste Management Plan (CDWMP) has been developed to ensure that waste arising on-site during the construction and demolition phase of the River Suir Sustainable Transport Bridge will be managed and disposed of in a way that ensures the provisions of the Waste Management Acts, 1996-2011 and associated Regulations (1996-2011) are complied with and to ensure that optimum levels of reduction, re-use and recycling are achieved.

This outline CDWMP has been prepared for the provision of waste management for the construction phase of the River Suir Sustainable Transport Bridge, taking into account the many guidance documents on the management and minimisation of construction and demolition waste, including:

- DEHLG (2006) *Best Practice Guidelines on the Preparation of Waste Management Plans for construction and Demolition Projects*. Department of Environment, Heritage and Local Government, Dublin;
- Provisions of the Waste Management Acts, 1996-2011 and associated Regulations;
- Construction Industry Research and Information Association (CIRIA) document 133 Waste Minimisation in Construction;
- TII (2014) *Guidelines for the Management of Waste from National Road Construction Projects*. Transport Infrastructure Ireland, Dublin; and,
- National Construction & Demolition Waste Council (NCDWC) 2006 *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.*

This plan is intended to be a working document and has been prepared to inform the Construction and Demolition Waste Management Plan which, in turn, will form an integral part of the Environmental Operating Plan (EOP) for the proposed development.

This document is preliminary in nature as it has been prepared at a stage when quantities are based on the design developed to a sufficient level of detail to inform the environmental impacts to be assessed in the Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS). However, changes may occur during detailed design stages which may alter the volumes of waste.

All materials used during construction will be imported. Minimal quantities of soils will be excavated during construction.

Prior to the commencement of construction works, a Waste Management Co-ordinator (WMC) (who may also be the Site Environmental Manager) will be appointed by the Contractor to assume responsibility for the further development of the CDWMP and the management and treatment of all waste materials created during the construction of the River Suir Sustainable Transport Bridge.

The Contractor's CDWMP must contain (but not be limited to) the following measures:

- Details of waste storage (e.g. skips, bins, containers) to be provided for different waste and collection times;
- Details of where and how materials are to be disposed of, i.e. landfill or other appropriately licensed waste management facility;

- Details of storage areas for waste materials and containers;
- Details of how unsuitable excess materials will be disposed of, where necessary;
- Details of how and where hazardous wastes such as oils, diesel and other hydrocarbon or other chemical waste are to be stored and disposed of in a suitable manner; and
- Details of locations.

Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects were published in 2006 by the National Construction & Demolition Waste Council (NCDWC). These Guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to its completion. These Guidelines have been followed in the preparation of this report.

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Project Description

The proposed River Suir Sustainable Transport Bridge comprises a 5-span, 8m wide bridge with a segregated space for pedestrians and a shared space for cyclists and an electric shuttle bus service. The bridge location will be approximately in line with Barronstrand Street, in front of the Clock Tower, and will land on the North Quay at the former industrial brownfield site. The sustainable transport bridge crossing point is approximately 550m downriver of Rice Bridge. A paved and landscaped plaza on the South Quay at the Clock Tower is also proposed. Two plant rooms will be required within the vicinity of the north abutment and the south abutment to house the plant and machinery used to operate the twin leaf bascule, whilst noting that the operating room will be in the control tower of the existing Rice Bridge. The plant room / buildings which will be located on the north and south quays will be of the order of 5m x 10m.

2.2 Construction Stage

It is anticipated that the construction of the proposed development will be progressed as a single construction contract with the construction phase lasting approximately 18-24 months.

2.3 Construction Procurement

It is envisaged that the construction of the proposed development will be tendered under either a Public Works Contract for Civil Engineering Works Designed by the Employer or a Public Works Contract for Civil Engineering Works Designed by the Contractor.

3.0 WASTE MANAGEMENT STRAGETY

3.1 Scope

The Contractor will develop a CDWMP that will detail:

- Licensing of Waste Disposal;
- Site clearance;

- Excavations and disposal of materials;
- Measures to protect water quality;
- Importation, stockpiling and placing of fill;
- Management of drainage works to ensure no pollution of the River Suir;
- Construction vehicle management; and,
- Dust and noise abatement measures.

3.2 Waste and Recycling Management

The management of construction and demolition waste will reflect the waste management hierarchy, with waste prevention and minimisation being the first priority, followed by reuse and recycling. During site clearance and construction works, there are numerous opportunities for the beneficial reuse and recycling of materials. The subsequent use of recycled materials in reconstruction works also reduces the quantities of waste which ultimately needs to be consigned to landfill sites.

The Contractor will develop and implement a plan and manage all waste with a goal of achieving the waste hierarchy in accordance with the relevant statutory provisions as shown in Figure 3.1.

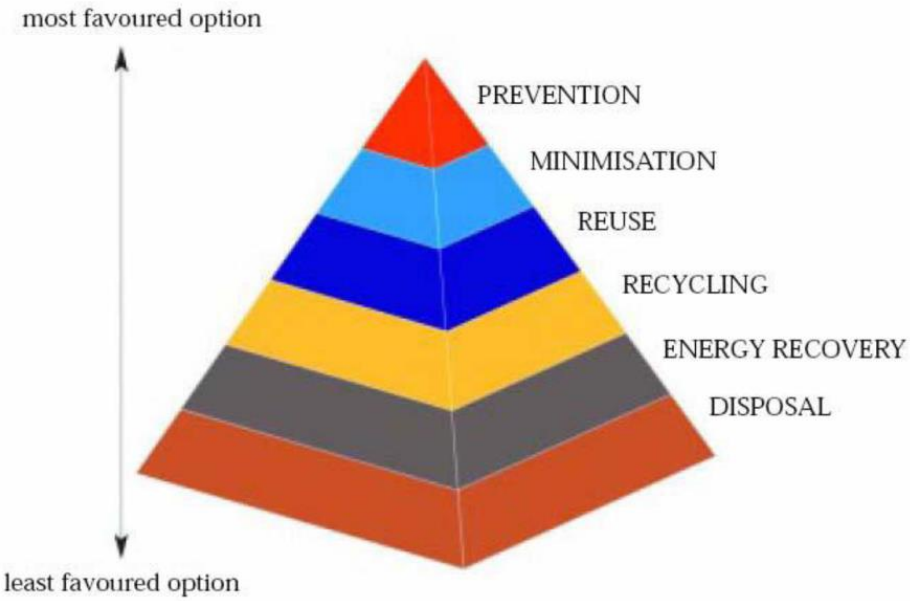


Figure 3.1 The Waste Management Hierarchy [DEHLG (1998) *Changing Our Ways*. Department of the Environment, Heritage and Local Government, Dublin]

Source Segregation

Wastes generated on the construction site will be identified and segregated according to their respective categories, as described by the European Waste Catalogue (EWC). Where possible, metal, timber, glass and other recyclable material will be segregated and removed off-site to a permitted/licensed facility for recycling.

In order to achieve this, designated waste storage areas will be created at the construction compound or other suitable locations for the storage of segregated wastes prior to transport for recovery/disposal at suitably licensed/permitted facilities. Suitably sized containers for each waste stream will be provided within the waste

storage area and will be supervised by the WMC, who will be appointed by the Contractor. This will be the person responsible for the management of waste during the construction of the River Suir Sustainable Transport Bridge. The number and sizing of containers will be agreed with Waste Contractors in advance of construction works commencing. Source segregation of waste will result in cost savings to the project as well as providing an environmentally sound route for the management of all construction and demolition wastes.

Re-use

Possibilities for re-use of clean, non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use. During Ground Investigations (GI), samples were taken from exploratory holes and were tested at the Chemtest Accredited Laboratory in the UK. All samples have been classified as falling within either the non-hazardous or inert limits. Some localised elevated levels of hydrocarbons (PAH) and heavy metals (Arsenic) were recorded, specifically in locations along the River Suir riverbed Where excavated material is not to be reused within the works, the Contractor will endeavour to send material for recovery or recycling so far as is reasonably practicable. The Contractor will ensure that, if required, any off-site interim storage facilities for excavated material have the appropriate waste licences or waste facility permits in place.

Material Management

In order to prevent and minimise the generation of waste, the Contractor will be required to ensure that raw materials are ordered so that the timing of delivery, the quantity delivered and the storage is not conducive to the creation of unnecessary waste. The Contractor, in conjunction with the material suppliers, will be required to develop a programme showing the estimated delivery dates and quantities for each specific material associated with each element of construction and demolition works. Following a "just-in-time" approach improves cash flow, better utilises storage space, reduces risk of environmental pollution events and reduces potential loss to theft and accidental damage as well as making the site safer.

It is essential that the planning, construction and demolition works are undertaken in close collaboration with waste management contractors, in order to determine the best techniques for managing waste and to ensure a high level of recovery of materials for recycling. The Contractor will be required to continuously seek to improve the waste management process on-site during all stages of construction and maximise opportunities for re-use and recycling where they exist. For example, in relation to waste packaging, the Contractor will seek to negotiate take-back of as much packaging waste as possible at source to ensure maximum recycling. The CDWMP will be included as an agenda item at the weekly construction meetings. In addition, the plan will be communicated to the whole team (including the Client) at the monthly meetings. This will include any updates to earlier versions of the document.

Waste Auditing

The Contractor will record the quantity (in tonnes) and types of waste and materials leaving the site during the construction phase. The name, address and authorisation details of all facilities and locations to which waste and materials from the construction phase are delivered will be recorded along with the quantity of waste (in tonnes) delivered to each facility. Records will show all material recovered and disposed of.

The waste management strategy for the project will follow the accepted waste hierarchy and the Contract will implement the following types of measures to reduce waste and maximize opportunities for recycling:

- Wherever possible, materials for construction activities will be ordered as to require the minimum possible storage time;
- Materials will be ordered, where possible, in sizes to prevent wastage;
- Appointment of a WMC, who will be responsible for handling, storage and delivery of materials to the proposed development;
- Ensure that stored material is protected from damage from plant and environmental factors such as rain and wind;
- Secure storage areas to prevent unauthorised access;
- Establish a waste management compound to handle incoming waste from construction activities – this should facilitate the segregation of key waste streams to maximise the opportunity to re-use, recycle and return wastes generated on-site;
- Provide a separate secured area for dealing with hazardous waste; and,
- Provide separate facilities for the storage of fuels and chemicals.

3.3 Waste and Recycling Targets

The Contractor's CDWMP, waste handling and proposed construction methods should endeavour to achieve the following targets

- The re-use of all earthworks materials on site where possible;
- 100% recycling of surplus reinforcement and other metals, where possible; and,
- No contamination of skips.

3.4 Waste and Recycling Opportunities

The Contractor will seek opportunities, wherever possible, to reduce the amount of waste generated on site and maximize the potential for recycling materials in accordance with the waste hierarchy through the following:

- Storing materials in designated areas and separate from wastes to minimise damage;
- Returning packaging to the producer where possible;
- Segregating construction and demolition wastes into reusable, recyclable and non-recyclable materials;
- Reusing and recycling materials on site during construction where practicable;
- Recycling other recyclable materials through appropriately permitted/licensed contractors and facilities; and,
- Disposing of non-recyclable wastes to licensed landfills.

4.0 WASTE DISPOSAL LICENSING

4.1 Licensing Requirements

Under the Waste Management (Collection Permit) (amended) Regulations, 2016, a waste collection permit for appropriate EWC Code(s) and designations is required by

a waste haulier to transport waste from one site to another. Compliance with the Waste Management (Shipments of Hazardous Waste in Ireland exclusively) Regulation, 2011 is also required for the transportation of hazardous waste by road. The export of waste from Ireland is subject to the requirements of the Waste Management (Shipment of Waste) Regulations, 2007. The Contractor will ensure that the transport and movement of all waste is carried out in compliance with these requirements.

Waste may only be treated or disposed of at facilities that are licensed to carry out that specific activity, *e.g*. chemical treatment, landfill or incineration, for a specific waste type. Records of all waste movements and associated documentation will also be held on-site. Generally, operators of waste management sites will facilitate a site visit and inspection of documentation if deemed necessary. Prior to any on-site recovery process, including the operation of mobile plant, an operator must apply to the governing local authority for a waste facility permit under the Waste Management (Facility Permit and Registration) Regulations, 2007. It is planned that waste activities at the site will comprise of source segregation, storage and collection and, therefore, it is highly unlikely that any waste licensable or waste permissible activity will be undertaken.

4.2 Exclusion from Legislation

The Directive on Waste contains a number of exclusions which make clear that certain materials are not subject to its requirements. A key exclusion affecting construction projects such as this development is set down in Article 2(1)(c). This states that the requirements of the EU legislation do not apply to:

> *"uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated"*

This provision is repeated in the Waste Management Acts, as amended by the European Communities (Waste Directive) Regulations, 2011 (SI No. 126/2011). Should materials generated by construction activities fall within this provision, they are not then subject to the other requirements of the EU or national waste legislation. This means that, for example, such materials are not defined as "waste", do not need to be handled by duly authorised waste collectors and do not need to pass to disposal or recovery facilities that are subject to waste licences or other equivalent form of statutory authorisation. In addition, the requirements of the Waste Hierarchy do not apply.

5.0 PROPOSED CONSTRUCTION METHODOLOGY AND MATERIAL USAGE

5.1 Site Preparation

The construction of the River Suir Sustainable Transport Bridge will require site clearance as part of the development. Site preparation will include certain diversion works of services and utilities, such as public lighting, power services, watermains, rising main, storm water, electricity, telecommunications, gas mains and traffic light services. Due to the nature of some of the diversions, a number of these service diversions will only be possible during the main construction works.

The Contractor's CDWMP will take the following into account:

- The extent of the areas to be cleared and the potential types and volumes of arisings;
- The location of any structures to be demolished;
- Statutory requirements; and
- Specific environmental requirements and seasonal requirements, e.g. in respect of Shad, Salmon and Lamprey.

5.2 Site Offices, Construction Compounds and Security

A construction compound will be required in the vicinity of the proposed development and is proposed and assessed as being located on the South Quay. The location, size and suitability of the compound will ultimately be at the discretion of the contractor once it is located within the project boundary and site access is approved by the Local Authority. For the purpose of the Environmental Impact Assessment Report (EIAR), it has been anticipated that the construction compound will be located on the South Quay. The location and layout of the construction compound selected by the contractor will however have to incorporate the protection and mitigation measures outlined in the EIAR and conform to the requirements outlined in the Natura Impact Statement (NIS) and planning conditions.

The compound will include stores, offices, material storage areas, plant storage and parking for site and staff vehicles. This site is proposed to remain in place for the duration of the contract but may be scaled up or down during particular activities on site.

During the construction phase, the contractor will be required to erect opaque hoarding of a minimum 2.0m in height around the site compound and works area on the South Quays. The hoarding shall be a high gloss printed finish with information and graphics about the project or as agreed with Waterford City and County Council. The precise hoarding type shall be agreed with Waterford City and County Council prior to works commencing.

The storage of fuels, other hydrocarbons and other chemicals within the construction compounds will not be permitted within 10m of the River Suir. All fuel storage areas will be bunded to 110% of storage capacity to prevent spills and provide sufficient additional capacity in the event of rainfall occurring simultaneously. The compounds will also have appropriate levels of security to limit potential vandalism, theft and unauthorised access within the compounds.

Following completion of construction, the compound will be cleared, landscaped and paved. Temporary buildings and containers, parking areas and waste material such as rubble, aggregates and unused construction materials will not be permitted to remain exposed on these sites and will need to be removed and disposed of appropriately.

5.3 Material Quantities

All materials used during construction will be imported. Minimal quantities of soils will be excavated during construction.

5.4 General Construction and Demolition Works

Quantities of general construction and demolition wastes are made up of waste such as wood, packaging, metals, plastics, bricks, blocks, canteen waste, some hazardous waste, e.g. oils, paints and adhesives. Site clearance and residual waste will be

generated during the construction phase, primarily from the construction of the proposed development. While it is difficult at this stage to predict precise volumes of these wastes expected from the proposed development, the EPA has produced figures for the construction and demolition waste recorded in the National Waste Database. This includes a percentage breakdown of each waste type in the construction and demolition stream (Table 5.2). A more detailed estimate of the anticipated quantities of these materials will be provided in the detailed CDWMP following appointment of the Contractor at construction stage.

Table 5.2 shows the breakdown of the construction and demolition waste types (from EPA data) produced on a typical site.

Table 5.2: Waste Materials Generated on a Typical Irish Construction Site

Waste Type	Proportion (%)
Soil and stones	51
Concrete, bricks, tiles, ceramic, plasterboard	39
Asphalt, tar and tar products	2
Metals	2
Other	6
Total Waste	**100**

An overview of the methods to manage the primary waste streams expected is presented below. The main types of construction waste produced will be:

Excavated material

Where short-term temporary storage is unavoidable, the method of storage of material will be key to its potential use as certain types of materials are likely to degrade if left uncovered in wet weather due to its low plasticity and silty nature.

Concrete

Waste concrete is likely to arise during the construction phase of the River Suir Sustainable Transport Bridge. It is proposed that waste concrete generated will be returned to the supplier for re-use. For every tonne of concrete waste that is recycled for aggregate in new concrete, significant savings are made in energy and carbon dioxide emissions. It also saves money by avoiding disposal costs, which continue to increase. Residual concrete waste will be source segregated and stored in designated containers at the waste storage area for subsequent separation and recovery at a remote facility.

Metals

Metal waste has a significant scrap value. Although it is now common practice for sites to segregate metals for reuse and recycling, there are still sites where metal is thrown away with general rubbish. One of the primary sources of metal waste is steel reinforcement. Wastage of steel reinforcement will be reduced by ordering made to measure steel from the manufacturer and detailed scheduling of all reinforced concrete structural elements.

Skip hire companies may provide free skips for the storage of scrap metal on sites and this will be investigated prior to construction commencing. When metal storage containers are full they will be removed by the waste storage contractor and sent to a metals recycling facility.

Timber

Timber waste will be stored separately as it is readily contaminated by other wastes and if it is allowed to rot will reduce the recyclability of other stored wastes. Any pallets will be returned to the supplier for re-use. Off-cuts and trimmings will be used in formwork where possible. A container for waste wood will be covered where possible and will be placed in the waste storage area. The waste wood will be collected by a waste contractor who will forward it to a wood recycling facility for chipping.

Treatment of timber with chemicals and the overuse of nails will be minimised and avoided as this will make it difficult to reuse/recycle the timber afterwards. The utilisation of reclaimed timber products will also be investigated.

Packaging and Plastic

Packaging waste can become a major problem on construction sites. Double handling will be avoided by segregating packaging wastes immediately after unwrapping. Many suppliers are now prepared to collect their own packaging for recycling, and this will also be investigated prior to works commencing. It is intended that, where possible, materials with recycled packaging will be purchased. Waste packaging will be segregated and stored in separate containers, preferably covered, in the waste storage area for collection by the waste management contractor and distribution to packaging recycling facilities.

Blocks, Bricks and Tiles

The careful storage of these raw materials will significantly reduce the volume of these wastes arising on site. The most likely wastes produced will be off-cuts, trimmings and waste arising from breakages. Every effort will be made to use broken bricks and off-cuts.

Hazardous Wastes

Prior to removal from the site, any hazardous waste identified will undergo a comprehensive waste assessment and classification by a suitably qualified person in accordance with the European Waste Catalogue and Hazardous Waste List. It should be noted that if non-hazardous waste becomes contaminated with hazardous waste the entire load will be considered hazardous. It is, therefore, critical to ensure that waste segregation areas are provided and are used properly to separate out hazardous, non-hazardous and inert waste arising. Hazardous wastes will be identified, removed and kept separate from other construction and demolition waste materials in order to avoid cross-contamination. Specific method statements detailing the necessary mitigation measures required during excavation, handling transportation and disposal of hazardous wastes encountered on the site will be prepared as required.

The likely disposal/treatment options for any hazardous wastes available to the Contractor will depend on the nature of the hazardous material and the concentration of parameters of concern. The costs associated with treatment and disposal will similarly vary depending on the concentration of parameters of concern and on the tonnage involved. There are several operators/facilities in operation within Ireland that could potentially accept the contaminated material depending upon the results of the Waste Acceptance Criteria testing or assist in the export of the material abroad for special treatment where required. Full details of the disposal route for hazardous wastes will be provided in the detailed CDWMP following the appointment of the contract and completion of the further investigations required.

Hazardous Liquids (Oils, Paints, Chemicals)

Hazardous liquid waste arising from the construction process will require careful handling. Oils, paints, bitumen, adhesives and chemicals will be kept in a separate contained storage area which will be locked when not in use. Hazardous liquids will be stored at least 10m from the River Suir. Lids will be kept on containers in order to avoid spillage or waste by evaporation. Waste oils, paints and chemicals, including the containers, will require careful handling and disposal. These will be stored in a containment tray with a capacity to contain 110% of the volume of the largest container.

Fuels and chemical will be stored in double-skinned containers or within a bund, i.e. an impervious structure with the capacity to contain 110% of the volume of the largest tank stored within it. All containers will be carefully labelled.

Food Wastes

Site staff generate food waste and packaging waste. Designated receptacles will be provided to allow for the segregation and storage of individual waste streams. These will include receptacles for food waste, *e.g*. brown bin for waste foods and peelings, dry recyclables, *e.g*. green bin for packaging, plastics, metals, wood, paper, cardboard and tetrapack, and residual bin, *e.g*. black bin for mixed food and packaging waste. Separate receptacles for the recyclable fractions may be provided such as plastics, metals, glass and this will be designed and detailed by the WMC in consultation with the selected waste management contractor.

Other Wastes (Residual)

Waste material other than those outlined above can constitute a significant proportion of the total waste generated by a construction site. This waste is normally made up of residual, non-recyclable waste such as soiled paper, cloth, cardboard or plastics, as well as food waste and general waste found on the site, including plastic bottles, bags, cans *etc*. Given the heterogeneous nature of this material, it is most important that residual waste is kept separate from the other waste streams to avoid contamination. This material will be stored in a dedicated container in the waste storage area. Container size and collection frequency will be assessed with waste management contractors as works proceed. All residual wastes will be dispatched to a suitably licensed facility for disposal. Other construction and demolition waste material will be collected in receptacles with mixed construction and demolition waste materials for subsequent separation and disposal at a segregation facility.

6.0 ASSIGNMENT OF RESPONSIBILITIES

A WMC will be appointed who will have overall responsibility for waste management on the site. The Employer (Waterford City and County Council) will receive summaries of any audit reports, which will be completed within three months of the end of each calendar year. The effectiveness and accuracy of the documentation may also be monitored on a regular basis via routine site visits. Following appointment of the preferred Contractor, the CDWMP will be updated in accordance with the final design and copies of the plan will be distributed to the Employer, the Site Manager and the site sub-contractors. The WMC appointed by the Contractor will be appropriately trained and experienced in all aspects of waste management. In addition he/she and the site crew must be in a position to:

- Distinguish reusable materials from material suitable for recycling;
- Ensure maximum segregation at source;

- Co-operate with site manager on best locations for stockpiling reusable material;
- Separate material or recovery; and,
- Identify and liaise with operators of recovery outlets.

The WMC will be responsible for educating all site staff, sub-contractors and suppliers about the available alternative to conventional waste disposal. Training will also be given to all site staff in materials management on sites. The WMC will continually identify waste minimisation actions on sites and this will be updated in the plan.

7.0 TRAINING

Copies of the CDWMP will be made available to all personnel on-site. All site personnel and sub-contractors will be instructed about the objectives of the plan and informed of the responsibilities that fall upon them as a consequence of its provisions. This is traditionally carried out during the induction process for new staff members. Where source segregation and material re-use techniques apply, each member of staff will be given instructions on how to comply with the CDWMP. Site notices will be designed to reinforce the key messages within the plan and will be displayed prominently for the benefit of staff.

8.0 WASTE RECORDS

When establishing the system for managing the details of all arisings, movement and treatment of construction and demolition waste in the CDWMP, the use of electronic tools should be considered to provide for convenient recording of information in a useful format such as "Smart – waste".

The Contractor will be required to arrange for full details of all arisings, movements and construction and demolition waste to be recorded during all stages of the proposed development. Each consignment of construction and demolition waste removed from the site will be documented in the form of a Waste Movement Record form, which will ensure full traceability of the material to its final destination. Separate record forms will be completed in respect to each waste transfer that takes place. The Contractor will also receive printed documents/records from waste disposal companies employed, quantifying the exact amount of waste material removed from site. The sheet from the disposal company also identifies how much material went to landfill and how much went for recycling. All such records will be retained in a designated location and made available for auditing of the CDWMP.

9.0 SUMMARY OF THE CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN

Waste will inevitably be generated during the construction and demolition phase of the River Suir Sustainable Transport Bridge. It is intended that all steel and concrete will be imported for use within the project area. At this stage it is anticipated that there will be no excavated material for re-use on-site.

Other than spoil material from excavations, waste arisings during the construction phase will be minimised by the purchasing manager, who will time the ordering of materials so as to reduce the likelihood of over-purchase or damage during storage. Construction and demolition waste fractions will be segregated and stored on-site in designated areas or containers in the waste storage area prior to transport by licensed hauliers to facilities for segregation recycling and disposal.

A WMC will be appointed to ensure that the CDWMP is followed. Training will be given to all staff so that they are aware of the CDWMP and know their responsibilities.

Records will be kept to trace the inputs and outputs of the construction works at the site and this should allow the Employer to make informed decisions regarding waste management in the future. These records will be made available to the relevant local authorities and the EPA should it be required.

The design and implementation of the detailed CDWMP, in conjunction with the EOP for the River Suir Sustainable Transport Bridge, will provide for the optimum planning/management and handling of waste generated by the project and will ensure that there will be no worse than a neutral or imperceptible impact from waste management practices during construction.

The contractor appointed to undertake the construction of the River Suir Sustainable Transport Bridge will develop their own CDWMP based on their detailed plans, the requirements of this outline plan, the requirements of the EIAR, the requirements of the NIS and any commitments given as part of the project approval process and the Employer's requirements and specifications for executing the River Suir Sustainable Transport Bridge.

ROUGHAN & **O'DONOVAN CONSULTING ENGINEERS**

Arena House
Arena Road
Sandyford
Dublin 18
D18 V8P6
Ireland

Phone +353 1 294 0800
Email info@rod.ie