Chapter 18:
Mitigation Measures

ROD
ROUGHAN & O'DONOVAN

Chapter 18 Mitigation Measures

18.1 Introduction

Mitigation measures are the measures proposed in order to avoid, reduce or, where possible, remedy the significant adverse environmental effects of the proposed Trinity Wharf Development. Mitigation measures have been incorporated into the design of the proposed bridge and will be applied during both the construction and operation phase where they have been assessed as necessary.

This chapter provides a summary of the mitigation measures for the Trinity Wharf Development as contained within chapters 4 – 17 of the Environmental Impact Assessment Report (EIAR). This is a summarised version stating only the mitigation measures to be provided and does not discuss the requirement for the measure to be applied or the residual impacts. This chapter also deals only with mitigation measures to be applied to the Trinity Wharf Development and does not address the avoidance or reduction mitigation which has been applied through the design development.

18.2 General Mitigation and Monitoring Measures

Table 18.1 General Mitigation and Monitoring Measures

No.	Description
1.1	**Site Preparation Works** Prior to any work commencing on the development site, a boundary security will be required to be established around the site to prevent unauthorised access.
1.1.1	Further asbestos surveys, intrusive asbestos surveys and site investigation and a Remediation Strategy will be developed prior to site clearance works and the subsequent construction of the site. The Asbestos Surveys and a Remediation Strategy will inform the site clearance strategy and removal of asbestos from the site. All site clearance works will be required to be undertaken by a suitably qualified, experienced and licensed asbestos contractor.
1.1.2	All site clearance and excavation works will be required to follow the mitigation measures of this EIAR (Chapter 4 and 8) as well as any future mitigation measures to be detailed in the Remediation Strategy. For all site clearance works and excavation works suitably qualified, experienced and licensed personnel will be required to undertake this specialist work in accordance with the 'measures for working with asbestos'. Any ACMs discovered will be required to be disposed of by a licenced contractor to a licenced waste facility in accordance with waste management legislation, as appropriate.
1.2	The '**Asbestos Survey and Remediation Strategy'** are currently in progress at the time of writing this EIAR. The following sections detail the stages involved in undertaking the Asbestos Survey and Remediation Strategy, any recommendations or mitigation from these surveys and reports will be required to be incorporated into the CEMP at construction stages. The Asbestos Survey and subsequent Remediation Strategy, as recommended by RSK (detailed in Appendix 8.1 of this EIAR) will be required to be undertaken as follows:
1.2.1	Prior to the start of any construction works, a site specific intrusive asbestos survey will be undertaken by a suitably qualified, licenced and experienced contractor to work with asbestos – that is being progressed at the time of writing this EIAR. The aim of the asbestos survey report is to determine the full extent, type and location of all surface and near surface ACMs and will include representative sampling as appropriate. A number of stages will occur as recommended by RSK walkover survey (detailed in Appendix 8.1) and will occur in the following order:

No.	Description
	a) Undertake an intrusive investigation including representative sampling as appropriate to identify any potential sub-surface asbestos contamination within the demolition material stockpiled in various locations across the site. b) Undertake a target intrusive investigation comprising trial pits and / or slit trenches to determine the extent of any possible asbestos in fill material and below floor slabs across the site. The site investigation will be required to be scoped to cause minimal disturbance to any surface ACMs identified and all suitable control measure implemented to prevent exposure to asbestos throughout the works. The investigation should only be undertaken and supervised by personnel suitably qualified to work with asbestos on site of this nature.
1.2.2	Develop a Remedial Strategy for the site on completion of the survey and investigations to detail the work required to mitigate the risks associated with asbestos contamination identified and to prevent the potential release of asbestos fibres during the proposed development works. The appointed contractor will be required to have the appropriately qualified and experienced to work with asbestos. a) A method statement and evidence of competencies will be required to be provided to WCC in advance of undertaking such the remedial strategy.
1.2.3	Remediation Verification Report: All mitigation measures proposed by the contractor to prevent the spread of asbestos or risk of fibre release and all associated remedial works implemented will be independently validated prior to proceeding with the redevelopment of the site.
1.3	**Measures for Working with Asbestos** All construction works will be undertaken in line with the Control of Asbestos Regulations (CAR) 2012 which requires actions to ensure the protection of workers and general public from asbestos exposures relating to work activities. CIRIA SP168 "Asbestos in soil and made ground: A guide to understanding and managing risks" as well as all relevant waste management legislation will also be adhered to by contractors. During the site clearance works and the construction stage of the proposed development, the following mitigation measures are to be implemented, which will be in addition to standard health and safety practices on construction sites: **Training –** All personnel removing, overseeing, directing, inspecting and/or disturbing ACMs and asbestos-contaminated soil will have, as a minimum and as appropriate to the activity, relevant training and experience in working with asbestos and/or asbestos in soils awareness. **Personal Protective Equipment (PPE)** – All personnel working with or in the vicinity of areas where asbestos is suspected or has been previously identified must wear personal protective equipment to include disposable category 5 coveralls. **Air monitoring** will be conducted during the disturbance of suspected ACMs as part of the site clearance works and during construction works. Where air monitoring is required it must be carried out by a UKAS accredited analyst in accordance with the method set out in HSG248 Asbestos; The Analysts' Guide for Sampling Analysis and Clearance Procedures. **Dust Suppressant** – Asbestos and Vehicle Management will be incorporated for the site clearance works and construction works to minimise the potential for the spread of contamination. Where material is to be stored on site it will be kept covered with polyethylene sheeting or sprayed with sufficient amounts of water to prevent drying out and dust generation. **Access and Vehicle Management** – A site wide traffic management system will be incorporated for the site clearance works and construction works to minimise the potential for the spread of contamination. Internal site routes will be agreed with the Main Contractor and asbestos contractor in advance of the works and all surfaces will be subject to regular inspection. Any haulage trucks transporting ACMs must be properly covered and sealed to ensure that no spillages can occur en-route. All haulage trucks must be inspected by the asbestos supervisor prior to transport and leaving site.

No.	Description
	Decontamination of Plant - All plant and machinery, which is to be used in the removal of surface ACMs or disturbance of soils containing asbestos, will be fully decontaminated before leaving the area. No plant will be allowed to leave the works area until it has been decontaminated and passed a visual assessment by a competent person. **Decontamination of Personnel** - It must be assumed that clothing and equipment that has come into contact with asbestos is contaminated and must be treated as such. A designated area with appropriate welfare facilities should be provided for personnel to change into PPE and RPE prior to any asbestos remedial works commencing. **Waste Management** - Any handpicked asbestos debris and used coveralls, disposable masks and filters will be double-bagged in red and clear bags, labelled appropriately and stored in a designated container on site. The container will be secured and kept locked at all times. All asbestos waste will be removed by an appropriately licensed waste contractor. All waste transfer documentation will be retained by the contractor and copies provided to the Project Manager and appointed environmental consultant. Any waste from the cleaning down and decontamination of plant and equipment will also be disposed of to a suitable licensed facility. **Unexpected discovery of asbestos** – If suspect asbestos-contaminated soils or materials are discovered during the construction phase in areas not previously identified or suspected, or in quantities not previously identified or suspected, the contractor will stop work immediately and leave the area until specialist advice is sought by the appointed asbestos consultant that is suitably qualified, experienced and licenced. The area will be demarcated with barrier tape, or other means, and access restricted. During the construction phase, these measures are to apply to elements of the works that are likely to encounter ACMs during its construction, such as the foul water pumping station, breaking up of the existing sea wall (where necessary) and the excavation works required to construct foul drains and other elements of the main site works.
1.4	**Design Approach to Asbestos Risk Mitigation** The approach taken to the management of risk of ACMs on the Trinity Wharf site is to minimise exposure to ACM materials by design. In so far as is possible, the development has been designed, and will be detailed, to avoid disturbance of buried ACMs and to leave them in-situ. Some design decisions that will achieve this aim are summarised as follows: • Advance clearance works by a specialist asbestos contractor to remove all surface asbestos fragments; • Cap the existing site with a barrier layer and fill above (to average total of c. 1.5m depth) with granular imported fill material; • Foundations for all buildings will be constructed on driven piles, thereby avoiding exposure to potentially asbestos-contaminated arisings; • Service trenches will be generally shallow and will be within the granular fill layer. During the detailed design stage, the locations of deeper trenches or chambers will avoid areas of asbestos contamination, where possible; and • Pending receipt of intrusive investigation data, it is assumed that there is asbestos present below existing concrete floor slabs visible on the site. Therefore, it is proposed that these concrete slabs will be left in-situ, in so far as is possible, in order to minimise the potential health hazards involved in breaking the slab. The asbestos surveys and the remediation strategy (described above) will confirm the required approach at detailed design stage. Where ACM disturbance is unavoidable, e.g. if buried ACMs are discovered at the location of the foul pumping station or deeper service trenches, excavation will be carried out by a suitably qualified, experience and licenced contractor under the supervision of the Site Environmental Manager (SEM) and the excavations made safe to prevent exposure of subsequent construction workers to ACM risk. In the event of ACMs having to be

No.	Description
	excavated, these will be dealt with in accordance with best practice standards by suitably qualified and trained personnel and disposed of to a licenced facility, as required.
1.5	**Construction Environmental Management Plan** Prior to any demolition, excavation or construction a Construction Environmental Management Plan (CEMP) will be produced by the successful contractors for each element of the proposed development. The CEMP will set out the Contractor's overall management and administration of a construction project. An Outline Construction Environmental Management Plan has also been prepared as part of this EIAR, see Appendix 4.1. The CEMP will be prepared by the Contractors during the pre-construction phase, to ensure commitments included in the statutory approvals are adhered to, and that it integrates the requirements of the Construction Erosion and Sediment Control Plan (CESCP), Environmental Operating Plan (EOP) and the Construction and Demolition Waste Management Plan (C&D WMP). The Contractors will be required to include details under the following headings: • Details of working hours and days; • Details of emergency plan – 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 Local Authority – 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 to prevent nuisance (demolition & construction); • Site run-off management; • Noise and vibration management to prevent nuisance (demolition & construction); • Landscape management; • Management of all contaminated land including asbestos and assessment of risk for same by suitably qualified, trained and licenced personnel; • Management of demolition of all structures and assessment of risks for same; • Stockpiles; • Project procedures & method statements for; o Site clearance, site investigations, excavations and working with asbestos containing materials (ACMS); o Management and removal of ACMs; o Demolition & removal of buildings, services, pipelines (including risk assessment and disposal); o Diversion of services; o Excavation and blasting (through peat, soils & bedrock); o Piling; o Construction of pipelines; o Temporary hoarding & lighting; o Borrow Pits & location of crushing plant; o Storage and Treatment of peat and soft soils; o Disposal of surplus geological material (peat, soils, rock etc.);

No.	Description
	○ Earthworks material improvement; ○ Protection of watercourses from contamination and silting during construction; • Site Compounds. The production of the CEMP will also detail areas of concern with regard 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.
1.6	**Environmental Operating Plan** The Environmental Operating Plan (EOP) is defined as 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 a construction project. Essentially the EOP is a project management tool. It is prepared, developed and updated by the Contractors 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 An Bord Pleanála's decision 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 Environmental Operating Plan (EOP) in accordance with the TII/NRA *Guidelines for the Creation and Maintenance of an Environmental Operating Plan*. The EOP will set out the Contractors approach to managing environmental issues associated with the construction of the road 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 National Parks and Wildlife Services 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; and • 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 person 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.
1.7	The TII/NRA Environmental and Construction Guidelines provide guidance with regard to environmental best practice methods to be employed in construction on National Road Schemes for the following: • 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 1.6.1for 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;

No.	Description
	• Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes; • Guidelines for the Management of Waste from National Road Construction Projects; • Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan. This is a non-exhaustive list and relevant guidance current at the time of construction will be followed. It is proposed to employ these guidelines, as and where relevant, on the Trinity Wharf project.
1.8	Included within the EOP will be the Construction & Demolition Waste Management Plan (C&D WMP) which clearly sets out the Contractor's proposals regarding the treatment, storage and disposal of waste. An outline C&D WMP has been prepared for the proposed road development. The C&D WMP is a live document that will be amended and updated to reflect current conditions on site as the project progress. The obligation to develop, maintain and operate a Waste Management Plan 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 - 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.

18.3 Mitigation and Monitoring Measures for Traffic and Transport

Table 18.2 Mitigation and Monitoring Measures for Traffic and Transport

No.	Description
2.1	**Transportation Mobility Management Plan** A Mobility Management Plan has been prepared for the proposed development. The purpose of the Mobility Management Plan is to assist the tenants achieve a modal shift away from single occupant vehicles as a means of getting to and from work. A modal shift will ease the pressure on traffic and car parking facilities surrounding the site. The primary elements of the Transportation Mobility Management Plan are; • An assessment of the development in terms of its accessibility by all modes of transport, • Recommendations consisting of physical measures and good working practices that encourage and make it easier for staff and visitors to travel to the site by public transport, car sharing, walking or cycling, • Setting modal split targets with on-going monitoring and assessment.
2.2	**An Accessibility Implementation Plan** will be prepared by the organisers if an event held at the cultural performance building coincides with office working hours. The objective of the Accessibility Implementation Plan is to ease transport and parking pressures on the site and on the surrounding network. The main elements of the Accessibility Implementation Plan will; • Implement the VMS system at the site entrance to provide real time information on the availability of parking within the site.

No.	Description
	• Provide details of alternative Town Centre car parks. The plan will ensure that event attendees are advised of other events in the town centre that may affect the availability of Town Centre car parking. • Notify attendees of the on-site parking limitations and encourage the use of alternative modes of transport such as public transport. The plan will ensure adequate public transport is scheduled to service the event. • Plan coach parking arrangements.
2.3	**A Construction Environmental Management Plan (CEMP)** in accordance with the Outline CEMP provided as Appendix 4.1 of this EIAR and an associated Construction Traffic Management Plan (CTMP) will be prepared by contractor(s) in consultation with the developer and Wexford County Council to confirm the nature of any and all mitigating road works; the programme for deliveries during the construction period; and, any and all mitigating traffic management measures, prior to commencing any works at the proposed development site. The CTMP will detail environmental measures aimed at minimising adverse environmental effects associated with traffic and transport during construction. Maintaining access for emergency services during the course of the construction programme will also be considered and included as part of the Construction Traffic Management Plan. It is acknowledged that the Construction Traffic Management Plan will include a requirement that the condition of the road infrastructure on the access routes to and from the site via the urban road network will be recorded before and after completion of the construction phase. Visual inspections will also be undertaken and recorded at regular, frequent intervals, to ensure that the existing road infrastructure remains in an acceptable condition throughout the duration of construction activities, or, should evidence of any defects arise during the construction period, remedial actions and/or works can be put in hand forthwith. Wheel washes for construction vehicles will be provided (if necessary) at the development site to prevent mud and dust being brought onto the public road. The site entrance, the access road and Trinity Street will be monitored and swept clean when necessary. Construction vehicles and site personnel will be required to adhere to the approved access routes and timing restrictions. Construction plant, equipment and vehicles will be parked onsite. No vehicles associated with the proposed development will be parked on the public roads. Additional measures will also be required to minimise potentially significant environmental effects occurring from the transportation of construction materials such as: • Ensuring the proper transport of materials e.g. vehicle loads will be enclosed or covered with tarpaulin to restrict the escape of particulate matter; and • Proper servicing and maintenance of vehicles will be undertaken to avoid any leaks or spills of oil, petrol or concrete.

18.4 Mitigation and Monitoring Measures for Population and Human Health

Table 18.3 Mitigation and Monitoring Measures for Population and Human Health

No.	Description
3.1	All mitigation measures detailed in Chapter 4 Description of the Proposed Development of this EIAR will be required to be implemented. A CEMP and an associated Construction Traffic Management Plan will be developed to address all modes of transport and will be agreed with Wexford County Council prior to the

No.	Description
	construction stage. The TMP will be required to maximise the safety of the workforce and the public and minimise traffic delays, disruption and maintain access to properties. • The Construction Traffic Management Plan will be required to maximise the safety of the workforce and the public and to minimise traffic delays, disruption and maintain access to properties; • The Construction Traffic Management Plan will also address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points; • The Construction Traffic Management Plan will be developed and agreed with Irish Rail; • The contractor will provide an appropriate information campaign for the duration of the construction works; and • The Construction Traffic Management Plan will be required to minimise disruption to economic amenities, marine users and residential amenities. The Plan will be approved by Wexford County Council prior to construction and will ensure access is maintained along Trinity Street for vehicles, pedestrians, cyclists and economic operators at all times.
3.2	Appropriate measures relating to working at heights and near water will be included as part of the EOP. Ringbuoys will be installed and maintained as part of construction design stage in consultation with search and rescue organisations in the area;
3.3	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 CESCP, EOP and the CDWMP;
3.4	A Transportation Mobility Management Plan will be developed and will address all modes of transport required as part of the construction stages i.e. road and Wexford Harbour. This will include details regarding haulage routes and construction compounds;
3.5	The contractor will be required to develop and implement a Stakeholder Management and Communication Plan which will be agreed with Wexford County Council prior to the construction stage. • All stakeholders will be required to be agreed with Wexford County Council prior to construction commencing; and • Details of the general construction process/phasing will be communicated to the relevant stakeholders prior to implementation to ensure local residents and businesses are fully informed of the nature and duration of construction works;
3.6	In order to minimise air quality impacts within the community, a Dust Management Plan will be implemented. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of this plan, as detailed in Chapter 13 Air Quality and Climate in this EIAR;
3.7	Noise and vibration mitigation measures are discussed in detail in Chapter 12 Noise and Vibration of this EIAR. A comprehensive Construction Management Plan, which includes adopting appropriate mitigation measures, will manage the risk of noise impacting the local community. The contractor will work within stringent construction limits and guidelines to protect residential and commercial amenities, including the application of binding noise limits and hours of operation. These measures will ensure that noise and vibration impacts will be reduced as far as possible.
3.8	The contractor will be required to implement a vibration monitoring programme at a select number of the nearest residential properties during the most critical phase(s) of construction e.g. pile driving.
3.9	An Accessibility Implementation Plan (AIP) will be prepared by the organisers if an event is held at the cultural performance building which coincides with office working hours. The objective of the AIP is to ease transport and parking pressures on the

No.	Description
	site and on the surrounding network. The AIP will involve a Variable Message Sign (VMS) system which can provide real time information on the availability of parking within the site and provide details of alternative car parks elsewhere. The plan will be required to ensure adequate public transport is scheduled to service the event.
3.10	A Transportation Mobility Management Plan will be developed in order to identify the measures that will be implemented to promote sustainable modes of transport and reduce the use of the private car in accordance with Smarter Travel Policy. This should include details of Workplace Travel Plans to encourage employers and employees to take steps to reduce dependency on the car and to take alternative transport options.
3.11	The recommended mitigation measures detailed in Chapter 10 Hydrology of this EIAR will be implemented to address the potential risk of flooding.

18.5 Mitigation and Monitoring Measures for Biodiversity

Table 18.4 Mitigation and Monitoring Measures for Biodiversity

No.	Description
4.1	**Mitigation by Avoidance** The proposed development minimises landtake from ecologically sensitive areas and has been constraints-led from the initial phase, through an iterative design process; and, into the final proposed development. The design has followed the basic principles outlined below to eliminate the potential for ecological impacts on Key Ecological Receptors where possible and to minimise such impacts where total elimination is not possible. The proposed development has been selected to avoid, as far as possible, direct, in-direct or secondary adverse impacts on Natura 2000 sites or other sites designated for nature conservation. The proposed development has been designed to minimise direct or indirect impacts on any habitats or species or other ecological features that were classified as being of Local Importance (Higher Value) or above. All piling within the Harbour will be restricted to the periods between the 1st June and the 31st January to avoid impacts on migratory fish.
4.2	**Mitigation by Design** The proposed development has been developed having regard to European and national legislation and all relevant guidelines in relation to ecology and engineering best practice for the planning and construction of proposed developments. These guidelines and best practice provide practical measures that can be incorporated into the design to minimise the impact and protect the receiving environment. The following is an overview of the design measures that will be employed to minimise and avoid significant impacts on the ecological receptors within the Zone of Influence:
4.2.1	An Outline Construction and Environmental Management Plan (OCEMP) has been produced to ensure that the construction does not lead to any unanticipated negative impacts on the environment. A Construction Environmental Management Plan (CEMP) and Environmental Management Plan will be completed by each Contractor in line with Appendices 4.1 and 4.2 of this EIAR prior to construction works commencing.
4.2.2	Vibratory driven sheet piles forming the sea wall on the site perimeter and the option of tubular steel piles, screw piles (helical anchors), or, weighted anchors with chains for the foundation of the marina and boardwalk elements (to be decided during detailed design) have been selected as their installation minimises disturbance and landtake from benthic habitats and mudflats.
4.2.3	The lighting plan has been designed to minimise impacts on biodiversity. Low level downward facing bollard lighting or illuminated strips have been selected along the seaward perimeter to minimise light spill outside of the footpaths (See Figure 4.19 in Volume 3). All luminaries will be LED which lack UV elements and will have peak

No.	Description
	wavelengths greater than 550nm (~3000°K). This will produce a warm white colour, and, in tandem with maintaining the minimum allowable lux levels, will reduce the impacts on bats and other wildlife.
4.2.4	Street lights will be located so that the rear shields are adjacent to the estuary and planted areas or optics are selected that stop back light.
4.2.5	The drainage has been designed to provide a high level of attenuation and water quality controls, as described in detail in Chapter 04: Description of the Proposed Development.
4.2.6	The buildings will have blue-green roofs. Species will include native coastal species and a variety of sedums which are pollinator friendly. The landscaping of the site will include trees, shrubs and a wildflower meadow which will provide opportunities for nesting and foraging birds. Details of the Planting Plan are in Appendix 4.6 which includes Drawing No. L-PP-01.
4.2.7	A suitably qualified Project Ecologist and Marine Mammal Observer (this can be the same person) will be appointed by Wexford County Council for the duration of the proposed development.
4.2.8	Each contractor will appoint a Site Environmental Manager to carry out environmental monitoring and to ensure that the mitigation measures proposed in this EIAR is followed.
Specific Mitigation Measures	
	Key Ecological Receptor 1 & 2 – Mudflats and Benthic Habitats & River Slaney/ Wexford Harbour Waterbody
4.3	**Habitat Loss** The loss of estuarine habitats cannot be mitigated for. In spite of the permanent loss of these habitats, this impact is considered insignificant given the total area is small (2302m^2 or <0.024% of these habitats within Wexford Harbour), has low faunal diversity (ASU, 2018) and is not an important area for wintering birds (Natura, 2016). Water will still be allowed to circulate underneath the marina and boardwalk and the new hard surfaces to which epifauna and seaweeds will attach, will add to the species diversity in the area (ASU, 2018).
4.4	**Water Quality** ***Construction Phase***
4.4.1	<u>*Sedimentation and surface water run-off*</u> • In order to attenuate flows and minimise sediment input into the River Slaney 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. • Sheet piling for the new seaward site boundary shall be installed prior to any excavation on the landward side (other than the access road and level crossing) and demolition of the existing wharf boundary. This will form an effective barrier to run-off from the site during construction. • Any material stockpiled shall be located a minimum of 30 m from the seaward boundary of the site and shall also be covered and remain stockpiled for as short a time as possible. • The Contractors shall provide method statements for weather and tide/storm surge forecasting and continuous monitoring of water levels in Wexford 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. • The placing of anchor blocks (if required) shall be undertaking so as to minimise disturbance of sediment from the sea-bed. Should local excavation of the seabed

No.	Description
	be required it shall be carried out behind a geotextile screen and boom with oil barrier to prevent pollution of the river/estuary.
4.4.2	<u>*Cementitious materials*</u> 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 Slaney from the landside elements of the construction. However, the following measures shall also apply: • All shuttering shall be securely installed and inspected for leaks prior to concrete 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 Slaney, 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 Slaney from the in-stream elements of the construction, concrete structural elements shall be pre-cast, wherever possible. • Where concrete or other wet materials are to be used over water, appropriate bunded platforms shall be in place to capture any spilled concrete, sealants or other materials. • Any such materials collected on these platforms shall be disposed of in accordance with the Construction and Demolition Waste Management Plan (CDWMP) (Appendix 4.1).
4.4.3	<u>*Hydrocarbons and other chemicals (See also Chapter 09 and 10 of this EIAR)*</u> • Land-based vehicles and plant shall be refuelled off-site, where possible. • All land-based fuelling of machinery shall be undertaken on an impermeable base in bunded areas at least 50 m from the seaward boundary of the site. • Marine based fuelling will only be undertaken using specifically designed nozzles to prevent spillages and spill kits will be available. • All fuelling equipment shall be regularly inspected and serviced. • Any petrol- or diesel-fuelled pumps or other machinery shall be located within temporary bunded units. • All fuel, oils, chemicals, hydraulic fluids, on-site toilets etc. shall be stored in the construction site compound, on an impermeable 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. • All waste oils, empty oil containers and hazardous wastes shall be disposed of in accordance with the Waste Management Act, 1996 (as amended). • Owing to the presence of contaminants within the construction site, excavation shall be limited to the absolute minimum necessary.
4.4.4	<u>*Painting of the boardwalk*</u> • Paints containing organotin compounds, e.g. TBT, shall not be permitted. • In order to minimise the risk of paint spillage into Wexford Harbour, the majority of the deck shall be painted over land, prior to be lifted into position over the estuary, and painting of the remaining sections (mostly at joining points) shall be carried out above bunded platforms which will capture any spilled paint.

No.	Description
4.5	**Water Quality** *Operational Phase* The surface water drainage of the proposed development will include blue-green roofs, rain gardens at building perimeters and soft landscaping features such as vegetated swales. The surface water drainage design will allow for storage during a 1-in-100-year flood event. The surface water drainage for the development site comprises a Sustainable Drainage System (SuDS) approach. The surface water drainage network will drain by gravity to the outfall locations around the site and will be designed to store the 1 in 100-year 6-hour rainfall event plus climate change (between tidal cycles). Surface water run-off from the proposed multi-storey car park will pass through a hydrocarbon interceptor. Details of the drainage for the proposed development are presented in Section 4.3.4.4 of Chapter 04. The foul sewer will be directed to the public wastewater infrastructure. The risk to the River Slaney has been found to be low and the potential impact assessment is deemed to be imperceptible. See further impact assessment in Chapter 09 Hydrogeology. The bye-laws listed in the Wexford County Council Harbour and Piers Bye-Laws 2014 will apply to vessels using the proposed marina.
4.6	**Lighting and Shade** *Construction Phase* 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. Construction lighting within 10m of the estuary shall be turned off outside of working hours. In addition, construction lighting will be limited to the minimum area required to be lit. The Project Ecologist will ensure that these measures are adhered to during the construction stage.
4.7	**Lighting and Shade** *Operational Phase* The lighting plan has been designed to minimise impacts on biodiversity. Low level downward facing bollard lighting or illuminated strips have been selected along the seaward perimeter to minimise light spill outside of the footpaths, and onto the estuary (See Figure 4.19 in Volume 3). All luminaries will be LED which lack UV elements and will have peak wavelengths greater than 550nm (~3000°K). This will produce a warm white colour, and in tandem with maintaining the minimum allowable lux levels, will reduce the impacts on bats and other wildlife. Owing to the scale of the proposed development, neither its construction nor its operation has the potential to give rise to significant shading impacts on the River Slaney.
	Key Ecological Receptor 2 – Migratory Fish
4.8	***Noise and Vibration*** The following are the mitigation measures which will apply to all pile driving for the marina, boardwalk and outer sea wall: • There shall be no pile driving of the marina, boardwalk and sea wall permitted in the period beginning on 1st February and ending on 31st May in any year. • All pile driving of the marina, boardwalk and sea wall shall be restricted to Monday to Friday, inclusive, i.e. there shall be no pile driving on Saturdays or Sundays. • Pile driving shall be restricted to between 7:00 am and 7:00 pm from 1st June to 30th September, inclusive, and to between 8:00 am and 6:00 pm from 1st October to 31st January, inclusive.

No.	Description
	• All breaks between pile driving of the marina and boardwalk 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. This measure shall not apply to vibratory driven piles for the sea wall. • A 30-minute soft-start/ramp-up procedure shall apply to each pile drive. This measure shall not apply to vibratory driven piles for the sea wall. • A trained and experienced Marine Mammal Observer (MMO) shall be appointed by WCC to perform that function in accordance with DAHG (2014) and the MMRA which is included in Appendix 7.3. • If, for any reason, a derogation from any of the above is required, this shall only be permitted with the consent of WCC, the NPWS and IFI. • All of the above measures shall be enforced by the WCC Project Ecologist and the SEM appointed by each Contractor.
	Key Ecological Receptor 3 – Otter
4.9	**Pre-construction Otter Survey** Prior to any works being carried out, a pre-construction otter survey will be undertaken to ensure that no otters have taken up residence within 150m of the proposed development.
	Key Ecological Receptor 4 – Marine Mammals
4.10	• A qualified and experienced Marine Mammal Observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms. • Unless further information specific to the location and proposed development is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with WCC, NPWS and IFI, pile driving activity shall not commence if marine mammals are detected within a 500m radial distance of the pile driving sound source. • **Pre-Start Monitoring** Pile driving activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible. An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO. The MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO. This prescribed Pre-Start Monitoring shall subsequently be followed by an appropriate Ramp-Up Procedure which should include continued monitoring by the MMO. • **Ramp-Up Procedure** In commencing a pile driving operation where the output peak sound pressure level (in water) from any source including equipment testing exceeds 170 dB re: 1µPa @1m an appropriate Ramp-up Procedure (i.e., "soft-start") must be used. The procedure for use should be informed by the risk assessment undertaken giving due consideration to the pile specification, the driving mechanism, the receiving substrate, the duration of the activity, the receiving environment and species therein, and other information (see section 3 of Appendix 7.3 of the EIAR).

No.	Description
	Where it is possible according to the operational parameters of the equipment and materials concerned, the underwater acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20-40 minutes. This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period. Where the measures outlined in the previous steps are not possible, alternatives must be examined whereby the underwater output of acoustic energy is introduced in a consistent, sequential and gradual manner over a period of 20-40 minutes prior to commencement of the full necessary output. In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment. Once an appropriate and effective Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone. • **Breaks in sound output** If there is a break in pile driving sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down or location change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken. For higher output pile driving operations which have the potential to produce injurious levels of underwater sound (see Appendix 7.3 MMRA sections 2.4, 3.2) as informed by the associated risk assessment, there is likely to be a regulatory requirement to adopt a shorter 5-10 minute break limit after which period all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as for start-up. • Reporting Full reporting on MMO operations and mitigation undertaken must be provided to the NPWS. • Monthly seal surveys of known and potential seal haul-out sites will be carried out immediately prior to and during the marine works. This is to ensure there are no changes in use of these sites and to provide the NPWS with useful monitoring data. These seal surveys will be carried out by the site MMO concurrent with implementing NPWS guidelines. • Signage at the marina will provide information to boat owners about the importance of Wexford Harbour for seals. It will also give information on how to avoid disturbance and signs of disturbance (head up etc).
	Key Ecological Receptor 6 – Bats
4.11	Lighting during the construction phase will avoid direct illumination of the estuary. Follow the removal of vegetation within the sites, new areas will be planted which will include pollinator friendly, and therefore bat friendly species. The lighting plan has been designed to minimise impacts on biodiversity. Low level downward facing bollard lighting or illuminated strips have been selected along the seaward perimeter to minimise light spill outside of the footpaths (See Figure 4.19 in Volume 3). All luminaries will be LED which lack UV elements and will have peak wavelengths greater than 550nm (~3000°K). This will produce a warm white colour, and, in tandem with maintaining the minimum allowable lux levels, will reduce the impacts on bats and other wildlife.
	Key Ecological Receptor 7 – Invasive Species
4.12	• Prior to any works being carried out, a pre-construction invasive species survey will be undertaken to ensure that additional invasive have not been introduced to

No.	Description
	areas within or close to the proposed development footprint. The Invasive Species Management Plan that is currently in place is presented in Appendix 7.4. • Vessels associated with the construction of the sea walls, the boardwalk and the marina have the potential to introduce invasive species to Wexford Harbour. Vessels should adhere to the industry recommended guidelines for preventing the introduction of non-native marine species. UKMarineSAC (2009) recommends that vessels comply with International Maritime Organisation guidance wherever possible, seek guidance from the Wexford Harbour authority regarding areas where ballast water uptake should be avoided (e.g. near sewage outfalls), encourage the exchange of ballast water in the open ocean, and discourage/prohibit the unnecessary discharge of ballast water in the harbour area. • Signage will be put in place at the marina informing the public of the marine invasive species that are associated with small craft and marinas and the importance of boat maintenance.
	Key Ecological Receptor 8 – Birds
4.13	The protection of bird breeding habitats during the breeding season (1st March to 31st August, inclusive), are set out in the Wildlife Acts. Any removal of vegetation within this period will require the supervision of a suitably qualified and experienced ecologist to ensure no breeding birds are present. As part of the landscaping of the site, trees, shrubs, a hedgerow and a wildflower meadow will be planted (Appendix 4.6, Drawing No. L-PP-01 (Planting Plan). This will provide nesting and feeding opportunities for birds. Bird-friendly glass (e.g. www.ornilux.com), which will reduce the reflectivity of glass facades and windows, will be used on all buildings.
4.14	**Ecological Enhancements** • Eight No. 17A Schwegler Swift Nest Boxes (triple cavity) will be incorporated into the development. These will be positioned on the north faces of the buildings out of the prevailing wind and at least 4.5m high. The type and position should be confirmed by the Project Ecologist. *Notes on the Common Swift and Setting up nest boxes* (Linda Huxley, 2014) provides guidance on setting up swift boxes. • Ten bird boxes will be placed around the site. These should include boxes for a variety of species and should be placed out of direct sunlight and the prevailing wind. The positioning of the bird boxes should be decided by the Project Ecologist. • Signage with information relating to the biodiversity of Wexford Harbour will be installed at the proposed development location to encourage an understanding and respect for the natural environment of the area. This will refer specifically to disturbance by boats and loose dogs.

18.6 Mitigation and Monitoring Measures for Soils and Geology

Table 18.5 Mitigation and Monitoring Measures for Soils and Geology

No.	Description
5.1	Prior to the start of any construction works further asbestos surveys, intrusive asbestos surveys and site investigation and a Remediation Strategy will be developed prior to site clearance works and the subsequent construction of the site. The Asbestos Surveys and a Remediation Strategy will inform the site clearance strategy and removal of asbestos from the site. All site clearance works will be required to be undertaken by a suitably qualified, experienced and licensed asbestos contractors.
5.2	All site clearance and excavation works will be required to follow the mitigation measures of this EIAR in this Chapter and those (detailed in Chapter 4 and 8) as

No.	Description
	well as any future mitigation measures to be detailed in the Remediation Strategy (to be completed). For all site clearance works and excavation works suitably qualified, experienced and licensed personnel will be required to undertake this specialist work in accordance with the 'measures for working with asbestos'. Any ACMs discovered in areas required for excavation, will be required to be disposed of by a licenced contractor to a licenced waste facility in accordance with waste management legislation, as appropriate.
5.3	The 'Asbestos Survey and Remediation Strategy' will be undertaken prior to construction. All mitigation measures/ recommendations from these surveys and the remediation strategy will be required to be implemented as part of the proposed development.
5.4	Remediation Verification Report will be produced to demonstrate that all mitigation measures proposed by the contractor to prevent the spread of asbestos or risk of fibre release and all associated remedial works implemented will be independently validated prior to proceeding with the redevelopment of the site.
5.5	'Measures for working with asbestos' as detailed in Chapter 4 shall be implemented by contractors as appropriate as part of the construction phase.
5.6	The specialist contractor will ensure secure containment and transport of all contaminated materials to the appropriate licenced waste disposal facility.
5.7	Contractors shall be required to submit and adhere to a Construction Method Statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works. All associated hazardous waste residuals will also be stored within temporary bunded storage areas prior to removal by an appropriate EPA approved waste management contractor for off-site treatment/recycling/disposal. Any other building waste will be disposed of within on-site skips for removal by a licensed waste management contractor. The contractor will be required to submit a Construction and Demolition Waste Management Plan to the Council for approval which will address all types of materials to be disposed and the location of the licenced waste disposal facilities that will be used, as appropriate.
5.8	Imported good-quality granular soils materials and rock armour revetment will be imported from local sources where possible. The nearest suitable licensed quarries are outlined in the Section 4.4.10 of the Chapter 4.
5.9	To minimise any impact on the underlying subsurface strata from material spillages, all fuels, oils, solvents and paints used during construction these will be stored within specially constructed temporary bunded areas or within dedicated bunded containers. Spill kits and hydrocarbon adsorbent packs will be stored on the site compound and operators will be fully trained in the use of this equipment. Fuel for vehicles will be stored in a mobile double skinned tank.
5.10	In order limit the risk to human health and the surrounding aquatic environment by exposure to contaminated material through excavation, it is proposed to retain the majority of the made ground in place. The current ground level across the entire site will be raised for the proposed development (1.5m raise on average), using imported good quality granular material. It is also proposed that the uppermost 250mm of this material will comprise of compacted clay with a low permeability of 1 x 10-7 ms-1 to limit infiltration to percolating water. A minor volume of excavated material planned to be excavated pertaining to the foul sewage pump-out station and any deep service trenches or chambers will be identified during detailed design. Temporary works design and monitoring will ensure that the there are no unacceptable ground movements and settlements of the adjacent ground. This material will be required to be tested for contaminants.
5.11	All buildings will rely on driven piles for foundations. This will minimise the need for the excavation and handling of the made ground layer and soft alluvial layers beneath it, as no in-situ ground needs to be displaced or handled during the execution of this type of piles.

No.	Description
5.12	Sheet piles forming the sea wall on the site perimeter and the option of either bored piles or tubular steel piles and screw piles (helical anchors) for the foundation of the marina and boardwalk elements (to be decided during detailed design) are also selected as their installation requires no excavation or dredging. A sheet-piled wall will provide a new sea wall for the site, raising the site level to meet flood requirements and providing a barrier to contain contaminated material within the site.
5.13	The rock armour revetment and the armour underlayer will be placed directly on in-situ riverbed silt, in order to avoid the need for the handling and removal of contaminated silt.

18.7 Mitigation and Monitoring Measures for Hydrogeology

Table 18.6 Mitigation and Monitoring Measures for Hydrogeology

No.	Description
6.1	A project-specific Construction Environmental Management Plan (CEMP) and Environmental Operating Plan (EOP) will be prepared by the contractors for the development in line with the Outline CEMP and EOP appended to this EIAR (see Appendices 4.1 and 4.2). For the phased elements, it will be maintained by the separate Contractors for the duration of the construction phase. The EOP CEMP will cover all potentially polluting activities and include an emergency Incident Response Plan procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the CEMP and EOP for the proposed development will be formulated in consideration of the standard best practice.
6.2	Earthworks shall be carried out such that surfaces promote runoff and prevent ponding and flooding.
6.3	Runoff will be controlled and treated to minimise impacts to surface and groundwater.
6.4	Prior to any works taking place on-site, a comprehensive and detailed ground investigation programme shall be undertaken to fully quantify the nature and extent of contaminated material present at the site
6.5	All material excavated at the site shall be assumed to be contaminated. Appropriate testing of this material by a suitably qualified and licenced waste contractor shall take place for all aspects of ground contamination and the material shall be disposed of off-site to a suitably licenced waste facility. Temporary storage of any contaminated material on-site shall be carefully managed so as to limit any risk of contaminated surface water runoff to the River Slaney Estuary. The material shall be stored at least 25m away from the high-water mark in the estuary. Runoff from the material shall be directed to lined pond or temporary sewer/tank and the water shall be disposed of off-site for treatment at an appropriate licenced facility. Alternatively, the material shall be covered while stored to remove the risk of surface water contamination.
6.6	Excavations into the existing ground for the installation of the foul drainage network, foul pumping station, deep service trenches and surface water drainage network serving the proposed access road off Trinity Street and the swale along the southern boundary of the site will be required. The material removed will be assumed to be contaminated and will be appropriately disposed of (as outlined in the point above). Suitable backfill material to the pipes will be imported to site. A 250mm layer of imported clay will be placed beneath the swale to prevent the infiltration of rainwater to the underlying subsoil and therefore prevent mobilisation of contaminants into the underlying gravels and weathered bedrock.
6.7	Where temporary pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.

No.	Description
6.8	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.
6.9	Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during construction.
6.10	Mitigation measures during the construction phase will include implementing best practice during excavation works to avoid sediment entering Wexford Harbour.

18.8 Mitigation and Monitoring Measures for Hydrology

Table 18.7 Mitigation and Monitoring Measures for Hydrology

No.	Description
7.1	A project-specific Construction Environmental Management Plan (CEMP) and Environmental Operating Plan (EOP) will be prepared by the contractors appointed for the development following the Outline CEMP attached as Appendices 4.1 and 4.2 to this EIAR. The CEMP will list any difficulties encountered and it will be maintained by each Contractor for the duration of the construction phase. The CEMP and EOP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the CEMP and EOP for the proposed development will be formulated in consideration of the standard best practice. The following will be implemented as part of this plan: • A draft Incident Response Plan detailing the procedures to be undertaken in the event of spillage of chemical, fuel or other hazardous wastes, non-compliance incident with any permit of license or other such risks that could lead to a pollution incident, including flood risks; • All necessary permits and licenses for in stream construction work for provision of the sea walls, boardwalk and marina works will be obtained prior to commencement of construction; and • Inform and consult with Inland Fisheries Ireland (IFI) and Waterways Ireland (WI). The draft CEMP and EOP will be developed by the selected construction contractors to suit the detailed construction methodology and allocate responsibilities to individuals in the construction team.
7.2	During construction, cognisance will have to be taken of the following guidance documents for construction work on, over or near water. • Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Eastern Regional Fisheries Board) • Central Fisheries Board Channels and Challenges – The enhancement of Salmonid Rivers. • CIRIA C532 Control of Water Pollution from Construction Sites Guidance for Consultants and Contractors. • CIRIA C648 Control of Water Pollution from Constructional Sites. • Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA/TII, 2006).
7.3	Based on the above guidance documents concerning control of constructional impacts on the water environment, the following outlines the principal mitigation measures that will be prescribed for the construction phase in order to protect all catchment, watercourse and ecologically protected areas from direct and indirect impacts: • Exposure of contaminated material shall be minimised by placing the low permeability clay capping layer immediately following initial site grading and clearance works. Grading works shall progress in a manner which always allows

No.	Description
	runoff to be directed towards a temporary treatment facility without surface ponding. This will minimise contact time between the contaminated material and surface water and thus limit the opportunity for contamination to occur. Runoff which has been in contact with exposed contaminated material will be captured and directed to a temporary lined facility, where the flow will be attenuated and sediment allowed to settle, before passing through a hydrocarbon interceptor and being discharged to Wexford Harbour. • Should temporary dewatering be required during deep excavations within the contaminated material, strict control measures will be put in place for disposal of same. Water pumped from excavations within the contaminated material shall either be passed through the temporary surface water treatment/attenuation facilities before discharge to Wexford Harbour or discharged to a foul sewer. Should very heavily contaminated groundwater be encountered during deep excavations and pumping be required of same, temporary dewatering shall be either collected and discharged to a foul sewer via tanker or treated on-site by way of a temporary water treatment works. Groundwater samples shall be taken from boreholes across the site in advance of construction works taking place to determine which method of disposal is required. Specialist advice will be sought as to the most appropriate form of treatment required as determined by the pre-construction groundwater sampling results. The works shall be planned in an appropriate manner so as to minimise the need for construction dewatering. Where excavation into contaminated material does take place, control measures to limit or prevent surface water runoff from entering the excavation shall be incorporated. These measures may include shoring, sheet piling, benching/battering or embankment of the excavation perimeters. • All construction compound areas will be required to be set back a minimum of 50m from the seaward boundary of the site. Protection of waterbodies from silt load will be carried out through use of grassed buffer areas, timber fencing with silt fences or earthen berms to provide adequate treatment of runoff to watercourses. • In order to attenuate flows and minimise sediment input into Wexford Harbour through run-off, all surface water run-off from the construction site shall be directed to a temporary facility, where the flow will be attenuated and sediment allowed to settle, before passing through a hydrocarbon interceptor and being discharged to Wexford Harbour. An impermeable membrane overlaid with suitable fill will be provided to storage areas to prevent contamination or pollution of the groundwater. • Settlement ponds, silt traps and bunds will be used where appropriate and construction within watercourses will be minimised. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap. General Constructional Compounds will not be permitted within 50m of Slaney River Valley SAC and Wexford Harbour and Slobs SPA. It may, however, be necessary to locate temporary storage areas adjacent to the Slaney Estuary when the marina and flood protection works are being undertaken. Measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the estuary. This will primarily be in the form of silt fences which will be installed along the compound boundary to stop 'dirty' surface water runoff from entering the estuary without treatment. • Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with the NRA/TII document "Guidelines for the crossing of watercourses during the construction of National Road Schemes". All chemical and fuelling locations will be contained within bunded areas and set back a minimum of 50m from watercourses. • All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery shall be steam cleaned and

No.	Description
	checked prior to commencement of in-stream works to avoid spread of invasive species. • Oil booms and oil soakage pads should be maintained on-site to enable a rapid and effective response to any accidental spillage or discharge. • No refuelling of construction plant shall be undertaken while the vehicles are in or adjacent to watercourses, as this could lead to contamination of the watercourse through spillage of fuel. In addition, all construction vehicles entering the watercourse should be in good condition, and be provided with drip trays to prevent pollution through dripping of oil or fuel from the vehicle. • Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent pollution; • The construction discharge will be treated such that it will not reduce the environmental quality standard of the receiving watercourses; • Any surface water abstracted from a watercourse for use during construction will be through a pump fitted with a filter to prevent intake of fish. • The use and management of concrete in or close to watercourses will be carefully controlled to avoid spillage. Washout from concrete mixing plant will be carried out only in a designated contained impermeable area. • 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. • 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. • Any concrete used in or over the estuary shall be pre-cast, where possible. • Where concrete or other wet materials are to be used over water, appropriate bunded platforms shall be in place to capture any spilled concrete, sealants or other materials. • A geotextile screen and boom with oil barrier will be required around such marine works to prevent runoff, silt, oil or other deposits generated by construction activities such as boring in overburden or rock from polluting the river. • Any materials collected on these platforms shall be transferred to the landside construction areas and disposed of in accordance with the CDWMP. • The placing of anchor blocs (if required) shall be undertaken so as to minimise disturbance of sediment from the sea-bed. Should local excavation of the seabed be required it shall be carried out behind a geotextile screen and boom with oil barrier to prevent pollution of the river/estuary.
7.4	**Morphological Changes to Surface Watercourses & Drainage Patterns** SuDS components will convey runoff to the Lower Slaney Estuary, while attenuation will be provided for the 1 in 100 year 6-hour event. The conveyance of runoff to the Lower Slaney Estuary will generally follow the existing site topography. The implementation of these proposed mitigation measures reduces the impact to imperceptible.
7.5	**Hardstanding Runoff** As a result of the increase in hardstanding areas, runoff from the site will increase. The proposed surface water drainage system will comprise predominantly SuDS features which will attenuate and cleanse the surface water runoff from the site prior to discharge to sea through multiple outfalls located along the extent of the proposed sea wall. Whilst the base of the permeable paving and grassed swales will allow some limited percolation to the underlying subsoils, the portion percolating portion is expected to be minimal due to the incorporation of a low permeability clay layer across the entire site. The surface water drainage system will be designed to store the 1 in 100 year 6 hour-rainfall event plus a climate change factor (between tidal cycles). The OPW

No.	Description
	FSU Portal calculates this rainfall depth to be 80.76mm. Attenuation of surface water runoff will occur within a layer of coarse graded clean aggregate material installed below the permeable paving which will have a voids ratio of typically 30%. These proposed mitigation measures reduced the associated impact from hardstanding runoff from moderate/significant to slight. The provision of permeable paving within the development will negate the need to provide numerous individual petrol interceptors throughout the development. Treatment to runoff generated will be provided within the pavement layers through the processes of filtration, biodegradation, adsorption of pollutants and the settlement and retention of solids within the pavement layers.
7.6	**Foul Drainage Infrastructure** In the event of a pump failure at the proposed foul pumping station, mitigation measures have been proposed. The pumping station has been designed to provide 24-hour effluent storage in case of failure. Standby pumps will also be provided.
7.7	**Implications for Designated Sites** It is proposed that surface water from the proposed development discharges to the Slaney Estuary, which is an environmentally sensitive area. Mitigation measures that will be implemented include the design of a surface water drainage system to serve the proposed development. The proposed surface water drainage system will comprise predominantly SuDS features which will attenuate and cleanse the surface water runoff from the site prior to discharge to sea through multiple outfalls located along the extent of the proposed sea wall (with some limited percolation into the subsoil). The incorporation of a SuDS based approach will ensure that discharge will be controlled, and treatment of runoff will take place within the SuDS components. The implementation of these mitigation measures will reduce the associated impact from moderate/significant to imperceptible.
7.8	**Flood Risk Mitigation** The flood risk associated with the proposed development is deemed to be moderate to significant. As discussed in Section 10.4.3, the following minimum levels will be required within the site: • To satisfy the Wexford Town and Environs Development Plan 2009-2015 (as extended) all buildings as part of the proposed development must have a minimum floor level of 2.64mOD. • As per the OPWs Flood Risk Management Guidelines for Local Authorities (2009) "Less vulnerable developments" such as local transport infrastructure must have a minimum level of 2.34mOD. The lowest proposed finished floor level for the development is 3.3mOD, while the lowest road level will be at 2.80mOD (generally 3.5mOD). In addition to the flood risk measures above, a new steel sheet pile sea wall is to be provided along the northern, southern and eastern edges of the site as part of the development, while sections of the northern, eastern and southern sides will comprise a combined sheet pile/rock armour revetment wall. A sheet pile driving rig will mobilise and begin driving sheet piles in front of the existing sea wall to approximately -10.5mOD into the stiff gravelly clay. The existing wall will remain in place until the sheet pile wall is correctly installed and only then will be demolished and removed from the site. Construction of the rock armour revetment will involve suitable boulders being placed directly onto the silt/sediment of the seabed. The marina will also be sheltered by a breakwater on the seaward side. This will involve driving pile sockets for the breakwater units and the pontoon walkways into the seabed. Vertical steel piles will then be grouted into the pile sockets to give good line and plumbness. Alternatively, helical anchors can be drilled into the seabed via a barge at the location for the lower terminal of anchor chains that will connect and secure the breakwater units and pontoon walkways and finger berths.

No.	Description
	The actual method of securing the marina elements (i.e. piled restraints or chained restraints) will be subject to ground investigations during detailed design phase. The proposed marina breakwater, sea wall and rock armour revetment along the perimeter of the site will protect the development against storm surge and wave action.

18.9 Mitigation and Monitoring Measures for Landscape and Visual Analysis

Table 18.8 Mitigation and Monitoring Measures for Landscape and Visual Analysis

No.	Description
8.1	**Construction Phase** The measures proposed revolve around the implementation of appropriate site management procedures – such as the control of site lighting, storage of materials, placement of compounds, delivery of materials, car parking, etc. Visual impact during the construction phase will be mitigated somewhat through appropriate site management measures and work practices to ensure the site is kept tidy, dust is kept to a minimum, and that any publicly accessible areas are kept free from building material and site rubbish. Site hoarding will be appropriately scaled, finished and maintained for the period of construction of each section of the works as appropriate. To reduce the potential negative impacts during the construction phase, good site management and housekeeping practices will be adhered to. The visual impact of the site compound(s) and scaffolding visible during the construction phase are of a temporary nature only and therefore require no remedial action other than as stated above. General construction measures are outlined in the Outline Construction Environmental Management Plan and Outline Environmental Operating Plan as per Appendices 4.1 and 4.2 of this EIAR which must be undertaken by all contractors.
8.2	**Operational Phase** Mitigation measures were largely included in the design of the project. The design statement refers to the design rationale, and extensive analysis was undertaken to arrive at the proposed design. The design process analysed the buildings and streetscape in the vicinity of the site and design responses took into account the following; • The proposed development is in the context of the Wexford Quays Economic Action and Spatial Implementation Plan which aims to connect the site to the Crescent and Paul Quay area and has a number of aims for the surrounding town. • The scale and height of the buildings (5-6 storeys) was designed to relate to the existing buildings along Paul Quay, particularly when seen from the Ferrybank and Wexford Bridge areas. It was decided that buildings taller than this would have a greater visual effect on the overall harbour. • The scheme creates connectivity to the town centre and allow for public access by linking Trinity Wharf to Paul Quay via a boardwalk, and also proposed public realm improvements in the Paul Quay area. Other options which connected to the Trinity Wharf site along the railway line were considered but this would have required security fencing and barriers for the railway line, so the connection of a boardwalk at Paul Quay is considered to be preferable and results in a more visually attractive connection that maximises the waterfront location. • The design of the proposed hotel building was amended and re-oriented to maximise public access to the waterfront in the location with the most remarkable views on the site

No.	Description
	• The proposed design includes provision of public spaces and walkways including a waterside route and viewpoints, to enhance the views from the site and thus enhance a key characteristic of the site. • The landscape plan proposed to enhance the site's character with tree and shrub planting to emphasise the natural character and setting of the site and create a buffer of suitable and robust vegetation along the railway line to integrate development into wider landscape. The landscape design strategy included in Appendix 4.6 of the EIAR will be implemented as part of the design.

18.10 Mitigation and Monitoring Measures for Noise and Vibration

Table 18.9 Mitigation and Monitoring Measures for Noise and Vibration

No.	Description
9.1	It is recommended that the contract documents should clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS5228-1 2009. These measures will typically include:
9.1.1	No plant used on site will be permitted to cause an ongoing public nuisance due to noise.
9.1.2	The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
9.1.3	All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
9.1.4	Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
9.1.5	Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
9.1.6	Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
9.1.7	Location of plant shall consider the likely noise propagation to nearby sensitive receptors.
9.1.8	During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 2 using methods outlined in BS5228:2009 Part 1.
9.2	**Working Hours** Normal working times will be 07:00 to 19:00hrs Monday to Friday and 08:00 to 16:00 Saturday. Works other than the pumping out of excavations, security and emergency works should be avoided outside of these periods.
9.3	**Emergency Work** The emergency work may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies and other services which have been interrupted, repair to any damaged temporary works and all repairs associated with working on public roads.
9.4	A suitable perimeter hoarding around the site on three sides will provide an effective method of reducing noise propagation from the site. This hoarding will need to be phased as it can only be constructed along the northern and southern boundaries once the sea wall and anchors in those locations have been constructed. It shall be erected along the railway boundary as soon as practicable during site setup. The hoarding shall be regularly inspected by the Site Environmental Manager and a Site

No.	Description
	Engineer to ensure the adequacy of the hoarding from a noise and visual perspective. Technical specifications on the acoustic performance of suitable hoardings can be found the UK's Design Manual for Roads and Bridges HA 66/95 which gives guidance on acoustic performance, forms of construction and physical properties of materials.
9.5	A vibration monitoring programme will be required to be adopted at a select number of the nearest residential properties during the most critical phase(s) of construction e.g. pile driving, etc.
9.6	A general noise management strategy will be required to be developed as part of the development and management of the marina and café/ restaurant uses including hours of operation, training for staff and signage to notify the public of the potential effect their activities, particularly at night, may have on nearby residents.

18.11 Mitigation and Monitoring Measures for Air Quality and Climate

Table 18.10 Mitigation and Monitoring Measures for Air Quality and Climate

No.	Description
10.1	**Air Quality** The pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the dust management plan. The key aspects of controlling dust are listed below. Full details of the dust management plan can be found in Appendix 13.3 and includes the following: • The specification and circulation of a dust management plan for the site and the identification of persons responsible for managing dust control and any potential issues; • The development of a documented system for managing site practices with regard to dust control; • The development of a means by which the performance of the dust management plan can be monitored and assessed; • The specification of effective measures to deal with any complaints received. At all times, the procedures within the plan will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.
10.2	**Climate** Construction traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to short-term and temporary nature of these works, the impact on climate will not be significant. Nevertheless, some site-specific mitigation measures can be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.
10.3	**Monitoring** Monitoring of construction dust deposition at nearby sensitive receptors (residential dwellings) during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the

No.	Description
	German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days.

18.12 Mitigation and Monitoring Measures for Archaeological and Cultural Heritage

Table 18.11 Mitigation and Monitoring Measures for Archaeological and Cultural Heritage

No.	Description
11.1	The avoidance of direct or indirect impacts on archaeological heritage is the preferred mitigation measures. Where this is not possible the following archaeological mitigation measures are proposed:
Pre-Construction Measures	
11.2	**Archaeological Testing or Monitoring** Dependent on the nature of foundations proposed for individual structures within the proposed development archaeological testing or archaeological monitoring may be required where sub-surface development works are to be undertaken. This is particularly important in the northern corner of the site where it is possible that the remains of the nineteenth century dock infrastructure still exist below the current ground surface and at the site of the holy well (RMP WX037-038) where it is possible that features survive below ground.
11.3	**Underwater Archaeological Impact Assessment** An underwater archaeology walkover inspection was undertaken by ADCO on the 11th December 2018 at Low Water. The mitigation measures included in their report are reproduced here while their full report is included in Appendix 14.3.
11.3.1	An Underwater Archaeology Impact Assessment (UAIA) of the area to be impacted by the proposed marina and boardwalk will be carried out prior to any construction works. Such work is licensed by the National Monuments Service. The work will be carried out as part of the required UAIA, which will inspect the known underwater archaeological elements adjacent to the development area.
11.3.2	In the event that the underwater assessment identifies features that will be impacted by the construction phase, further archaeological mitigation will be required and may include investigation and excavation.
11.3.3	An Archaeological Topographic Survey of the reclaimed land area and associated intertidal elements is required to capture a detailed pre-disturbance record of the existing land surfaces. The work will prepare detailed topographic mapping that enables metrically accurate 1:20 plan, elevation and section drawings. It will be necessary to capture an above ground stone-by-stone record of the dockyard walls and fabric. The record will serve as the permanent record of this element that will be destroyed or otherwise permanently buried by the development.
Construction Phase Measures	
11.4	A review of the site investigation logs to assess the nature of the buried strata will be undertaken.
11.5	**Archaeological Monitoring of Ground and Seabed Disturbance** Archaeological Monitoring of Ground and Seabed Disturbance activities during the construction phase and associated elements, with the proviso to fully resolve any archaeological features identified. Such work is licensed by the National Monuments Service.

No.	Description
11.6	**Archaeological Excavation and Preservation In Situ** Should the results of the mitigations outlined above indicate the requirement for archaeological excavation and/or preservation *in situ*; this will be undertaken as per best practice and in consultation with the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht.
Project Management Measures	
11.7	AN ARCHAEOLOGICAL CONSULTANT experienced in and specialising in maritime archaeology should be appointed to the project to advise the design team on archaeological matters, liaise with the state regulators, prepare archaeological licence applications and complete archaeological site work.
11.8	ARCHAEOLGICAL MONITORING is licensed by the National Monuments Service at the Department of Culture, Heritage and the Gaeltacht. The application for such a licence requires a detailed method statement, outlining the procedures to be adopted to monitor, record and recover material of archaeological interest during such work. Licence applications take four (4) working weeks to be processed and must be granted before archaeological-related work can commence.
11.9	THE TIME SCALE for the project should be made available to the archaeologist, with information on where and when the various elements and ground disturbances will take place.
11.10	SUFFICIENT NOTICE. It is essential for the developer to give sufficient notice to the archaeologist/s in advance of works commencing. This will allow for prompt arrival on site to undertake additional surveys and to monitor ground disturbances. As often happens, intervals may occur during the construction phase. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.
11.11	DISCOVERY OF ARCHAEOLOGICAL MATERIAL. In the event of archaeological features or material being uncovered during the construction phase, it is crucial that any machine work cease in the immediate area to allow the archaeologist/s to inspect any such material.
11.12	ARCHAEOLOGICAL MATERIAL. Once the presence of archaeologically significant material is established, full archaeological recording of such material is recommended. If it is not possible for the construction works to avoid the material, full excavation would be recommended. The extent and duration of excavation would be a matter for discussion between the client and the licensing authorities.
11.13	ARCHAEOLOGICAL TEAM. It is recommended that the core of a suitable archaeological team, including an archaeological dive team, be on standby to deal with any such rescue excavation. This would be complimented in the event of a full excavation.
11.14	SECURE SITE OFFICES and facilities should be provided on or near those sites where excavation is required.
11.15	SECURE WET AND DRY STORAGE for artefacts recovered during the course of the monitoring and related work should be provided on or near those sites where excavation is required.
11.16	ADEQUATE FUNDS to cover excavation, post-excavation analysis, and any testing or conservation work required should be made available.
11.17	MACHINERY TRAFFIC during construction must be restricted as to avoid any of the selected sites and their environs.
11.18	SPOIL should not be dumped on any of the selected sites or their environs.

No.	Description
11.19	POST-CONSTRUCTION PROJECT REPORT AND ARCHIVE. It is a condition of archaeological licensing that a detailed project report is lodged with the DCHG within twelve (12) months of the completion of site works. The report should be to publication standard and should include a full account, suitably illustrated, of all archaeological features, finds and stratigraphy, along with a discussion and specialist reports. Artefacts recovered during the works need to meet the requirements of the National Museum of Ireland.
11.20	The recommendations listed above are subject to the approval of the National Monuments Service at the Department of Culture, Heritage and the Gaeltacht.

18.13 Mitigation and Monitoring Measures for Architectural Heritage

Table 18.12 Mitigation and Monitoring Measures for Architectural Heritage

No.	Description
12.1	Avoidance of architectural heritage is the preferred mitigation measure, however either direct or indirect impacts on architectural heritage is likely to occur as a result of the development where avoidance is not possible. Mitigation by architectural record involves the production of a written account generally supplemented by measured drawing and a photographic survey. The level of recording will depend on the significance of the structure in question. Any architectural features within the site including the former boundary wall (BH 10) running northeast-southwest through the site and the stone wall (BH 11) along the western boundary of the site should be subject to architectural recording prior to their removal.

18.14 Mitigation and Monitoring Measures for Material Assets and Land

Table 18.13 Mitigation and Monitoring Measures for Material Assets and Land

No.	Description
13.1	There are no specific mitigation measures in relation to Material Assets. The design of the development has accommodated the necessary improvements in infrastructure to service the site, without having impacts on infrastructure along Trinity Street. The provision of the proposed utilities and services will facilitate the required needs of the development without impacting on any existing utilities.