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Addendum to EIAR Chapter 5 Biodiversity, Species & Habitats Suir Island Infrastructure Links



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5 Addendum to EIAR Chapter 5 Biodiversity, Species and Habitats

5.1 Introduction

Tipperary County Council submitted the Planning Application for the proposed Suir Island Infrastructure Links development on 25th September 2023. An Bord Pleanála issued a Request for Further Information (RFI) on 9th July 2024 in accordance with Section 51(4) of the Roads Act 1993, as amended.

RFI No. 5 stipulates that the response documentation should be in addendum format. Thus, this document sets out to address the necessary changes which pertains to EIAR Chapter 5 Biodiversity, Species & Habitats. This addendum addresses the following Biodiversity RFI Items:

- Item 3(c)(i) of the An Bord Pleanála further information request states:

“The EIAR outlines there will be no in-stream works and no direct loss or disturbance to instream habitats. However, the proposed development includes for the construction of temporary access ramp and installation of a pre-cast box culvert at the site area of a back-water flood channel to the south of Pier 1 which conveys water during flood events, with sheet piling proposed at this location. From application drawings submitted, the ground level of the culvert corresponds to the approx. base flow as indicated on plans (drawing no.2460) and is below the 10% and 50% AEP. It is also noted that proposed piers and abutment works located within the flood barriers/defences are below the level of AEPs, which is particularly the case for the proposed southern bridge (drawing no.2260). While it is noted that works will be timed to avoid flooding and will be temporary in nature, given the levels outlined and potential for flooding, consideration should be given to the potential impacts arising from instream works, and from instream works arising in periods of increased base flow and flooding. In the event of potential impacts being identified, appropriate mitigation measures addressing same are to be outlined, where applicable.”

- Item 3(c)(ii) of the An Bord Pleanála further information request states:

“Furthermore, having regard to the sensitive nature of the site and the potential for the development at this location to give rise to impacts on habitats, water quality and subsequent impacts on aquatic and otter species, consideration should also be given to potential impacts arising from enabling in-stream works and any machinery movements that may affect the river channels and/or riverbanks. In the event of potential impacts being identified, appropriate mitigation measures addressing same are to be outlined.”

- Item 3(c)(iii) of the An Bord Pleanála further information request states:

“Consideration should be given to the potential impact of lighting on otter species at construction and operational stages.”

To address the above RFI Items, this addendum includes the revisions or additions as shown in Red text. The following headings have been added under each of the respective chapter headings covering Impact Assessment, Mitigation and Monitoring Measures as per the original EIAR Chapter 5 Biodiversity, Species & Habitats and Conclusions:

- Installation of the Pre-Cast Box Culvert in the Floodplain Channel and Works at Piers & Abutments located in Floodplain to address Item 3(c)(i);
- Enabling Instream Works & Any Machinery Movements that May Affect the River Channels and/or Riverbanks to address Item 3(c)(ii);
- Potential Impact of lighting on otter species at construction and operational stages to address Item 3(c)(iii);

Revised Section(s)

5.4 Impact Assessment

5.4.2 Construction Impacts

Impact Assessment of the Installation of the Pre-Cast Box Culvert in the Floodplain Channel

A temporary pre-cast culvert will be installed in the floodplain channel to the south of Pier 1 so as to provide access to Pier 1 and maintain connectivity to the north and south of the access ramp to Pier 1 during the construction phase. The presence of the culvert will facilitate the flow of water through the floodplain channel during a flood event.

The floodplain channel is characterised by a muddy substrate supporting a stand of riparian/mixed broad-leaved woodland mosaic. The floodplain channel does not convey flowing water during normal river flow conditions.

During the installation and decommissioning of the box culvert and sheet piling there will be disturbance to the muddy substrate of the floodplain channel. In the event that installation works coincide with a flood event the potential will exist for any muddy substrate disturbed during the installation to become entrained and suspended in water flowing through the back channel and mobilised downstream. Spawning habitat for fish, such as Atlantic salmon and trout occur downstream of the floodplain channel along the main channel of the River Suir. The potential impact of the mobilisation of silt arising from installation and/or decommissioning works that coincide with a flood event will have the potential to include:

- The settlement of silt on spawning redds resulting in the infilling of intra-gravel voids and the smothering of eggs and newly hatched fish.
- The settlement of silt on riverbeds can smother and displace macroinvertebrates, reducing the prey resource for fish species.
- Suspended solids can settle in pool and riffle habitats resulting in a reduction in the availability and quality of rearing habitat for fish.
- Silt-laden runoff can result in a reduction in transparency, impairing the ability of fish and otters to find food.
- Suspended solids can abrade or clog salmonid fish gills. Whilst high concentrations of suspended solids are required to clog fish gills, small concentrations can result in abrasion to gills, which can in turn create the potential for infection.
- The settlement of silt on white-clawed crayfish refugia and loss of suitable instream conditions to support white-clawed crayfish.
- The loss of foraging resource for otters as a result in a degradation in suitable habitat for prey species and their migration away from the affected area.

Impact Assessment of Works at Piers and Abutments located within the Floodplain

The An Bord Pleanála further information request notes that the proposed Piers and Abutments are located below the level of the 1%, 10%; and 50% Annual Exceedance Probability AEPs.

The following elements are located within the flood barriers/defences, below the AEPs:

- Construction of the temporary access ramp to Pier No. 1;
- Construction of temporary sheetpiling around the access ramp to Pier No. 1;
- Installation of the access ramp culvert to Pier No. 1;
- Construction of temporary sheetpiling around Piers No. 1 to 3;
- All activities required to construct the piers including excavations, concrete formwork, concrete works, access scaffolding etc;

- Construction of elements located above, but in close proximity to the floodplain such as Abutment 02 and 03 located on the Suir Island flood defence berm;
- All rehabilitation works;

As such the construction phase associated with these elements will be inundated in the event of flood at 1% AEP or greater. Given this potential for contact between these elements and flood waters, in the event that any polluting materials are contained within these working areas, the potential for their emission to the river's flood waters will arise.

The potentially polluting materials that will be associated with the working areas of these elements will be restricted to exposed soils and subsoils and the release of excess sediment material to flood waters. No hydrocarbons, wet cement, grout, or other potentially contaminating fluids will be contained within the working areas associated with these elements of the project. Furthermore, as set out in Section 5.5.1 below no cement shall be cast if the forecast for the next 7-days is forecast to exceed or result in a 50% AEP flood event.

The release of excess sediment material from the working areas associated with these elements of the project will have the potential to become suspended in flood waters and transported downstream where they could settle on natural stone/cobble/gravel riverbed that are important for supporting spawning fish species such as Atlantic salmon, lamprey species and trout, as well as white-clawed crayfish and other aquatic invertebrates. The release of such material will have the potential to contribute to the impacts that are listed above.

Impact Assessment for Enabling Instream Works & Any Machinery Movements that May Affect the River Channels and/or Riverbanks

No works proposed as part of the project will be undertaken instream, which represents the extent of the River Suir that conveys flows during normal flow conditions.

The closest point of construction works to the riverbanks will be at Pier 01, Pier 02 and Pier 03 as well as abutments A01 and A04. Piers 01, 02 and 03 are located 2.4m; 6.5m; and 2.4m respectively from the nearest point of the river bankside. Abutment A01 is located 5.5m from the riverbank on the Quay, whilst Abutment A04 is located 10.5m from the riverbank at the verge of Raheen Road.

The movement of construction machinery can affect the integrity of riverbanks and ground stability where the underlying ground conditions are susceptible to disturbance and collapse.

All machinery that will be used during the construction phase of the project will be confined to the construction footprint. Machinery required to access the 3 no. Pier locations will comprise:

- 1 no. sheet piling rig
- 1 no. tracked excavator
- 1 no. rotary coring/drilling rig
- 1 no. small dumper truck

A drilling rig will also be required for the rotary bored piling of the piers. The drilling rig for Pier 01 will be positioned on the temporary access ramp to the south of the Pier 01 location. The drilling rig for Pier no. 2 will be positioned on the existing embankment to the north of Pier 02. The drilling rig for Pier 03 will be positioned to the south of Pier 03 on the Raheen Rd.

In order to establish the susceptibility of ground conditions at the Pier and Abutment locations to destabilisation and collapse detailed Site Investigations of the overburden occurring at each of the Pier and Abutment locations have been completed.

The Site Investigations were carried out in February and March of 2022 to determine the geotechnical environment in which to construct the proposed bridge foundations. Investigations were carried out in close proximity to the riverbank and the upper strata descriptions were assessed to estimate the bank

stability to ensure the bank does not subside due to the mechanical pressures applied by sheetpiling rigs or piling operations.

Standard Penetration Tests (SPT) were carried out to determine the relative density and angle of shearing resistance of cohesionless soils and also the strength of stiff cohesive soils of the bank. Based on the foregoing the upper strata can generally be described as brown grey sandy gravelly silty clay with medium cobbles and boulder content at Pier 02 and 03, whilst at Pier 01 the ground consists of brown grey sandy gravelly silty clay. SPT results classify the soils as loose to compact with relative densities (%) ranging between 20-60% and friction angles of 30-40°.

Rotary bored piling will be required to be undertaken during the installation of abutments A01 to A04 and for piers P01 to P03. The nearest pier or abutment to the river channel will be abutment A01 at approximately 5.5m from the riverbank on The Quay and pier P01 and P03 at approximately 2.4m from the river bankside of the northern and southern channel.

In addition to rotary bored piling for the piers and abutments, sheet piles will be installed via hydraulic piling as a temporary construction phase element to provide for a dry working area around Pier 01 to 03.

Following a review of the Site Investigations the project engineers have determined that given the presence of alluvial substrate at Pier 02 and Pier 03, the integrity of the ground will not be at risk of destabilisation as a result of machinery movements, rotary piling operations or sheet piling at or in the vicinity of these pier locations.

Following a review of the Site Investigations and in view of the ground conditions at Pier 01, the project engineers have determined that, in the absence of appropriate mitigation measures, machinery movements, rotary piling operations could present a risk to ground stability and bankside collapse at and in the vicinity of Pier 01. With regard to sheet piling operations at Pier 01 the project engineers have determined that these conditions are appropriate for the hydraulic installation of the sheet piles and will not present a risk to ground stability and bankside collapse.

In the event of ground failure and collapse of riverbank side, impacts to water quality and instream habitats relied upon by fish, aquatic invertebrates and otter will arise. These impacts are considered in Section 5.5 below.

Aside from the movement of machinery at Pier and Abutment locations, the works associated with piling are also identified as a potential source of disturbance to ground stability. It is noted that piling has been identified as the activity with the potential to generate the highest levels of noise emissions (see EIAR Chapter 9).

Notwithstanding the project engineer's determination that conditions are appropriate for the hydraulic installation of sheet piles, in the event¹ that the installation of the sheet piles, as well as the rotary bored piling operations and machinery movements, generate high levels of vibration, these operations could, in theory also undermine the stability of the banksides posing a risk of bankside collapse into the river.

A ground failure and collapse of riverbank as a result of works and machinery movements at Pier or Abutment locations will have the potential to result in a temporary and localised effect to instream habitats relied upon by fish, aquatic invertebrates and otters. The effect on such species will include:

- The settlement of silt on spawning redds resulting in the infilling of intra-gravel voids and the smothering of eggs and newly hatched fish.

¹ Note that such an event is considered unlikely given the ground conditions and approach that will be adopted for the sheet piling operations as detailed in Section 7.8 of the Natura Impact Statement and reproduced in Section 5.5.1 below.

- The settlement of silt on riverbeds can smother and displace macroinvertebrates, reducing the prey resource for fish species.
- Suspended solids can settle in pool and riffle habitats resulting in a reduction in the availability and quality of rearing habitat for fish.
- Silt-laden runoff can result in a reduction in transparency, impairing the ability of fish and otters to find food.
- Suspended solids can abrade or clog salmonid fish gills. Whilst high concentrations of suspended solids are required to clog fish gills, small concentrations can result in abrasion to gills, which can in turn create the potential for infection.
- The settlement of silt on white-clawed crayfish refugia and loss of suitable instream conditions to support white-clawed crayfish.
- The loss of foraging resource for otters as a result in a degradation in suitable habitat for prey species and their migration away from the affected area.

The effect is considered to be *temporary* and *localised* given the eroding nature of the River Suir at Suir Island and the limited area of river bankside that could be undermined (probability of which is *unlikely*).

Impact Assessment of lighting on otter species at construction and operational stages

Artificial nighttime lighting can result in effect otters through changes to their foraging resource, foraging success, social interactions and predation risk. Illumination of watercourses can result in a decrease in prey availability which in turn will diminish foraging success, with longer term consequences for productivity.

Construction phase or operation phase lighting that results in the illumination of the River Suir and associated banksides will have the potential to result in the above effects to otters.

5.5 Mitigation and Monitoring Measures

5.5.1 Construction

Mitigation Measures for Installation of the Pre-Cast Box Culvert in Floodplain Channel

All works associated with the installation of the pre-cast box culvert and associated sheet piling will be completed during periods of normal or ebb flow conditions when the floodplain does not contain flowing water.

- As highlighted in the EIAR Chapter 7 and associated hydraulic modelling report, only one pier shall be constructed at any one time, thus minimising the reduction in flow area in the floodplain and reducing the potential for adverse effects on the environment;
- All plant, personnel and equipment shall be removed from these works areas at the end of each working day (working hours stated in Section 5.3 of the OCEMP (Appendix 7.1 of EIAR Chapter 7 Hydrology));
- The contractor shall keep record of all rainfall forecasts to ensure works are completed, plant and equipment removed, and the works safeguarded 2-days prior to any major rainfall forecasts in the catchment area;
- The contractor shall liaise with the Clonmel Flood Defence Scheme and Early Warning System personnel on all major rainfall events;
- Method Statements and Procedures shall be compiled prior to the commencement of the works which shall be followed for each flood warning event;
- All formwork for the pier construction shall be so designed to withstand any flood event up to the 1% AEP;

- Standard formwork and scaffolding to be used within the floodplain works areas will be designed by a temporary works designer to withstand flood events exceeding the 1-in-2-year recurrence interval flood;
- No concrete shall be cast if the forecast for the next 7-days would exceed or result in a 50% AEP flood event, thus allowing concrete to cure sufficiently;
- No refuelling shall be permitted within the floodplain area;
- Dewatering of working areas shall strictly be carried out in accordance with Section 5.8 of the OCEMP (Appendix 7.1 of EIAR Chapter 7 Hydrology).
- Sheetpiling and all formwork shall be inspected on regular basis by temporary works designers to ensure works are secure prior to forecasted rainfall events.

Mitigation Measures for Works at Piers and Abutments located within the Floodplain

In order to minimise the risk of the release of excess sediment from working areas associated with these elements of the project leading up to and during potential flood events, the following measures will be implemented for the construction phase:

Construction at Pier 01; Abutment 02; Abutment 03; Pier 02; and Pier 03 will be undertaken sequentially so that works are undertaken at each of these elements individually. This will minimise the footprint of the construction phase working area that will be susceptible to flooding in the event of a flood.

Weather forecasting will be used to plan works at Pier 01; Abutment 02; Abutment 03; Pier 02; and Pier 03. Works will only be commenced during times when high rainfall events² that could trigger flooding are not forecast.

Upon commencement of works at each of Pier 01; Abutment 02; Abutment 03; Pier 02; and Pier 03 daily monitoring of the weather forecast will be undertaken. In the event that a high rainfall event is forecast during the working period, works will be discontinued, all plant, equipment and loose construction materials will be removed from the works area and the ground within the working areas will be compacted using a hand held mobile wacker plate to minimise the potential for mobilisation of sediment in the event of flooding and contact between the working area and flood waters.

Works will only resume after flood waters recede and no further high rainfall events are forecast.

The measure above to be carried in sequence and individually at Pier 01; Abutment 02; Abutment 03; Pier 02; and Pier 03 will minimise the potential for the release of sediment from the works area to flood waters and will ensure that any significant effects to the water quality of the river and instream habitats downstream are avoided.

For the decommissioning phase of temporary infrastructure that will facilitate works at the Piers and Abutments all imported soils will be carefully removed under the supervision of the site environmental manager and ECoW, whilst the temporary sheet piling remains in place. Reinstatement and rehabilitation will be carried out in unison to removal of soils and the sheetpiles and temporary culvert for Pier No. 1 will be removed by crane as no access will be possible following the removal of soils.

The decommissioning phase works of the temporary infrastructure will be subject to the same weather forecasting protocols as set out for the construction phase.

² The Met Eireann definition of a Yellow rainfall event, when rainfall is 20mm – 30mm in 6 hours or less; 30mm – 40mm in 12 hours or less; 30mm – 50mm in 24 hours is used to define the threshold level of a high rainfall event.

Mitigation Measures for Enabling Instream Works & Any Machinery Movements that May Affect the River Channels and/or Riverbanks

Whilst the risk to ground instability and riverbank failure arising as a consequence of machinery movements and piling works at Pier and Abutment locations has been assessed to be negligible, mitigation measures will be incorporated into the construction phase to further reduce the already negligible risk of such an event occurring.

This will be achieved by providing ground reinforcement at the Pier 1, Pier 2 and Pier 3 locations as well as at the Abutment 01 and 04 locations. The ground reinforcement will consist of temporary soil stabilisation materials/layers such as Reinforced and drainage trackbed separators and rock stability layers will be installed prior to traversing close to the bank.

A sequential approach shall be adopted to access Pier 01 consisting of the muddy substrate and potentially saturated soils. The methodology shall broadly consist of; creating short sections of enclosed sheetpiling blocks to minimise the ingress of ground water; the removal of saturated material if present; laying of geotextiles and the deposition of temporary rockfill layers within the enclosed section to provide construction platforms of suitable bearing capacity; and rehabilitation and reinstatement of muddy substrate following the completion of the works. The temporary rockfill layers to be used will be sourced from a certified quarry, will be of uniform graded materials, free of contaminants and compliance test certificates will be provided to site management upon delivery to site.

In addition, it is further noted that the temporary access ramp to Pier 01 has been designed to cater for an excess of the maximum capacity of machinery that will use the access ramp during the construction phase. It is further noted that all materials used for the construction of the temporary access ramp will be compacted, which will in turn minimise the potential for mobilisation of sediment from the access ramp during a flood event.

With respect to the piling operations to be undertaken at the pier and abutment locations it is noted that mitigation measures have been set out in Section 7.8 of the Natura Impact Statement. These mitigation measures are based on a piling method that will utilise rotary piling techniques.

This approach to piling for the piers and abutment foundations will reduce the potential for high impact (noise and vibration inducing) strikes or hammering. This coupled with the set-back distances of the pile locations from the river at all pier and abutment locations, as well as the presence of the bedrock and overburden between the river and the pile locations at piers and abutments, will ensure that no noise or vibration associated with the piling will have the potential to cause injury to fish (i.e. will not exceed the low guide value of the 183 dB within adjacent waters) within the river channel adjacent to the piling locations.

All piling works will be timed to occur outside the most sensitive time of the year when Atlantic salmon and lamprey species spawn along the section of the River Suir at Suir Island. River lamprey spawn along this section of the River Suir during springtime, between March and April (Gallagher et al., 2022); sea lamprey usually spawns in late May or June, when the water temperature reaches at least 15°C (Maitland, 2003) and surveys of sea lamprey spawning along this section of the River Suir coincides with this timeframe (Gallagher et al., 2019, 2020, 2022). Atlantic salmon spawn along this section of the River Suir during the winter and spring between November and March. In view of these spawning timeframes and taking into account the time of year when river flows are typically low, all piling works will be timed to be undertaken between mid-July and September.

In addition to the above the approach to the rotary piling will include a slow start-revving up procedure. This will involve slowly starting rotary piling and revving up the piling over a 30-minute period. This slow start period will allow noise-sensitive species to move away from the piling area and avoid injury.

The use of rotary bored piling will also ensure that vibration levels associated with this piling will be low and will not present a risk of undermining the integrity of adjacent riverbanks and their collapse.

In order to minimise to a low and insignificant risk the potential for sheet piling installation works to result in noise and vibration emissions and riverbank instability and collapse, the sheet piling to be used will be installed using hydraulic sheetpiling as opposed to hammer or vibratory installation. In addition, the sheetpiling will consist of interlocking steel panels, which will be driven through the overbank materials prior to any excavations occurring near the riverbanks. The interlocking/retaining nature of the sheetpiling will protect the riverbanks from destabilising during the piling operations and subsequent works within the sheet piled working area.

With the implementation of the above measures and as imposed in any Conditions and/or Restrictions in any Approval by the Competent Authority, the piling works during the construction phase will not result in adverse effects to Annex 2 fish species, white-clawed crayfish or otters supported by the stretch of the River Suir surrounding Suir Island.

Mitigation Measures for lighting on otter species at construction stage

In order to avoid potential impact to otters during the construction phase all works to be carried out within 10m of the River Suir will be required to be completed during daytime hours only. No works will be completed in these areas during nighttime. No construction phase artificial nighttime lighting will be permitted to illuminate the River Suir or the 10m buffer zone adjacent to the River Suir.

A lighting specialist will be engaged for the construction phase of the project. The lighting specialist will be responsible for assessing the zone of illumination associated with construction phase lighting and will, in collaboration with the project Ecological Clerk of Works and the Site Management, ensure that no construction phase lighting illuminates the River Suir and the 10m buffer area throughout the duration of the construction phase.

Mitigation Measures for general construction noise on otter species at construction stage

Any short-term disturbance to otters arising from noise generated during construction works and the presence of construction workers will be minimised to a low and insignificant level through the selection of construction plant and machinery and construction methods that minimise high noise emissions. Examples of this include:

The selection of quiet plant: This practice will be implemented in relation to static plant such as compressors and generators. These units will be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item will be selected.

Noise Control at Source: This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact. Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures shall be implemented:

- The use of machinery for lifting bulky items, dropping, and loading of materials within work areas should be restricted to normal working hours.
- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant shall be switched off when not in use and not left idling.
- For compressors, generators, and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.

- Demountable enclosures will be used to screen operatives using hand tools and will be moved around site, as necessary.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.
- Care will be taken when cleaning augers of piling rigs. Shaking and banging of the auger to loosen earth will be avoided.
- Use of pneumatic hand tools will be avoided at night-time and fixings should be manually tightened where possible.
- Site compounds will be located in excess of 30m from noise sensitive locations within on-the-ground constraints.

The implementation of the above noise minimise measures will ensure that noise emissions are minimised throughout the construction phase. This approach, along with the absence of any breeding or resting places for otters at or in the vicinity of the project site and the completion of all works in the vicinity of the River Suir and the 10m buffer area along the River Suir during daylight hours will ensure that any noise generated during construction or the presence of construction workers in such areas will not result in significant disturbance effects to otters.

5.5.2 Operational

Mitigation Measures for lighting on otter species at operational stage

The following measures will be implemented to minimise the impact of artificial night lighting to otters:

- The final lighting design will avoid light spill to the River Suir and adjacent bankside and the design will be required to demonstrate no change in light conditions on the river and adjacent 10m bankside with respect to baseline levels.
- The lighting for the bridge sections has been designed in accordance with the best practice guidelines for bats and lighting prepared by the Institute of Lighting Professionals and Bat Conservation Trust. The design of the lighting in line with these measures will also ensure that a sensitive approach to lighting has been adopted for all other light sensitive species, including otters.
- The following key requirements will be incorporated into the lighting design:
- Lighting will be controlled via movement sensors which will be triggered by human activity as people walk or cycle by at night. This lighting regime will reduce the overall time that the lighting is in use which will in turn reduce impacts on otters. Bespoke dimming regimes can be installed, or particular lighting units switched off or dimmed during periods of low-level use.
- All luminaires will lack UV elements and only LED luminaires will be used.
- Metal halide fluorescent have not been used in the design.
- A warm white spectrum light will be used to reduce blue light component
- The luminaires shall feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Other features that have been incorporated into the public lighting design include the following:
- Lighting will be based on movement sensors and so will not be on all the time.
- The lights have been designed to minimise light spill and no light will spill onto the river channel and adjacent 10m bankside, ensuring the potential impacts of lighting to otters is minimised. Only luminaires with an upward light ratio of 0% and with good optical control have been included in the lighting design
- Existing luminaires on the North Plaza and Raheen Road will have no upward tilt. The bespoke designed handrail lighting on the bridges, access ramps and stair will contain, but no light spill will arise as a consequence of the bespoke design.

- The provision of these lighting requirements as part of the operation phase lighting design will ensure that the provision of nighttime lighting will not result in adverse residual impacts to otters.

Conclusion

Conclusion for Installation of the Pre-Cast Box Culvert in Floodplain Channel

It is concluded that with all mitigation measures, as set out in the Natura Impact Statement and above implemented during the construction phase, in the event of interaction between flood waters and construction works areas, as specified above, there will be no potential for such interactions to result in significant negative effects to biodiversity receptors.

Conclusion for Works at Piers and Abutments located within the Floodplain

It is concluded that with all mitigation measures, as set out in the Natura Impact Statement and above implemented during the construction phase, in the event of interaction between flood waters and construction works areas, as specified above, there will be no potential for such interactions to result in significant negative effects to biodiversity receptors.

Conclusion for Enabling Instream Works & Any Machinery Movements that May Affect the River Channels and/or Riverbanks

It is concluded that with all mitigation measures, as set out in the Natura Impact Statement and above implemented during the construction phase, construction works adjacent to the riverbank at Pier and Abutment locations and machinery movement, will not have the potential to result in significant negative effects to biodiversity receptors.

Conclusion for lighting on otter species at construction and operational stages

It is concluded that with all mitigation measures, as set out in the Natura Impact Statement and above implemented during the construction and operation phase, lighting provided as part of the project will not have the potential to result in significant negative effects to otters.

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