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# EU Habitats Directive: Annex IV Risk Assessment

Uisce Éireann - Waterford City Wastewater  
Treatment Plant Upgrade Survey

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# 1. Introduction

Uisce Éireann is seeking a Marine Usage Licence (MUL) to undertake marine site investigations in the River Suir Estuary (Figure 1) to progress a Waterford City Wastewater Treatment Plant (WWTP) Upgrade. The proposed site investigation works comprise a suite of geophysical, geotechnical, bathymetric, ecological, archaeological and CCTV surveys within the River Suir estuary. Their purpose is to gather high-quality baseline data on seabed conditions, subsurface geology, environmental receptors and the condition of the existing outfall. This information is essential for determining the optimal route for a new marine outfall, informing the detailed engineering design, and potentially supporting future environmental consenting processes. All works are temporary and limited to the defined MUL area.

The proposed survey works are located within the Lower River Suir SAC (002137). The SAC is selected for a range of Annex I habitats, including *salt meadows*, *floating river vegetation*, *eutrophic tall herb communities*, *alluvial forests*, *old oak woodlands* and *yew woodlands*. In addition, the SAC supports a suite of Annex II species, namely freshwater pearl mussel (*Margaritifera margaritifera*), white-clawed crayfish (*Austropotamobius pallipes*), sea lamprey (*Petromyzon marinus*), brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), twaite shad (*Alosa fallax fallax*), Atlantic salmon (*Salmo salar*) and otter (*Lutra lutra*).

Geophysical Reconnaissance and Environmental Surveys are expected to last for approximately 16 weeks. Specific dates for the schedule are pending the issuing of a MUL. The primary objective of this survey is to gather data on the sub-surface geology. This information will be crucial in assessing the detailed design of the Waterford City WWTP outfall upgrade.

The proposed survey area, which corresponds to the MUL application area, is 71 ha. It encompasses an area of the Suir extending upstream from the existing Waterford City WWTP outfall location at Gyles Quay (Kilkenny) south to Little Island (Waterford) and eastwards to Bellview Port beyond the confluence of the Kings Channel and River Suir (Figure 1). This report provides an assessment of the potential impact the proposed project might have on Habitats Directive (92/43/EEC) Annex IV species identified as having the potential to be present in the project area.

This document presents an Annex IV risk assessment prepared to address the strict protection provisions for Annex IV species.



Figure 1. Overview of proposed MUL survey location

## 2. Legislation

Article 12 of the EU Habitats Directive states:

*1. States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:*

*(a) all forms of deliberate capture or killing of specimens of these species in the wild.*

*(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration.*

*(c) deliberate destruction or taking of eggs from the wild.*

*(d) deterioration or destruction of breeding sites or resting places.*

*2. For these species, Member States shall prohibit the keeping, transport and sale or exchange, and offering for sale or exchange, of specimens taken from the wild, except for those taken legally before this Directive is implemented.*

*3. The prohibition referred to in paragraph 1(a) and (b) and paragraph 2 shall apply to all stages of life of the animals to which this Article applies.*

*4. Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.*

The Habitats Directive is transposed into Irish law by S.I. No. 477/201- European Communities (Birds and Natural Habitats) Regulations, 2011-2021. Annex IV species are subject to strict protection under Regulation 51/52 of this Statutory Instrument.

Project design and mitigation has been applied to prevent prohibited acts (capture/killing/disturbance, and deterioration/destruction of breeding sites or resting places). A Regulation 54 derogation is considered only where the residual risk of a prohibited act remains. Any derogation must pass the three cumulative tests in sequence: (1) it is required for a reason listed in Regulation 54(2)(a)–(e); (2) there is no satisfactory alternative (including ‘do nothing’), noting that alternatives cannot be rejected solely on cost/delay grounds; and (3) it is not detrimental to maintaining the population at favourable conservation status in its natural range, with precaution applied where scientific uncertainty persists.

This document presents an Annex IV risk assessment to address the strict protection provisions for Annex IV species. The focus being on avoiding prohibited acts (injury/killing, deliberate disturbance, and deterioration/destruction of breeding sites or resting places) for Annex IV species within the Zone of Influence of the proposed project.

## 3. Scope of work

### 3.1 Overview

Uisce Éireann proposes to undertake a suite of geophysical, geotechnical, bathymetric, ecological, archaeological, and CCTV surveys within the River Suir estuary. Their purpose is to gather high-quality baseline data on seabed conditions, subsurface geology, environmental receptors and the condition of the existing outfall. The proposed survey area, which corresponds to the MUL application area, is 71 ha. It encompasses an area of the Suir extending upstream from the existing Waterford City WWTP outfall location at Gyles Quay (Kilkenny) south to Little Island (Waterford) and eastwards to Bellview Port beyond the confluence of the Kings Channel and River Suir (Figure 1).

The following survey investigations are considered necessary and are detailed further in Table 1.

- Geophysical survey, including:
  - Side-scan sonar (SSS)
  - Magnetometer
  - Sub-bottom profiler (SBP) - Parametric Sub Bottom Profiler
  - Sub-bottom profiler (SBP) - Boomer
  - Sub-bottom profiler (SBP) - Sparker
  - Multibeam Echo Sounder (MBES)
  - Marine Refraction Seismic
  - Marine Electrical Resistivity Tomography (ERT)
- Marine Environmental/Ecological surveys, including:
  - Benthic ecology Subtidal Drop down video and intertidal walkover/drone surveys
  - Grab sampling
  - Intertidal hand coring
- Archaeological surveys, including:
  - Intertidal walkover surveys potentially with the use of a metal detector
  - Potential diver surveys
- Geotechnical surveys, including:
  - Drop-down camera survey
  - Boreholes
  - Standard Penetration Testing (SPT)
  - Grab sampling
- Bathymetric surveys
  - Multibeam Echo Sounder (MBES)
- CCTV Survey of the Existing Outfall
  - Diver-operated cameras/Remotely Operated Vehicle (ROV)
- Additional potential surveys
  - Deployment of tidal gauges
  - Deployment of Sondes
  - Collection of water samples

It is intended that surveys will commence as soon as practicable following an award of the Marine Usage Licence (MUL). A high-level programme, including indicative durations and timings, is provided in Table 1, with all of the activities expected to be completed within an overall 16-week period. The proposed

equipment and indicative specifications are summarised in Table 2. Vessel details are provided in Section 3.2 (Vessels), and equipment operational description is provided in Section 3.3.

**Table 1.** Indicative survey timeline.

<b>Survey</b>	<b>Timeline</b>
Geophysical survey	Up to 16 weeks
Marine Environmental / Ecological survey	Up to 5 days
Archaeological survey	Up to 5 days
Geotechnical survey	Up to 16 weeks
Bathymetric survey	Up to one week
CCTV survey of the existing outfall	Up to one week

**Table 2.** Proposed Survey activity estimated time and maximum duration of survey work.

Survey	Method	Method detail	Sampling Effort
<b>Geophysical</b>  <b>Up to 16 weeks</b>	Side Scan Sonar (SSS)	SSS surveys are used to determine sediment characteristics and seabed features. The EdgeTech 4205 may be taken as an indicative example of an SSS device and for these surveys will have a potential operating frequency range of approximately 300/600kHz in the offshore area and 600/900kHz in the shallower nearshore area with sound pressure levels of 220-230dB re1µPa @1m. The SSS will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SSS may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Magnetometer	A magnetometer is used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and in the shallow sub-surface. The Geometrics G-882 can be taken as an indicative equipment example. It is a passive device (i.e. it does not emit any sound waves into the marine environment) the sensor responds to local variability in magnetic field. The magnetometer will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	Magnetometer survey may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) – Parametric Sub Bottom Profiler	SBP is used to develop an image of the subsurface, identifying different strata encountered in the shallow sediments. The Innomar “standard” Sub-Bottom Profiler is an indicative example of a parametric system with a primary and secondary frequency range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1µPa @ 1m, which would be used in both nearshore and offshore areas. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Parametric Sub Bottom Profiler may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Boomer	The Applied Acoustics AA301 is an indicative example of a boomer, the instrument consists of a piezo electric plate transducer mounted on a surface tow catamaran frame. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m). The Boomer SBP operates in a frequency range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1µPa @ 1m which would be used in the nearshore shallower area. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Boomer may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Sparker	The applied Acoustics Dual 400 Tip is an indicative example of a sparker system used in sub-bottom profiling. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m) or a multi-channel hydrophone such as the Geometrics GeoEel LH-16™ Digital Streamer. The sparker source has a frequency range of between 0.4-	SBP Sparker may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to

Survey	Method	Method detail	Sampling Effort
		5kHz and a recorded sound pressure of 203dB re 1µPa @1m. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	10 days.
	Multibeam Echo Sounder (MBES)	A bathymetric survey will be conducted using multibeam echo sounders. These systems may be mounted on a dedicated survey vessel or towed behind a smaller vessel, depending on site conditions and water depths. Multibeam systems emit wide acoustic signals to generate high-resolution images, creating three-dimensional maps of the seabed. Line spacing will be between 5 and 20m, depending on depth. The operating frequencies emitted from MBES will be 300-700 kHz, with a peak operating frequency of approximately 400kHz. Exposure time is approx. 0.05 ms per 1 ms for multibeam operating with 200-400 kHz, or 0.05 per 0.3 ms for higher frequencies (>400 kHz). Sound pressure levels will be approximately 215-220dB re 1µPa @ 1m.	MBES may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Marine Refraction Seismic	Marine refraction surveys use controlled seismic sources, such as air guns or weight drops, to generate seismic waves that travel through sediment and rock layers. Arrays of hydrophones or geophones deployed on the seabed record the refracted seismic waves as they bend and travel along subsurface interfaces. By analysing the travel times and velocities of these refracted waves, detailed models of sediment thickness, bedrock depth, and structural features can be developed. Airgun impulse energy is mostly concentrated within low frequencies, with peak frequencies between 5 and 90kHz. Source levels are predicted to be within the range of 186-220dB re 1µPa @1m.	Marine Refraction Seismic may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
	Marine Electrical Resistivity Tomography (ERT)	ERT surveys are conducted to investigate the electrical properties of subsurface sediments and rocks. The technique involves deploying a series of electrodes along the seabed, either towed or fixed. As a non-invasive, non-seismic geophysical method, marine ERT produces no significant underwater noise and has minimal environmental impact.	Maximum 20 ERT lines of 315m length line with diameter of 20mm. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
<b>Marine Environmental / Ecological</b>  <b>Up to 5 days</b>	Benthic ecology samples (including subtidal and intertidal habitats surveys)	Identify benthic communities and habitats at the site. Subtidal sample locations may be subject to drop down video in advance of sampling; intertidal sample locations may be subject to walkover/drone survey in advance of sampling.	There will be up to <b>30 no.</b> dedicated subtidal benthic ecology grab sampling locations within the proposed MUL Area and multiple samples (max 4) may be taken at each location. Samples would be of volume 0.1 m <sup>2</sup> .  There will be up to <b>30 no.</b> dedicated intertidal coring /grab locations if shoreline conditions allow for

Survey	Method	Method detail	Sampling Effort
			sediment sampling.
<b>Archaeological</b>  <b>Up to 5 days</b>	Walkover	<p>Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore.</p> <p>Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.)</p>	To be confirmed pending the results of the geophysical surveys.
<b>Geotechnical</b>  <b>Up to 16 weeks</b>	Drop-down video	Drop-down video survey to inspect the seabed and identify any reef structures in the vicinity without disturbance to the seabed.	There will be up to <b>30 transects</b> of up to 30 m each using a drop-down camera and video surveillance.
	Boreholes	<p>Boreholes will be advanced to depths of up to 10 m below the riverbed, with drilling terminated earlier where competent bedrock is encountered. Drilling within the river channel will be carried out using cable percussion and rotary coring techniques through the overlying sediments, with rotary coring employed to progress into the underlying bedrock where present. Standard Penetration Tests (SPTs) will be undertaken at appropriate depth intervals in accordance with BS EN ISO 22476-3 to assess in-situ soil resistance and stratigraphy.</p> <p>All drilling equipment and procedures will comply with relevant BS EN ISO technical specifications for geotechnical investigations. In-river boreholes will be drilled from a jack-up barge or stable floating platform to ensure safe working access during tidal or flowing water conditions. Deployment of the jack-up legs may result in minor, localised and temporary disturbance to the riverbed, with each leg typically occupying a footprint of less than 1 m<sup>2</sup>.</p> <p>Preliminary investigation point locations are shown in Figure 3. The locations may require adjustment to address localised access conditions.</p>	A maximum of <b>10 no.</b> boreholes of a diameter of 300 mm will be required within the proposed MUL Area.
	Standard Penetration Tests (SPTs)	Standard Penetration Tests (SPTs) will be undertaken within the proposed foreshore and in-river boreholes to characterise subsurface stratigraphy and assess in-situ soil resistance. The test involves driving a split-spoon sampler at the base of the borehole using a 63.5 kg hammer dropped from a height of 760 mm, with the resulting blow count recorded in accordance with BS EN ISO 22476-3. The sampler is driven through a total penetration of 450 mm, and the number of blows required for the final 300 mm is reported as the N-value. SPTs will be performed at appropriate depth intervals or where changes in strata are observed to provide a representative profile of the	A total of approximately 40 no. SPTs will be carried out within the foreshore and in-river investigation area. SPTs will be undertaken in the 10 no. boreholes located within the river channel, with tests performed at appropriate depth intervals in accordance with the marine investigation specification.

Survey	Method	Method detail	Sampling Effort
		ground conditions within the foreshore investigation area. All testing equipment and procedures will comply with the relevant international standards to ensure consistency and reliability of the results.	
	Grab samples	<p>Grab samples will be collected from the foreshore and in-river investigation area to obtain disturbed sediment suitable for geotechnical classification and chemical testing. The samples will be analysed to determine particle size distribution, soil grading, moisture content, Atterberg limits, organic content, particle size distribution, and other parameters required to characterise the natural sediments present within the foreshore zone. Engineering tests such as moisture condition value (MCV) testing, California Bearing Ratio (CBR) analyses and soil compaction testing on bulk samples will also be undertaken.</p> <p>Chemical testing will also be undertaken to assess potential aggressivity, including measurements of pH, sulphate concentration, redox potential and resistivity, to inform the design of concrete and other construction materials associated with the proposed works. All sampling, handling and testing procedures will be carried out in accordance with relevant international standards to ensure the acquisition of consistent and reliable geotechnical and chemical data.</p>	A maximum of 14 no. grab samples will be collected within the proposed MUL Area.
<p><b>Bathymetric Surveys</b></p> <p><b>Up to one week</b></p>	Multibeam echo sounders (MBES)	<p>This survey will provide high-resolution data on seabed features, depths, and morphology of the intertidal and subtidal zones within the proposed MUL Area.</p> <p>Bathymetric surveys will be conducted using multibeam echo sounders (MBES) and associated positioning systems. The MBES system may be mounted on a dedicated survey vessel or towed behind a smaller craft, depending on site conditions and water depths. The system emits wide acoustic signals to generate three-dimensional maps of the seabed, with line spacing between 5 and 20 meters, depending on depth. Operating frequencies will typically range from 300 to 700 kHz, with a peak operating frequency of approximately 400 kHz. Sound pressure levels are expected to be approximately 215–220 dB re 1µPa @ 1m. Exposure time is approximately 0.05 ms per 1 ms for multibeam operating with 200–400 kHz, or 0.05 per 0.3 ms for higher frequencies (&gt;400 kHz).</p> <p>The survey will focus on the marine section of the existing outfall route, potential alternative corridors, and the intertidal zone delineated by the high-water mark, as required for the MUL application.</p> <p>The survey will be undertaken in accordance with best practice guidelines to</p>	Bathymetric surveys will be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days, subject to weather, tidal conditions, and vessel availability

Survey	Method	Method detail	Sampling Effort
		<p>minimize environmental impact, including adherence to the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (DAHG, 2014).</p> <p>The maximum extent of the bathymetric survey area is presented in Figure 4.</p>	
<p><b>CCTV Survey of the Existing Outfall</b></p> <p><b>Up to one week</b></p>	Diver-operated cameras/Remotely Operated Vehicle (ROV)	<p>The outfall has been in continuous service since the plant was commissioned in 2010. While significant defects are not expected, there has been no recent condition assessment to confirm its current state. A Closed-Circuit Television (CCTV) survey is therefore proposed to ensure continued performance and compliance. The survey will be undertaken using either diver-operated cameras or a Remotely Operated Vehicle (ROV), depending on site conditions and accessibility. In deeper or higher-risk sections of the outfall, high-resolution imaging and sonar-equipped systems will be used to ensure safe and comprehensive inspection.</p> <p>The survey will help identify any defects or deteriorations such as cracking, deformation, leakages or blockages, any of which could compromise discharge performance or regulatory compliance.</p>	CCTV Survey of the Existing Outfall will be undertaken along the existing outfall within the proposed MUL Area. This activity is anticipated to occur within daylight hours over a period of up to 5 days.

### 3.2 Survey vessel/s

A multipurpose workboat will be used, based on suitable vessel available at the time of mobilisation. It is considered that a shallow draught vessel with a large wheelhouse, suitable for survey support and operations requiring frequent manoeuvring in confined waters will be used. A vessel size in the range of 16 m with a shallow draught and gross tonnage of ~45 is assumed. Noting that survey operations are typically undertaken at low speeds, appropriate to equipment deployment and data acquisition, vessel speeds are likely to be in the range of < 10 knots. Deck equipment will include a crane, hydraulic A-frame and winch system, allowing safe deployment/recovery of towed sensors and ancillary equipment. Standard navigational and communications equipment includes VHF, radar, electronic chart plotter, GPS, autopilot, echo sounder and AIS. Figure 2 shows an example of the type of survey vessel that would be required. Other smaller vessels supporting project works, have yet to be identified, as their availability will be subject to grant of MUL licence.

Vessel activity will involve low-speed survey lines, line turns and occasional station-keeping during equipment deployment/recovery. The vessel type will be a shallow-draught, approximately 16 m steel workboat with A-frame/winch capability, suited to towing and handling survey sensors in confined waters. Vessel movement and operational noise are expected to be intermittent and localised relative to the overall survey footprint.

### 3.3 Geophysical equipment

Where benthic sampling uses vessel thrusters/winch/ROV, treat as non-impulsive operational noise. Briefly describe, e.g. if it is low magnitude/short duration relative to primary acoustic sources.

#### *Side scan sonar*

Side scan Sonar (SSS) is another device that transmits sound pulses that provide the information required to map the seabed. It differs from MBES in that SSS has a finer beam width and smaller footprint to MBES and therefore higher resolution. It is generally towed behind the vessel very close to the seabed and emits fan-shaped acoustic pulses directed down toward the seafloor which are recorded as a series of cross-tracks. The sound frequencies used by side-scan sonar range generally range from 100 to 1000kHz; higher frequencies yielding better resolution but less range.

#### *Magnetometer*

A magnetometer is a passive instrument that measures the Earth's magnetic field allowing magnetic anomalies to be measured. It is towed behind the survey vessel where it samples background magnetism. When the magnetometer detects an anomaly, such as ferrous objects such as fragments of a ship hull or a geological formation of basalt. This is detected as a change to the background magnetic field. This tool can detect artifacts above or below the seabed.

#### *Sub-bottom profiler*

A Sub-bottom profiler employs an acoustic signal, to provide the information required to identify and measure marine sediment layers that exist below the sediment/water interface. The proposed equipment comprises a Knudsen Chirp system or similar which transmit a sweep of frequencies (e.g. 2-10 kHz) in a single pulse. Depending on the profile of the seabed (rock, sand, mud etc.) and level of compaction, the energy reflected back can be related to the sub-bottom composition.

### *Sub-Bottom Profiling (SBP) - Boomer*

A sub-bottom profiler boomer is an instrument used to image sediment layers beneath the seafloor. A Boomer system is a seismic reflection profiling instrument that operate in the 700 to 2000 Hz region. Boomers are generally used in coastal waters down to a few hundred meters depth when sub-bottom penetration requirements can not be met with higher frequency systems. The proposed equipment will operate at frequencies within the range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1 $\mu$ Pa @ 1m.

### *Sub-Bottom Profiling (SBP) - Sparker*

A Sub-Bottom Profiling Sparker is an instrument used to used to image sediment and rock layers beneath the seafloor, it has a similar purpose to that of the boomer described above but is designed when deeper penetration is required. The proposed equipment will operate at frequencies within the range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1 $\mu$ Pa @ 1m.

### *Multibeam echosounder*

A multibeam echosounder (MBES) is a type of sonar frequently used to map bathymetry. It operates by emitting an acoustic wave in a fan shape beneath the point of its transceiver attached to the hull of the vessel. The time it takes for the sound waves to bounce off the seabed and return to the transceiver is used to calculate the water depth within the arc of the fan. The proposed MBES operates at a sound pressure level of ~215–220 dB re 1  $\mu$ Pa @1m and 300–700 kHz (peak ~400 kHz).

### *Marine Refraction Seismic*

Marine Refraction Seismic systems are used to determine the structure and properties of subsurface layers beneath the seafloor by analysing refracted seismic waves. They use controlled seismic sources, such as small airguns or sparkers, to generate acoustic waves that travel through the sediment and refract along geological boundaries. Arrays of hydrophones or geophones record these refracted waves, allowing interpretation of sediment thickness, bedrock depth and structural features. Peak frequencies typically range between 5–90 Hz, with expected source levels in the range of 186–220 dB re 1  $\mu$ Pa @ 1 m.

### *Marine Electrical Resistivity Tomography (ERT)*

Marine Electrical Resistivity Tomography (ERT) is a non-invasive geophysical method used to image the subsurface beneath the seabed or coastline by measuring variations in electrical resistance. It involves deploying a series of electrodes along the seabed, either in a fixed layout or towed configuration. Low-voltage electrical currents are passed through the seabed, and resulting potential differences are measured to map variations in subsurface electrical resistivity. As a non-acoustic, non-invasive technique, ERT produces no underwater noise and is used to assess sediment layering, groundwater influence, and bedrock morphology.

## **3.4 Marine environmental/ecological surveys**

### *Seabed imagery- drop down video/ROV surveys*

Underwater camera systems or Remotely Operated Vehicles (ROVs) may be used for visual inspection of the existing benthic conditions within the MUL area. High quality video recordings and stills may be collected for further analysis and confirmation of suitable conditions for further intrusive activities e.g. benthic sampling or geotechnical works.

### *Benthic sampling*

A Day grab is an instrument used for sampling soft seabed sediments. When deployed overboard it is lowered on a winch to the seabed where the jaws open to take a small (approx. 5L) sample of the surface sediment (top 20cm). A Hammon grab is a very similar type of sampler, but the jaw mechanism is slightly different which allows it to sample coarser sediments (e.g. gravel and shelly sediments). The samples retained can then be analysed to obtain an overview of the sediment fauna, and particle size. Both samplers are routinely used for surveillance monitoring to support a number of EU Directives such as the Habitats Directive and Water Framework Directive. Day or Hammon grabs do not introduce noise into the underwater environment other than that produced from a slight impact with the grab making contact with the seabed.

### *Intertidal coring and walkover surveys*

For intertidal sediment assessment a 0.01m<sup>2</sup> hand core taken to a depth of 20cm for benthic faunal analysis will be used. Additional surveys of intertidal hard strata may also be carried out by conducting walk over surveys of the relevant hard strata to record biotopes and species present.

### 3.5 Archaeological surveys

Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore. Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.).

### 3.6 Geotechnical surveys

#### *Boreholes*

Up to 10 boreholes with a diameter of up to 300mm and a depth of up to 10m below the seabed will be carried out. To facilitate this, a drill head is lowered to the seabed from the vessel via a drill string and stabilised using a seabed frame. The drill head penetrates the seabed via rotation of the drill string and the application of a downward pressure. Soils and rock samples are then retrieved for laboratory testing via the drill string. Borehole drilling may be combined with *in-situ* testing such as cone penetration testing or down the hole testing at some investigative locations.

#### *Standard Penetration Tests (SPTs)*

Standard Penetration Tests may be undertaken within selected boreholes. A 63.5 kg hammer is dropped from a height of 760 mm to drive a split-spoon sampler into the sediment. The blow count for the final 300 mm of penetration is recorded as the N-value. Up to 40 SPTs may be undertaken to characterise sediment density and stratigraphy.

#### *Geotechnical grab samples*

Up to 14 grab samples may be collected within the MUL area for geotechnical classification, including grain size, moisture content, Atterberg limits and associated chemical testing to assess sediment aggressivity (pH, sulphates, redox and resistivity).

### 3.7 Ancillary data collection

Additional ancillary data may be collected. This may include collecting water samples and data on temperature, turbidity, and conductivity/salinity using a multi-parameter sonde deployed during the deployment and deployment of tidal gauges.

## 4. Receiving environment

The Lower River Suir estuary is subject to existing anthropogenic noise associated with navigation and port operations at Belview Port, including vessel movements and cargo handling activity. The port's main operational base is located at Belview on the River downstream of the proposed MUL area.

### 4.1 Cetaceans

Under Article 12 of the Directive, all cetaceans (whales, dolphins and porpoises) are subject to strict protection within Irish waters Exclusive Economic Zone. A total of 26 cetacean species have been recorded in Ireland. A marine Mammal Database compiled and managed by the National Biodiversity Data Centre has collated data from numerous sources (e.g. Irish Whale and Dolphin Group, ObSERVE project) on the distribution of cetaceans off the coast of Ireland. The Waterford Estuary and lower River Suir may be used intermittently by small cetaceans. IWDG reporting indicates common dolphins have been sighted in the Waterford Estuary for extended periods, including foraging in the River Suir/Waterford City area.

In addition, local reporting confirms that small cetaceans have been observed as far upstream as the Grannagh area (May 2023; reported as "dolphins" by some observers, with species identification uncertain) and that a large dolphin was reported stranded at Grannagh boat slip (February 2024; species not confirmed from accessible information) (Dunne C. 2023). The cetacean observation might indicate possible intermittent use of the estuary, but in the absence of other recorded events, may represent an isolated occurrence and does not demonstrate site fidelity in the absence of more substantial evidence.

### 4.2 Otter

Otter (*Lutra lutra*) is an Annex IV species and is also listed as an Annex II species for the Lower River Suir SAC (002137). Coastal/estuarine otters may forage along intertidal margins and sheltered shoreline habitats. Otter is a strictly protected Annex IV species and is also an Annex II Qualifying Interest of the Lower River Suir SAC (002137). The assessment therefore considers the risk of disturbance, injury and any interaction with breeding/resting places (holts/couches) within the Zone of Influence.

Otters in estuarine/coastal settings typically commute and forage along shoreline margins and intertidal edges. The proposed boreholes include several locations positioned adjacent to the northern shoreline margin (Figure 1). Accordingly, potential interaction with otter commuting/foraging margins is plausible, and otter is treated as in-scope for the nearshore components of the works. The eastern extent of the MUL lies adjacent to Belview Port on the north bank (Figure 1), where existing vessel movements and port operations are likely to contribute to baseline disturbance/noise in that reach; this provides contextual baseline information but does not remove the need to assess project-specific effects.

### 4.3 Reptiles (marine turtles)

Leathery Turtle (*Dermochelys coriacea*) are recorded occasionally from around the entire coast of Ireland. However, no records for this species were found for the area within or adjacent to the proposed project site.

### 4.4 Bats

All bat species in Ireland are listed in Annex IV of the EU Habitats Directive. These include:

- Common pipistrelle (*Pipistrellus pipistrellus*)

- Soprano pipistrelle (*Pipistrellus pygmaeus*)
- Nathusius' pipistrelle (*Pipistrellus nathusii*)
- Leisler's bat (*Nyctalus leisleri*)
- Brown long-eared bat (*Plecotus auritus*)
- Daubenton's bat (*Myotis daubentonii*)
- Whiskered bat (*Myotis mystacinus*)
- Natterer's bat (*Myotis nattereri*)
- Lesser horseshoe bat (*Rhinolophus hipposideros*)

There are records for Common pipistrelle, Soprano pipistrelle, Brown long-eared bat and Daubenton's bat at Little Island to the south of the MUL area. Little Island is the site of a golf course with significant areas of mature tree lines and wooded areas that provide suitable roosting and foraging habitat for bats. Significant tree lines and hedgerows are also present on the opposite side of the river channel, to the north of the MUL area. It is possible that bats may migrate across the river channel, the location of the MUL area, for foraging.

## 5. Risk Assessment

This Annex IV Risk Assessment has been prepared to assess whether the proposed project may affect the strict protection laws established for Annex IV species as a result of survey operations. This report details the Annex IV species within the zone of influence of the proposed project and assesses the potential impacts on these species.

### 5.1 Cetaceans

The effects of underwater noise can lead to disturbance, harm or injury to cetaceans depending on the type and frequency of the noise and the distance of the receptor. Cetacean sensory systems are adapted to life in the water. They rely on sound to navigate, to communicate with one another and to sense and interpret their surroundings. Behavioural responses of marine mammals, including cetaceans, to a sound are known to be strongly influenced by the context of the event and individual factors such as the animal's experience, motivation, conditioning and activity (Southall *et al*, 2007). Such features and variability may also require consideration in the case-specific assessment of impact on marine mammals from introduced sound sources (NPWS 2014). Sound waves dissipate through the water with distance from the source. While local oceanographic conditions affect the path of the sound and its transmission.

For the purposes of this Annex IV assessment, potential underwater sound sources associated with the proposed survey activities include geophysical survey systems (e.g. multibeam echosounder, side scan sonar, Sub-bottom profiling, Marine Refraction Seismic equipment and Marine Electrical Resistivity Tomography equipment, and (where relevant) geotechnical works (e.g. borehole drilling).

Depending on the exposure levels from underwater noise, auditory injury to marine mammals can occur. This may result in temporary loss in hearing sensitivity, known as Temporary Threshold Shift (TTS) or more permanent damage, known as Permanent Threshold Shift (PTS). The potential for auditory injury is related to the noise frequency relative to the hearing bandwidth of the marine mammal and is also influenced by the duration of exposure. The level of impact on an individual is a function of the Sound Exposure Level (SEL) that an individual receives as a result of underwater noise.

Table 3 details the various functional groups relative to hearing for the majority of cetaceans encountered in Irish waters.

**Table 3.** Cetacean functional groups relative to hearing at different sound frequencies.

<b>Low frequency</b> 7 Hz-22 kHz	<b>Mid-frequency</b> 150 Hz-160 kHz	<b>High frequency</b> 200 Hz–180 kHz
Baleen whales	Most toothed whales, dolphins	Certain toothed whales, porpoise
<b>Species- Ireland</b> Humpback whale Blue whale Fin whale Sei whale Minke whale	<b>Species– Ireland</b> Sperm whale Killer whale Long-finned pilot whale Beaked whale species Dolphin species	<b>Species– Ireland</b> Pygmy sperm whale Harbour porpoise

After: NPWS (2014). *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.*

Southall (2007) describes the sound pressure levels associated with the various functional groups as detailed in table 4.

**Table 4.** Sound pressure levels associated with Temporary & Permanent Threshold Shift

<b>Functional group</b>	<b>Injury Criteria (based on single pulse)</b>	
	<b>TTS</b>	<b>PTS</b>
Low frequency cetaceans	224dB re: 1µPa (peak)	230dB re: 1µPa (peak)
Mid frequency cetaceans	224dB re: 1µPa (peak)	230dB re: 1µPa (peak)
High frequency cetaceans	224dB re: 1µPa (peak)	230dB re: 1µPa (peak)
Pinnipeds (in water)	212dB re: 1µPa (peak)	218 dB re: 1µPa (peak)

Borehole drilling has the potential to produce a continuous noise source with a sound pressure level in the region of 145-190 db re 1µ in water @ 1m from source. This is below the level expected to cause injury to cetaceans but could cause behavioural change should they be within a couple of meters of the transducer. Bathymetric surveys have the potential to produce a pulsed noise source with a sound pressure level, depending on the equipment type being used, within the range region of 200-232 db re 1µ in water @ 1m from source. This is within the range where significant adverse effects (Permanent Threshold Shift or Temporary Threshold Shift), in all cetacean groups, occur should they be within a couple of meters of the transducer.

Acoustic sources proposed for the surveys are temporary, intermittent, and will attenuate rapidly in the shallow estuarine waters confined by riverbanks and a convoluted path to the more open waters of Waterford Harbour. The realistic acoustic footprint is therefore limited to the survey area and its immediate surroundings.

**Conclusion:** Given that Common dolphins have been recorded within the ZoI of the proposed project and the hearing range of this species is within the threshold for potential injury to this species, should they be within a few meters of the sound source, the potential for adverse Likely Significant Effects (LSEs) to Common dolphin is possible.

## 5.2 Otters

### *Underwater noise — pathway and plausibility*

Otters are not obligate underwater-hearing specialists; however, experimental evidence indicates that otters can detect underwater sound and may show behavioural responses, including changes in dive behaviour and foraging efficiency, to tonal signals in the kHz range under controlled exposure conditions (Stepien *et al.*, 2024).

For this project, the otter noise pathway is most relevant where sound sources operate close to shore margins and in shallow nearshore waters, because this is where receptor use is most likely. On that basis it is considered that:

- Nearshore borehole drilling (where undertaken) may cause disturbance to otters.
- Concurrent geophysical/positioning acoustics (where used nearshore): are treated as minor continuous acoustic sources; these are typically screened as low risk for otter but remain relevant where operated repeatedly along shoreline margins or for extended durations.
- Impulsive sources in the inner estuary: these would represent the higher potential for behavioural disturbance; however, their relevance to otter would still be proximity-led (i.e., greatest where operations approach margins).

In the absence of site-specific underwater sound measurements and final equipment duty cycles, the assessment proceeds on a precautionary qualitative basis: otter disturbance is considered a plausible pathway for near-bank drilling and any nearshore acoustic operations, with risk expected to be localised and temporary where activities are short-duration and managed to minimise repeated shoreline disturbance.

### *Disturbance (non-acoustic) and interaction risk*

Even when underwater noise is classified as low risk, otters may be affected by disturbance from vessels, personnel presence, and shoreline access. These activities can overlap commuting routes along the bank and, if conducted repeatedly or at sensitive times, may cause temporary displacement from favoured shoreline margins. In addition, works undertaken close to shore can create a pathway for disturbance of resting places (holts/couches) in bank habitats, particularly where access routes involve vegetation clearance, repeated approaches, or night-time lighting.

### *Other considerations*

Key additional risk considerations for otter in this context include:

- Resting places: any holt/couch in the works corridor would represent a legally sensitive receptor.
- Temporal pattern of works: prolonged presence at a single nearshore location, or repeated return visits, increases the likelihood of disturbance compared with short, discrete activities.

## 5.3 Reptiles (marine turtles)

Due to the lack of recorded sighting of this species within the Zol of the proposed project, no risk of LSEs to marine turtles has been identified.

## 5.4 Bats

Bats, typically becomes active in late spring and early summer with foraging occurring during the night from dusk to dawn.

There is potential for Common pipistrelle, Soprano pipistrelle, Brown long-eared bat and Daubenton's bat to migrate over the MUL area to forage during the period of dawn to dusk in late spring/summer. However, due to the nature of the proposed work, no survey operations during the hours of darkness will occur. Therefore, no potential for impacts on bats, their roost sites, migration paths or foraging habitat is considered possible.

## 6. Conclusion

The proposed project has the potential to lead to disturbance to the Annex IV species; Otter and harm or injury to Common dolphin without mitigation.

Article 12 of the EU Habitats Directive requires Member States to take the requisite measures to prohibit deliberate disturbance of Annex IV species. Accordingly, the mitigation measures set out in Section 7 are proposed to avoid injury and the likelihood of disturbance, and to ensure compliance, subject to confirmation of the final equipment list, operational parameters (including duty cycle) and full implementation of mitigation.

## 7. Proposed mitigation

### 7.1 Otter

The following measures are recommended:

1. Prior to the project commencing a shoreline otter survey should be conducted: A suitably qualified ecologist should undertake a targeted walkover of shoreline access points and the immediate bank zone at within the MUL area to identify signs of otter use and confirm, or otherwise the presence of resting places within the area potentially affected by access/works.
2. Avoidance of resting places: if a holt/couch is identified, apply an appropriate avoidance buffer and revise methods/access to avoid disturbance or damage.

### 7.2 Common dolphin

NPWS (2014) provides guidance to manage the risk to marine mammals from man-made sound sources in Irish waters. This document provides guidance and mitigation measures to address key potential sources of anthropogenic sound that may impact negatively on marine mammals in Irish waters. The guidance set out in NPWS (2014), relates to geophysical acoustic surveys (seismic, multibeam and single beam surveys) and Drilling and should be fully implemented as detailed below.

#### **Acoustic survey operations**

1. 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.
2. Acoustic surveying using the geophysical survey equipment specified for this project shall not commence if marine mammals are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

### Pre-Start Monitoring

Sound-producing 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 a Ramp-Up Procedure which should include continued monitoring by the MMO.

### Ramp-Up Procedure

In commencing an acoustic survey operation using the above equipment, the following Rampup Procedure (i.e., “soft-start”) must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1 $\mu$ Pa @1m:

- (a) Where it is possible according to the operational parameters of the equipment concerned, the device’s acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1 $\mu$ Pa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes.
- (b) 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.
- (c) Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched “on” and “off” in a consistent sequential manner over a period of 20 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 the 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 sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken.

For higher output survey operations which have the potential to produce injurious levels of underwater sound (see 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 Regulatory Authority as outlined in Appendix 6 of NPWS (2014).

### **Drilling operations**

The following measures are recommended:

1. 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 (Appendix 7).
2. Unless information specific to the location and/or plan/project 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 the Regulatory Authority, drilling activity shall not commence if marine mammals are detected within a 500m radial distance of the drilling sound source, i.e., within the Monitored Zone.

### Pre-start monitoring

3. Drilling 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.
4. 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.
5. In waters up to 200m deep, 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.
6. This prescribed Pre-Start Monitoring shall subsequently be followed immediately by normal drilling operations. The delay between the end of Pre-Start Monitoring and the necessary full drilling output must be minimised.

### Drilling operations

7. Once normal drilling operations commence, there is no requirement to halt or discontinue the activity 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

8. If there is a break in drilling 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 must be undertaken in accordance with the above conditions prior to the recommencement of drilling activity.

### Reporting

Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority as outlined in Appendix 7 of NPWS (2014).

## 8. Assessment of residual risk

Provided the mitigation proposed in Section 7 is implemented in full, and subject to the final confirmed equipment list and operational parameters (including duty cycle and any simultaneous operations), the residual risk to Annex IV receptors is assessed as low.

For cetaceans, the overall likelihood of exposure is assessed as low given the infrequent occurrence of cetaceans within the inner estuary and the rapid attenuation of underwater noise within a confined location.

For bats the residual risk is assessed as low as survey operations will not occur between dawn and dusk and there is not potential for disturbance or damage to bat roosts or foraging habitat.

For marine reptiles (turtles) the residual risk is assessed as low, as the species is not recorded for the Mul area.

For otter, the residual risk is assessed as low, with the primary sensitivities relating to disturbance along shoreline commuting/foraging margins and (where present) resting places. With implementation of the proposed mitigation no likely significant effects on otters is possible.

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