

Limerick City & County Council

Maritime Usage Licence Project Description

Limerick Flood Relief Scheme

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1.0 Introduction

1.1 Project Description

The Scheme area for the Limerick City and Environs Flood Relief Scheme (hereafter referred to as the Limerick FRS), is located within the Shannon Upper and Lower River Basin and is subject to both coastal and fluvial flooding. The Office of Public Works (OPW), working in partnership with Limerick City & County Council (LCCC) and Clare County Council, completed the Shannon Catchment Flood Risk Assessment and Management (CFRAM) Study in 2018. The Shannon CFRAM Study identified Limerick City as an Area of Further Assessment and concluded that a flood relief scheme is to be undertaken.

Tetra Tech RPS have been commissioned by LCCC as Engineering and Environmental Consultants to design and progress the delivery of a Limerick FRS. The objective of the overall project is the identification, design and submission (for planning consent) of a flood scheme, that is technically, socially, environmentally and economically acceptable, to alleviate the risk of flooding to the community of Limerick to a determined standard of protection, and to procure, manage and oversee the construction of that scheme.

This Maritime Usage Licence Application (MULA) is required to undertake site investigations (hereafter referred to as SI works), within the upper Shannon Estuary. These SI works are required to inform detailed construction and engineering design of the Limerick FRS and to provide baseline data for any subsequent environmental assessments. Information collected by the SI works will support the overall Limerick FRS project in its aim to alleviate coastal and fluvial flooding in Limerick City and surrounding areas. Therefore, this MUL represents a critical step towards supporting future climate resilience within the community of Limerick.

1.2 Accompanying Reports

The MULA consists of the following documents and reports:

- Maritime Usage Licence Application Form and relevant attachments;
- Project Description;
- Supporting Information for Screening for Appropriate Assessment (SISAA) report;
- Risk Assessment for Annex IV Species;
- Subsea Noise Technical Report; and,
- Natura Impact Statement (NIS).

1.3 Purpose of the Report

This report has been prepared by Tetra Tech RPS, on behalf of LCCC, to provide information on the SI Works proposed to be undertaken for the Limerick FRS project in support of the MULA to MARA. This document provides a detailed description of the methods, equipment and quantities for proposed activities, and will be used to inform the above-mentioned reports.

2.0 Project Description

2.1 Site Location

This MULA covers the geographical area where SI works are required below the HWM, within and immediately downstream of Limerick City in the upper Shannon Estuary. The SI works boundary is provided in **Figure 2-1** and will be referred to as the MUL Area throughout the application documents. The MUL Area encompasses an area of 466 ha and is illustrated in **Figure 2-1**.

The SI works will comprise geophysical, geotechnical and environmental surveys, and the proposed locations of these surveys area shown in **Figure 2-2**.

It should be noted that all locations shown are provisional only and subject to change, due to evolving project options or at on-site locations due to the presence of obstructions/refusals at individual locations.

For the avoidance of doubt, no construction works associated with the flood relief scheme are included under this MUL application.

Limerick Flood Relief Scheme

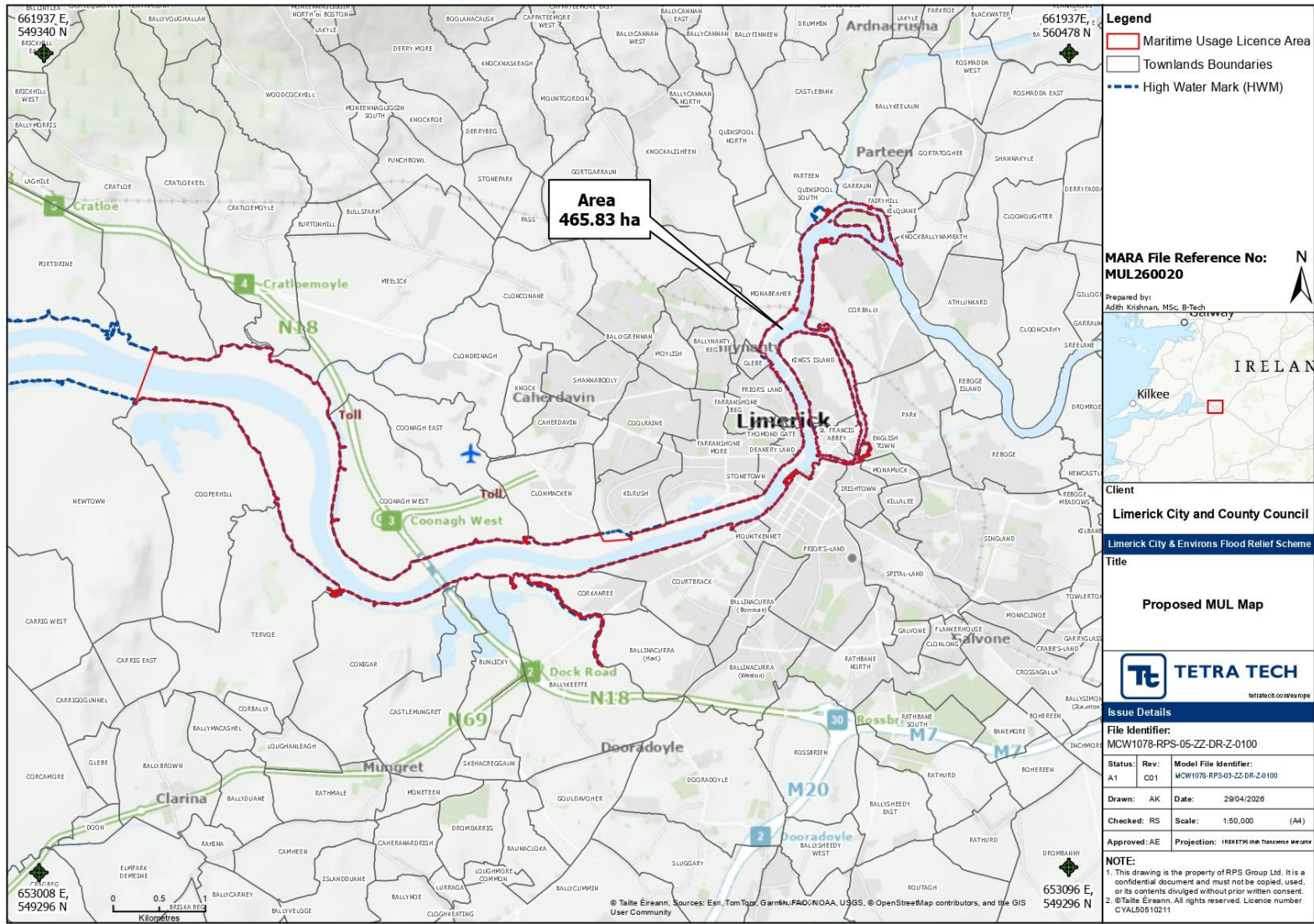


Figure 2-1: Proposed MUL Area Boundary

Limerick Flood Relief Scheme

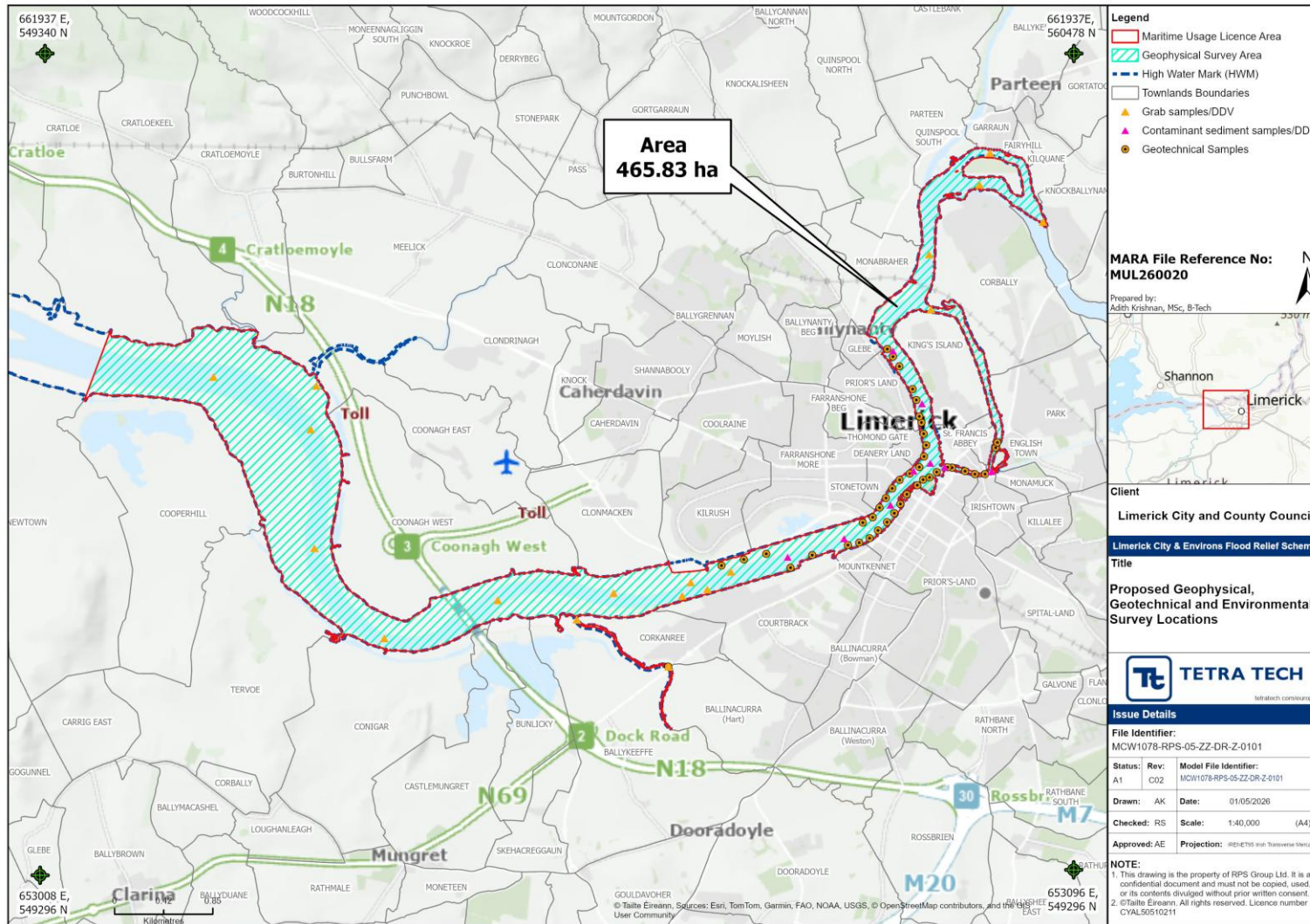


Figure 2-2: Proposed Geophysical, Geotechnical and Environmental Survey Locations

2.2 Description of the SI Works

2.2.1 Overview

In order to provide a reliable basis for design and development, the following surveys and investigations are required. The aim of the SI works is to acquire data to a high quality and specification for the site as summarised below and described in the following sections.

LCCC are seeking a MUL for a period of five years from the date of the granting of the licence. It is expected that the SI works will be undertaken over different periods within the licence period, with the geophysical surveys being undertaken first to inform the drilling corridors for the boreholes and rotary cores. It is expected that each geotechnical sampling location will take two days to complete; however, this is dependent on weather conditions and contractor/vessel availability. The geophysical survey is likely to take approximately one week to complete, dependant on weather conditions and contractor/vessel availability.

It is noted that the requirement for more refined works may arise as the SI works progress and data are analysed. This may include areas of particular interest using more targeted techniques and/or refined sampling locations and quantities. All SI works will be undertaken within the MUL Area, and within the maximum number of samples as presented below.

An overview of SI works is presented below, followed by a more detailed breakdown of the proposed survey elements in **Table 2-1**. It should be noted that the information provided in this table lists the proposed activities individually, however, where possible and efficient to do so, activities will be grouped together and undertaken as part of one survey campaign. For example, the geophysical survey campaign will likely involve one vessel undertaking the multi-beam echosounder (MBES), side scan sonar (SSS), sub-bottom profiler (SBP) and magnetometer surveys.

2.2.1.1 Geophysical SI works

- Land-based (below the high-water mark) topographical surveying and archaeological investigations.
- Marine (boat-based) surveys comprising geophysical techniques (MBES, SSS, SBP). Geomagnetic surveying using a magnetometer will also be undertaken. All equipment will be hull-mounted with no requirements for an ultra-short baseline (USBL) system to provide positioning information.

2.2.1.2 Geotechnical SI works

- 51 No. boreholes with rotary core boreholes and cable percussion boreholes will be taken within the MUL Area below the HWM using a rotary and cable percussive drilling rig.
- Standard Penetration Tests (SPTs) will be taken within the MUL Area below the HWM using a 50mm split spoon sampler and occasional jacking operations to deploy, stabilise, or demobilise the drill barge and associated equipment.

2.2.1.3 Environmental SI works

- Benthic grab sampling (including containment sediment samples);
- Drop-down video (if required); and,
- Water sampling, including conductivity, temperature and depth (CTD) Measurements (if required)

2.2.1.4 Archaeological SI works

- Intertidal walkover surveys within the MUL Area using handheld metal-detectors, photographic survey and drone survey where applicable
- Marine Geophysical survey (this is the same campaign as the Marine Geophysical Surveys described above)
- Sampling (at geotechnical SI locations samples may be taken for archaeological inspection)
- Dive surveys where deemed necessary utilising a Remotely Operated Vehicle (ROV) if applicable.
- Wade survey where water depths and conditions permit up to 75 cm water depth seawards of the low water mark.

Table 2-1: Proposed SI Works Activities

Survey Type	Survey Elements (indicative equipment)	Indicative Equipment (where applicable)	Maximum Quantity (where relevant)
Land-based Topographical Surveys (below HWM, on intertidal zone)	Survey station (e.g., tripod and total station) and mobile surveying equipment.	Hand-held pole mounted Global Navigation Satellite Systems (GNSS) devices.	N/A
Marine Geophysical Surveys (undertaken from survey vessel)	Multi Beam Echosounder (MBES)	Kongsberg EM series, Kongsberg Geoswath series, R2 Sonic series & Reson Teledyne Seabat series	N/A
	Side Scan Sonar (SSS)	Edgetech FS-4200 series, C-Max CM2 series and Klein System 3900-5000 or similar.	
	Sub-bottom profiler (SBP-C)	GeoAcoustics Geopulse series	
	Sub-bottom profiler (SBP-P)	Innomar smart, quattro (QBM) sixpack (HBM), Innomar SES 2000 compact light, Innomar standard quattro (DBM) sixpack (DBM), Innomar medium 100	
Marine Geomagnetic Surveys (undertaken from survey vessel, no acoustic signal)	Magnetometer	Geometrics G-882, Marine Magnetics SeaSPY, G-Tec Magwing System or similar.	N/A

Survey Type	Survey Elements (indicative equipment)	Indicative Equipment (where applicable)	Maximum Quantity (where relevant)
Marine Geotechnical Surveys (undertaken from survey vessel(s)/ jack-up barge; JUB/spud barge)	Rotary and cable percussive boreholes	Drill rig and JUB / drilling vessel (See Section 2.5)	51
	Standard Penetration Tests (SPTs)	Split spoon sampler/JUB	
Marine Environmental Surveys (undertaken from survey vessel)	Drop-down video (DDV) and/or Remotely Operated Vehicles (ROV) survey.	Camera system	N/A
	Grab sampling (incl. contaminant sediment samples)	Hamon / Day / Van Veen Grab (0.1m ²)	63
	Water quality samples, including conductivity, temperature and depth (CTD) Measurements.	CTD profiler and Niskin bottler sampler	20
Archaeological Surveys	Intertidal walkover surveys	See Section 2.7.1	N/A
	Marine geophysical survey (this is the same campaign as the Marine Geophysical Surveys described above).	Same equipment as marine geophysical equipment listed	
	Sampling	See Section 2.7.3	N/A
	Dive survey	See Section 2.7.4	N/A
	Wade survey	See Section 2.7.5	N/A

2.2.2 Estimated Project Schedule/ Programme

LCCC propose to begin survey activities as soon as feasible following license award, with a phased programme of investigations, capitalising on suitable weather windows and vessel availability over this time period. This phased approach will progress the overall development towards detailed design stage. The exact survey schedule is dependent on the availability of the supply chain and therefore exact timelines for the surveys cannot be determined in advance of securing a MUL.

The programme of works for the SI works will be dependent upon award of the MUL and the appointment and availability of survey contractors. Based on the proposed scope of works to be conducted, it is expected that each geotechnical sampling location will take two days to complete; however, this is dependent on weather conditions and contractor/vessel availability. The geophysical survey is likely to take approximately one week to complete, while the environmental survey is likely to take approximately two weeks to complete dependant on weather conditions and contractor/vessel availability.

The estimated timeframes are subject to change based on variables such as weather conditions, unforeseen seabed conditions, unforeseen obstructions, etc.

Mobilisation location will be dependent on the survey contractor, who may choose to mobilise from their home port, port of previous job or local port. The local port options for mobilisation, for example, could include Shannon Foynes or Ted Russell Dock depending on vessel size and marine traffic restrictions.

Surveys will be conducted day or night, seven days a week and subject to tidal conditions.

2.3 Land-based Geophysical Surveys

Detailed topographical surveying is required to provide accurate and up-to-date maps detailing natural and man-made features, elevations, land boundaries and landforms. The topographical surveys provide high-quality information to enable the creation of accurate maps of the terrestrial and intertidal areas.

Traditional land surveying techniques will involve the deployment of personnel and land surveying equipment. This will include the setting up of a survey station (e.g., tripod and total station) from which accurate measurements and levels can be taken. Similarly, more mobile surveying equipment can be used to accurately map the ground. These units can consist of handheld devices, backpacks, or hand-held pole mounted Global Navigation Satellite Systems (GNSS) devices.



Figure 2-3: Total station set up on a tripod operating as a base station for survey control



Figure 2-4: Carry-on survey equipment being used during a walkover of the site

The topographical works will be carried out during low tide periods and are not seasonally bound. The works will be carried out over a duration of two months; however, these may be undertaken non-consecutively due to weather conditions. Access to survey locations will be via existing road networks and private property access with prior consent of the landowner.

2.4 Marine Geophysical Surveys

The marine geophysical surveys will be undertaken within the Limerick FRS MUL Area at high tide prior to the ground investigation works.

The geophysical survey scope is intended to provide seabed and sub-seabed information to inform borehole drilling locations and assist in the design of the project. It is therefore foreseen to gather, as a minimum, detailed information on:

- Bathymetry;
- Seabed conditions and hazard identification;
- Seismostratigraphic units and terrain models.

The foreseen scope of works will consist of non-intrusive survey methods, in that they will not physically interact with the seabed. The exact geophysical equipment details will be confirmed following the procurement of a survey contractor. The assessment of the impacts of the SI works set out in this MULA is based on standard survey equipment that is expected to meet the survey specifications. Appointed survey contractors will be required to use equipment which aligns with the parameters of the standard equipment described and assessed in this MULA in order to ensure that no greater environmental impacts than those assessed in this MULA will arise.

In specific zones of interest (relating to man-made or natural geohazards, and areas of potential marine archaeology identified from the desktop studies undertaken prior to the

surveys), a phased approach for the survey will be implemented. The first phase will collect information suitable at reconnaissance survey level and will inform the drill locations for the borehole and rotary cores. If required, the second phase will concentrate on smaller, targeted zones of special need within the MUL Area. Both phases will use the same equipment described below and to the same spatial specifications.

2.4.1 Multibeam Echosounder (MBES)

MBES will be used to map bathymetry at chosen location within the Shannon Estuary. MBES surveys are non-intrusive and do not physically interact with the seabed. Full 100% coverage of the area concerned associated with the survey and area classification will be required. Surveys shall identify the level, nature, and detailed coverage of the seabed to ensure identification of seabed features within the area shown and identify potential large upstanding archaeological features and guide habitat mapping with the backscatter function if available. Processing of data sets shall include processing for archaeological indicators. The area shall be surveyed in such a way as to produce a comprehensive data set required to enable the generation of multiple sections through the survey area in any direction.

Method: A remote sensing acoustic device which will be either attached to the vessel(s) hull at the bow or mounted on a side pole. The system shall have an operating frequency of at least 200 kHz.

Indicative Equipment:

- Kongsberg EM series;
- Kongsberg Geoswath series;
- R2 Sonic series & Reson Teledyne Seabat series (see **Figure 2-5**) or similar.



Figure 2-5: MBES R2Sonic 2024

Swath width: Swath width will be optimised to provide 100% seafloor coverage with typical swath widths of 3 to 6 times water depth depending on arrangement of equipment hardware.

Location: MBES survey will be undertaken within the MUL Area, primarily at the proposed drill positions to the practical operating limits of survey vessels as dictated by vessel draft and safety requirements.

2.4.2 Side Scan Sonar (SSS)

Method: A submerged SSS device for imaging areas of the seafloor will be hull mounted.

Indicative Equipment:

- Edgetech FS-4200 series (See **Figure 2-6**);
- C-Max CM2 series;
- Klein System 3900-5000 or similar.



Figure 2-6: Edgetech FS-4200

Swath width: The hull mounted SSS swath width will be based on the water depth encountered. A 100% overlap between each swath is envisaged (200% coverage).

Location: SSS will be undertaken at potential archaeological sites and to identify hazards and underwater services/obstructions to facilitate the drilling locations to the practical safe operating limits of survey vessel as dictated by draft requirements.

Location: MBES survey will be undertaken within the MUL Area to the practical operating limits of survey vessels as dictated by vessel draft and safety requirements.

2.4.3 Sub-bottom Profiling

The sub bottom profiling (SBP) survey will be completed using a high-resolution CHIRP (SBP-C) sub-bottom profiler (swept-tone seismic reflection system), or a Parametric system (SBP-P) using pure tone pulses or sweeps). Sub bottom profiling over the site and specified runs is yet to be determined.

The geophysical SBP survey shall identify the bed level and the nature, thickness, and location of the sub surface strata to rock head.

The survey shall include both items detailed below:

1. Completion of specified runs.
2. Completion of a Free Line Survey.

Method: SBP are acoustic devices for acoustic imaging of sections of the seabed. The images produced are used to produce profiles beneath the seafloor, enabling delimitation of major sedimentary interfaces. For these surveys, the equipment will be They are either mounted on the vessel hull / pole. The depth of penetration and near-surface resolution are dependent on the type of system deployed and the sediment encountered. For CHIRP systems, penetration in unconsolidated sediment (i.e. not rock) will often be 5 to 50 m (fine clay – coarse sand). The spatial (i.e. depth) resolution is on the order of 1-10 cm. Parametric SBP provides superior near-surface resolution but is generally limited to penetration of up to 30m depending on sediment type.

Indicative Equipment:

- Innomar SES 2000 compact light, or similar (see **Figure 2-8: Innomar SES 2000 compact light**)
- GeoAcoustics Geopulse series (see **Figure 2-7**)

Swath width: n/a

Location: This data will be collected across the MUL Area covering the same general areas as the MBES and SSS.



Figure 2-8: Innomar SES 2000 compact light



Figure 2-7: GeoAcoustics Geopulse series

2.4.4 Magnetometer

The magnetometer survey will be undertaken at suitable line spacing to ensure complete coverage of the seabed for archaeological purposes (and in line with UAU guidelines), i.e., identify large metal debris or metallic archaeological remains.

Method: A marine magnetometer will be deployed to locate and identify ferrous objects on or below the seabed. The device precisely measures the Earth's magnetic field and detects any ferrous anomalies such as anchors, Unexploded Ordnance (UXO), fishing gear, wrecks, pipelines, cables etc. The magnetometer is a passive system and will be towed behind the survey vessel.

Indicative Equipment:

- Geometrics G-882 caesium vapour magnetometer – see **Figure 2-9**.
- Marine Magnetics SeaSPY,
- G-Tec Magwing System or similar.



Figure 2-9: Geometrics G-882

Survey spacing: Line spacing will be dependent on water depth encountered, with additional runs of higher density line spacing within areas where any magnetic signal is recorded.

Location: The magnetometer will be deployed across the same area described for the SSS.

2.5 Marine Geotechnical Surveys

The aim of the geotechnical survey is to provide sufficient geotechnical data to allow the characterisation of the sub-seabed strata and composition of the seabed and the level of rock head (including follow on coring to confirm rock head).

Normal industry standards for performance of all positioning, drilling, sampling, SPT testing, laboratory testing and analysis and reporting will apply. Material sampling, in situ testing, data logging, laboratory testing and reporting (factual and interpretative) will be required.

The works will include the following:

- Cable percussion and rotary drilling boreholes at 51 targeted locations (to a maximum of 25m investigation depth below seabed level) where river works are most likely across the quay wall areas to provide a high level assessment;
- Standard penetration tests (SPT).

2.5.1 Rotary and cable percussive drilling

The works comprise geotechnical drilling from a suitable drill barge within the chosen locations in Limerick City on the River Shannon to assess the strata of the existing quay walls. Drilling operations will employ a combination of cable percussion and rotary drilling techniques as appropriate to site conditions, progressing to rockhead. The maximum casing diameter to be used is 300mm and the maximum core diameter is 150mm. Cable percussion methods will be used for investigation through soft to medium grained soils to obtain representative disturbed and, where required, undisturbed samples. Class 1 undisturbed are required and will be undertaken using UT100 (100mm diameter thin-walled sampling). Rotary drilling utilising water flush with a biodegradable mud additive will be used to obtain rock core. Boreholes will be advanced to rockhead (approximately 10m – 15m below ground level (BGL)) or to such depth as directed by the Engineer, with rockhead defined by drilling refusal on sound rock and corroborated by core recovery. Rotary drilling will be advanced until 5m to 10m of competent rock core is recovered (approx. 20m – 25m BGL)

The drilling rig will be equipped with positioning and station keeping systems (spud barge or equivalent). Conductor casing to be installed to maintain near surface borehole stability. All temporary casings (including conductor, rotary and cable casings) will be removed on completion of the investigation works and filled with suitable bentonite/cement grout to reinstate ground stability. Standard geotechnical sampling to obtain disturbed/undisturbed samples and rock cores in accordance with “Specification and Related Documents for Ground Investigation in Ireland 2016” will be undertaken.

2.5.2 Standard Penetration Tests (SPTs)

Works will include Standard Penetration Tests (SPTs) using a 50mm split spoon sampler and occasional jacking operations to deploy, stabilise, or demobilise the drill barge and associated equipment. Both SPTs and jacking of barge piles generate noise and low-frequency vibration including hammer impacts during SPTs and hydraulic jacking or driving systems used to set or adjust the position of the barge.

2.5.3 Wall Cores

Wall coring will comprise four rows with 3 no. wall cores in each row to form a grid in the existing quay wall to determine its thickness from top to bottom. Temporary scaffolding will be fixed to the quay wall to enable the concrete coring specialists to safely access the location of each concrete core at each level. Concrete cores will be drilled with a diamond tipped coring bit to core out 100mm cores. A drilling medium of clean water flush will be used to cool the drilling bit. Core holes will be grouted up following their completion. As temporary scaffolding will be used to access the quay walls there will be no interaction with the seabed within the estuary.

2.6 Marine Environmental surveys

The aim of the proposed environmental surveys is to collect pre-construction baseline data. This will include a benthic sampling programme using grab sampling and where required video or still photographs (if required).

The following investigations are proposed within the MUL Area.

- Benthic grab sampling at 27 sampling locations. Two x 0.1m² grab samples will be taken at all sampling locations, one for macrofauna and particle size analysis (PSA) and one for organic matter analysis. An additional grab sample to investigate the potential for contaminated sediments will be undertaken at nine sampling locations from Ted Russell Dock to BHP Laboratories including the Abbey River in Limerick City. Total 63 No. grab samples will be undertaken.
- Water quality profiling and sampling may be undertaken at 27 stations to coincide with benthic grab sampling, with samples taken for analysis of metals SO₄, Nitrate, Nitrite, Si, Phosphorus, TOC and Chlorophyl A, if required.
- Drop-down video (DDV) may be utilised, if required, however, it is expected that the natural turbidity of the Shannon Estuary will limit the usefulness of any images/footage obtained. This would include a video transect and/or photograph stills at each benthic grab sampling locations within the MUL Area.

2.6.1 Grab Sampling

Superficial sediment/ benthic seabed samples will be obtained using grab samplers deployed from the survey vessel. Grab samplers employ mechanical force to close opposing steel clam shells which in turn scoop up superficial samples of seabed sediments and benthic material. Samplers operate to a seabed depth not exceeding 0.5m and sample over an area of 0.1m² with recovery of approximately 0.015 m³ (~15 litres) of material. Two grab samples will be collected at each location, one for faunal analysis and one for sediment physicochemical analysis (PSA, organics). An additional sample will be collected from Ted Russell Dock to BHP Laboratories including the Abbey River for sediment contaminant analyses. Faunal grab samples will be sieved on a 1 mm mesh sieve and preserved in 5-10% buffered formalin for analysis in a laboratory.

Different types of grab samplers are available according to the types of seabed conditions expected. Day and Van Veen type grab samplers are suited to general seabed conditions, and Hamon type grab samplers are suited to the recovery of mixed and coarser sediments. While all types of grab samplers may be deployed in the proposed surveys across the MUL Area according to expected site-specific conditions, the principles of operation are the same.

Proposed grab sampling locations are presented in the drawings in **Figure 2-2**. Final sampling locations will be subject to the analysis of geophysical survey findings with respect to anticipated geology and any identified anomalies (e.g., uncharted marine archaeology features, etc.).

2.6.2 Water Profiling / Sampling

Water profiling and sampling will be taken at various locations within the MUL Area if required and these will likely coincide with benthic grab locations. As further information from the geophysical campaigns is analysed, sampling locations may change to reflect changes to the potential locations.

Each water sample shall be analysed for the following: conductivity, temperature, pH, dissolved oxygen and turbidity. Where suitable, parameters will be tested in situ to receive accurate data. A Niskin bottle (or similar) will be used to obtain a sufficient sample of water at the surface (< 1m depth) and a second sample just above the seabed (~1m) for the subsequent chemical analysis.

Water quality sampling may take place at any time over the lifetime of the MUL. Where deemed necessary, samples will be taken once in each season, i.e., summer, autumn, winter and spring.

Conductivity, Temperature, Depth (CTD) water measurements shall be taken at a number of locations. The CTD unit will be deployed from the survey vessel into the water column. Depending on conditions up to three measurements at each location may be taken, i.e. near surface, mid-water, and near seabed. Measurements shall be taken only after stabilisation of the temperature at each location. At each location conductivity and

temperature shall be recorded every hour during a complete semi-diurnal tidal cycle. A CTD profile shall be produced for each location.

2.6.3 Drop-Down Video

Where deemed necessary by the marine ecologist, a DDV high-resolution system may be deployed from a suitable vessel to characterise the flora and fauna at each survey location. This activity will be passive, non-intrusive and will not interact with the seabed.

Given the known turbidity within the Shannon Estuary and the likely homogeneity of soft-sediment habitat types to be found within the MUL Area, DDV may not be required at each sampling location. If DDV is required at a grab sample location a 100 m transect will be conducted with still images taken at 10m intervals. The video footage will be analysed in real time and an assessment on the suitability of the survey station for grab sampling will be made. As stated above, the marine ecologist will review in situ to determine if DDV is required at each sampling locations.

The exact camera system to be used is subject to appointment of survey contractor, however, the DDV survey will be non-intrusive in nature.

2.7 Archaeological Surveys

Archaeological surveys will be undertaken by a suitably qualified archaeologist where deemed necessary. The purpose of the surveys is to collect baseline data which will be used to inform the cultural heritage impact assessment. Archaeological surveys will be undertaken in advance of any intrusive survey work. The exact archaeological surveys required will be dependent on preliminary geophysical survey findings and will be subject to agreement with the National Monuments Service and any licencing requirements. The archaeology surveys could include the following survey types.

2.7.1 Intertidal Surveys

A team of archaeological personnel will be deployed to the intertidal areas of the MUL Area to undertake a walkover inspection of the intertidal area at Low Water Spring tide, during daylight hours. Surveys will include the use of handheld metal-detectors, photographic survey and drone survey where applicable. Surveys involving handheld metal-detectors will include a series of transects at 10 m intervals across the accessible intertidal area. No intrusive sampling will be undertaken, and it is expected that access to the intertidal area will be via existing access points.

2.7.2 Marine Geophysical Surveys

Geophysical survey for the purposes of archaeological investigation is the same campaign described in **Section 2.4**. This includes a multi-suite instrument deployment to provide comprehensive and robust survey information of the seabed surface and the sub-surface layers. Marine geophysical survey is subject to archaeological licensing from the National Monuments Services in the Department of Housing, Local Government and Heritage.

2.7.3 Sampling

Where deemed necessary by the project archaeologist, at the location of geotechnical investigations an archaeologist/ geoarchaeologist will be present to take samples for archaeological inspection. Samples may be removed from the investigation location, properly stored and transported from site for more detailed assessment and appraisal.

2.7.4 Dive Survey

Where deemed necessary by the project archaeologist, and where water depths and conditions permit, dive surveys may be undertaken at specified locations. Such inspections will be conducted in accordance with safety legislation governing Diving at Work and would require specialist mobilisation and support. Deployment of Remotely Operated Vehicle (ROV) may also be used.

The dive/ ROV surveys will be inspections of target features recorded in the walkover, geophysical and geotechnical surveys that require further clarity in relation to their archaeological potential and extent.

2.7.5 Wade Survey

Where deemed necessary by the project archaeologist, and where water depths and conditions permit, wade surveys will be undertaken at specified locations reaching up to 75cm water depth seaward of the low water mark.

2.7.6 Monitoring

Where required, there will be an archaeological presence onboard the survey and geotechnical vessel(s) to observe the record being taken and recover material of archaeological potential where observed, to ensure such material is recovered and reported properly. The presence on-board will be agreed on a case-by-case basis. Key occasions where presence is anticipated to be required include working within an Archaeological Exclusion Zone; working in an area of known archaeology; working in a location that has a high volume of investigation locations.

2.8 Vessels

At the time of this application specific details of the survey vessels are not available as they are subject to a procurement process. The geophysical marine surveys and geotechnical investigations will involve the deployment of dedicated marine spreads suitable for the scope of work required, the water depth expected, and the anticipated seabed conditions. The final details of equipment to be deployed are not yet confirmed, however, standard equipment proposed to meet the specifications is described in the following sections and has been assessed in this MULA. This information is considered adequate to enable the likelihood and significance of any related environmental impacts of each of the survey activities to be determined on a conservative basis. Appointed contractors will be required to use equipment which aligns with the parameters of the standard equipment described

below and assessed in this MULA in order to ensure that no greater environmental impacts than those assessed in this MULA will arise.

All vessels will be fit for purpose, will possess all relevant classification certificates, and will be capable of safely undertaking the survey work required. Health, safety, environment, and welfare considerations will be a priority and will be actively managed. Vessels will comply with all applicable MARPOL requirements including vessel-based spill response planning. Appointed contractors will be required to comply with all legislation and license conditions relevant to the activities within their scope of work including the provision of marine mammal observers (MMOs) where relevant to the activity scope. Prior to survey mobilization all statutory safety roles will be appointed and responsibilities assigned, and project/ survey-specific Health, Safety, and Environmental (HSE) plans will be approved for implementation as part of project execution planning.

Survey vessels will conform to the following minimum requirements as appropriate:

- Compliance with Safety of Life at Sea (SOLAS), International Maritime Organization (IMO), and national requirements for operating within Irish territorial waters;
- Compliance with applicable MARPOL requirements;
- Station-keeping and sea-keeping capabilities required to safely carry out the proposed activities;
- Calibrated equipment and spares with tools as necessary to undertake all specified works;
- Endurance to undertake the required works (e.g. in respect of fuel, water, stores, etc.);
- Sufficient qualified staff to allow the survey operations to be carried out efficiently (typically 24-hour continuous for offshore survey, 12-hour for nearshore survey) including anticipated requirements for marine mammal observers as appropriate;
- Adequate accommodation and crew welfare facilities; and
- Suitable max draught for working in the MUL area.

Typical vessels for geophysical surveys will be circa 10 – 20m in length. See **Figure 2-10** as an example of a geophysical survey vessel. A smaller nearshore vessel may be required to complete surveys in the River Abbey adjacent to George's Quay, such a vessel is illustrated in **Figure 2-11**.



Figure 2-10: Typical Geophysical Survey Vessel



Figure 2-11: Typical Nearshore Geophysical Survey Vessel

Typical vessels for geotechnical investigations include Jack-Up-Barges (JUB) (**Figure 2-12**) and Spud Barges (**Figure 2-13**). At the time of this application procurement of the JUBs was subject to a tendering process and the specific details were not available. However, for the purposes of conservative assessment it is assumed that the most likely arrangement is that the JUB will have four legs that are deployed when on station. It is estimated that each leg has a plan area of between 0.5m^2 and 2m^2 which interacts with the seabed. Therefore, approximately between 2m^2 and 8m^2 of seabed will have the potential to be directly disturbed each time the JUB is deployed at a given survey location. A smaller spud barge may be required to complete surveys in the River Abbey adjacent to George's Quay. Spud barges can have a two or four leg arrangement to keep station. It is estimated that each leg has a plan area of between 0.2m^2 and 1m^2 which interacts with the seabed. Therefore, it is estimated that a minimum of 0.4m^2 and a maximum of 4m^2 of seabed will have the potential to be directly disturbed each time the spud barge is deployed.



Figure 2-12: Jack-Up-Barge (JUB)



Figure 2-13: Spud Barge

2.9 Safety, Health, Environment & Quality Management

The survey contractor will be contractually required to maintain and operate ISO-accredited or compliant Safety, Health, Environmental and Quality (SHEQ) management systems for the duration of its contractual obligations regarding the described survey scopes. Reports and other submissions shall be provided as and when required for review and approval by law and/or by employer's representative to ensure safe and secure operations and worksites.