MWP

Natura Impact Statement

Proposed Dredging at Limerick City

November 2026

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1. Summary of Findings

1.1 Natura Impact Statement

Project Title	Proposed Dredging at Limerick City
Project Proponent	Waterways Ireland
Project Location	Limerick City
Natura Impact Statement	In cases where an Appropriate Assessment is required, a Natura Impact Statement (NIS) is prepared and includes a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications of a project, individually, or in combination with other plans or projects, for Natura 2000 sites in view of the conservation objectives of the sites.
Conclusion	The Natura Impact Statement (NIS) assesses the potential direct, indirect and in-combination effects of the proposed maintenance dredging at Limerick City on the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077), having regard to their site-specific conservation objectives. The updated project description (MWP, November 2026) provides for eight annual dredging campaigns within a requested ten-year Maritime Usage Licence period. The assessment incorporates updated environmental information, including the March 2025 sediment characterisation programme undertaken following consultation with the Marine Institute, and identifies mitigation measures intended to avoid or reduce potential adverse effects on the qualifying interests and special conservation interests of the relevant European sites. Having regard to the nature, scale and duration of the proposed maintenance dredging works, the results of the March 2025 sediment characterisation programme, the numerical modelling assessment and the mitigation measures identified in Section 8, it is concluded that the proposed development, either alone or in combination with other plans and projects, will not adversely affect the integrity of the Lower River Shannon SAC (002165) or the River Shannon and River Fergus Estuaries SPA (004077) in view of their conservation objectives.

2. Introduction

2.1 Purpose of the Assessment and Legislative Context

Appropriate Assessment is the consideration of the impact of a project on the integrity of a Natura 2000 site, either alone or in combination with other plans or projects, with respect to the site's ecological structure and function, and in view of the site's conservation objectives. The conservation objectives of a Natura 2000 site are site specific and based on the ecological requirements of the species and habitats present. They define the desired conservation condition of certain species and habitat types for the site. Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, structure and function. The conservation objectives may be either to maintain or restore the favourable conservation condition of a habitat/species.

Article 6(3) of Directive 92/43/EEC stipulates that certain projects and plans must be subjected to an "appropriate assessment" of their effects on the integrity of Natura 2000 site(s). Article 6(3) provides in full:

"*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*"

A screening for Appropriate Assessment report was prepared for the proposed dredging to determine whether the project is likely to significantly affect Natura 2000 sites. The Screening for Appropriate Assessment report determined that Appropriate Assessment of the proposed dredging is required, as likely significant effects on Natura 2000 sites, either individually or in combination with other plans or projects, could not be excluded on the basis of objective scientific information, in view of the sites' conservation objectives. It was concluded, in the absence of mitigation, that significant impacts on the following Natura 2000 sites, potentially occurring as a result of the proposed dredging that is the subject matter of this Natura Impact Statement (NIS), could not be ruled out:

- Lower River Shannon SAC (002165)
- River Shannon and River Fergus Estuaries SPA (004077)

Please refer to Appendix 1 for the screening for Appropriate Assessment report.

This NIS is a scientific examination of evidence and data, carried out by competent persons, to identify and classify any implications (ecological effects) for the Natura 2000 sites listed above in view of the conservation objectives of those sites. The aim of the NIS is to provide sufficient scientific information to inform the competent authority's Appropriate Assessment of the proposed dredging described in Section 4 of this report.

This NIS identifies the aspects of the proposed dredging that may interact with the ecological requirements or sensitivities of the habitats and species assessed in Section 6 and determines whether these interactions could result in adverse effects on the integrity of the Natura 2000 sites listed above, in view of their conservation objectives. Mitigation measures to avoid or reduce adverse ecological effects are provided in Section 8.

2.2 Statement of Competency

This report has been prepared by Gerard Hayes (BSc.) Ecologist at MWP. Gerard has 15 years' experience in ecological surveying, ecological impact assessment and the appropriate assessment process. He is an appropriately qualified, trained and competent professional. He has completed numerous ecological assessments for a wide variety of projects. He is an experienced field ecologist and has a diverse ecological

survey profile, including habitats and flora, mammals (including bats), birds and terrestrial/aquatic invertebrates. He has held licences for surveying numerous protected species including salmon, lampreys and white-clawed crayfish.

The Natura Impact Statement was reviewed and updated in November 2026 by Jennifer Snook, BSc (Hons) Wildlife Biology, Ecologist at Malachy Walsh and Partners (MWP). Jennifer has professional experience in ecological surveying and assessment, including the preparation and review of Screening for Appropriate Assessment reports and Natura Impact Statements. The November 2026 revision incorporates relevant updated environmental information and addresses matters raised in the Request for Additional Information issued by the Maritime Area Regulatory Authority (MARA) under Section 117(3) of the Maritime Area Planning Act 2021.

2.3 Project Overview

Waterways Ireland is the North / South Implementation Body responsible for the inland navigable waterways systems in Ireland. The main functions of Waterways Ireland are the management, maintenance, development and restoration of the inland navigable waterway system throughout the island of Ireland, principally for recreational purposes. The Shannon Navigation in the Limerick City area, around Sarsfield Lock and the Abbey River, underwent a significant dredging operation in November and December 2011. Almost 12,000m^3 of bed material deposits were removed to licensed landfill to restore navigation depths for boat traffic.

Following the 2015/2016 flood event, a hydrographic survey was undertaken to determine the extent of sediment accumulation within the Limerick Navigation. Siltation is an annual event within the lower sections of the Limerick Navigation. A bathymetric survey undertaken in 2021 identified accumulated sediment upstream and downstream of Sarsfield Lock. Based on the survey, approximately 3,361 m³ of material was identified upstream of the lock and 5,374 m³ downstream, giving an estimated total of 8,735 m³. These quantities informed the original dredging proposal. The updated project description (MWP, November 2026) provides for an initial dredging campaign involving approximately 6,355 m³ of fine sediment, followed by seven subsequent annual maintenance dredging campaigns of approximately 2,118 m³ each. The proposed eight-year dredging programme comprises an estimated total of 21,181 m³ of material, within a requested ten-year Maritime Usage Licence period. Approximately 70 m³ of coarse granular material is also proposed for separate removal during the initial campaign. Further details are provided in Section 4.2.

Maintenance dredging will be undertaken using a crane-mounted submersible DOP pump operating from a pontoon raft positioned within the designated dredging areas. Fine sediment will be transferred via floating discharge pipelines to three designated in-channel discharge locations within the River Shannon. Coarser granular material will be removed separately using mechanical excavation. The proposed dredging and discharge locations are illustrated in the relevant project drawings.

The dredging pontoon will be positioned at designated set-up locations within the proposed dredging areas. The crane operating radius, pontoon positioning arrangements and anchoring requirements will be as specified in the definitive project method statement and drawings. Discharge operations will be undertaken during ebb-tide conditions to facilitate downstream sediment transport and dispersion.

Dredging operations are proposed to take place during ebb-tide conditions, within an anticipated operating window of approximately five hours per day. The project description identifies an expected water-to-silt ratio of 80:20 and an estimated pumping duration of 108 hours. The proposed pumping duration and discharge rates have been assessed in the context of the updated dredging quantities and operational programme described in the Project Description (MWP, November 2026).

Approximately 70 m³ of coarse granular material is anticipated within the proposed dredging areas, primarily within the downstream approach channel. This material will be excavated separately using a long-reach excavator mounted on a pontoon raft and transferred by barge to Limerick Port for onward transport to an appropriately authorised waste facility. Removal will be undertaken during suitable tidal and river-flow conditions, in accordance with the agreed project methodology.

3. Methodology

3.1 Appropriate Assessment Guidance

This NIS has been prepared with reference to the European Commission's *Assessment of Plans and Projects in Relation to Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission, 2021*), Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC* (European Commission, 2018), and Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities (DoEHLG, 2009, revised 2010).

3.2 Consultation

Consultation was undertaken with the Marine Institute in January and February 2025 regarding sediment characterisation results obtained during earlier sampling campaigns. Particular consideration was given to an elevated lead concentration recorded during the 2022 sediment sampling undertaken by AQUAFACT.

The Marine Institute advised that the elevated lead result should initially be queried with the analytical laboratory and, where no analytical error was identified, repeat testing should be undertaken. Where elevated concentrations persisted, further sampling of the surrounding area was recommended to investigate the potential extent of contamination. The Marine Institute also highlighted the requirement for sediment characterisation data to be sufficiently recent for consideration as part of the EPA Dumping at Sea permitting process.

Following this consultation, additional sediment sampling was undertaken in March 2025. The results of the updated sediment characterisation are discussed in Section 4.1.3.6.

3.3 Desktop Study

In order to complete the NIS, certain information on the existing environment is required. A desktop study was undertaken to collate available ecological and environmental information relevant to the study area and proposed dredging works. The desktop assessment was reviewed and supplemented in November 2026 to incorporate relevant additional information. This comprised a review of the following publications, data and datasets:

- Ordnance Survey Ireland (OSI) Aerial photography and 1:50000 mapping
- National Parks and Wildlife Service (NPWS)
- National Biodiversity Data Centre (NBDC) (on-line map-viewer)
- BirdWatch Ireland
- Teagasc soil area maps (NBDC website)
- Geological Survey Ireland (GSI) area maps
- Environmental Protection Agency (EPA) water quality data
- Shannon International River Basin District (ShIRBD) datasets (Water Framework Directive)
- Review of requested records from NPWS Rare and Protected Species database
- Limerick Development Plan (2022 – 2028)
- Limerick City Docks Dredging Numerical Modelling Study (MaREI, 2021)
- Marine Sediment Characterisation - Limerick Docks Dredging and Disposal Operations (Aquafact, 2022).
- Water Framework Directive Compliance Assessment – Maintenance Dredging at Sarsfield Lock, Limerick City (MWP, 2026).

- Marine Strategy Framework Directive Assessment – Maintenance Dredging at Sarsfield Lock, Limerick City (MWP, 2026).
- Sediment sampling and analytical results for the proposed dredging areas (Fitz Scientific, 2025), including the Dumping at Sea Material Analysis Reporting Form and supporting laboratory certificates.
- Assessment of Impact on the Environment – Maintenance Dredging, Sarsfield Lock, Co. Limerick (MWP, 2025).Other information sources and reports footnoted in the course of the report.

3.3.1 Database Searches

The study area lies within the Ordnance Survey National Grid hectad R55. Concise and site-specific information on species records available for the hectad R55 was retrieved from the NBDC on-line database and reviewed. Relevant records were reviewed to inform the assessment of potential effects on ecological receptors. Other species of conservation interest in the Lower River Shannon SAC was retrieved and can be found in the main body of this report.

3.4 Field Surveys

The desktop study was supplemented by both multi-disciplinary ecological walkover surveys and targeted ecological surveys of the proposed dredging site. These habitat and faunal surveys were undertaken by MWP staff ecologists. Survey methods can be found in the report for screening for Appropriate Assessment in Appendix 1.

Information on lampreys can be found in Appendix 3 under 'Lamprey assessment of the River Shannon at Limerick'. This assessment included an evaluation of lamprey spawning habitats and juvenile lamprey habitats both within and upstream of the proposed dredging site in the environs of Limerick City. Lamprey habitats were assessed with reference to habitat quality and juvenile lamprey density using electrical fishing in shallower areas and dredge sampling in deeper areas at all proposed dredge locations. Inland Fisheries Ireland were consulted and informed survey design.

3.5 Assessment of Potentially Significant Effects

The Screening for Appropriate Assessment report (Appendix 1) concluded that likely significant effects on two European sites, namely the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077), could not be excluded, either alone or in combination with other plans or projects.

An evaluation is undertaken hereunder to determine which of the qualifying interests (QIs) of the SAC and special conservation interests (SCIs) of the SPA potentially lie within the zone of influence of the project and require further assessment (see Section 6). This is done through a scientific examination of ecological evidence and data listed in Section 3.3 or referenced in the text as well as the results of the ecology surveys (Section 4.1.3).

Potential ecological effects arising from the proposed dredging are assessed with reference to the following impact pathways, as detailed in Sections 6 and 7::

- Habitat loss/alteration
- Habitat or species fragmentation
- Disturbance and/or displacement of species
- Water quality and resource

The potential effects of the proposed dredging on the qualifying interests (QIs) of the SAC and special conservation interests (SCIs) of the SPA within the project's zone of influence are assessed in view of the conservation objectives of the respective European sites. The assessment considers whether the proposed dredging, either alone or in combination with other plans or projects, could adversely affect the integrity of these sites, taking account of the proposed mitigation measures (see Sections 7–9).

4. Description of the Project

4.1 Site Location and Context

The proposed dredge sites are situated at various locations upstream and downstream of Sarsfield Lock, adjacent to the southern bank of the Abbey River and River Shannon in Limerick City (see Figure 1). The Abbey River is a distributary of the River Shannon and isolates King's Island from the mainland. Flow in the Abbey River is affected by a weir and a lock (Sarsfield Lock) at the lower end of the channel. The Abbey River and River Shannon are both within the intertidal zone, this transitional waterbody known at Limerick Dock (EU Code IE_SH_060_0900).

Following the 2015/2016 flood event, a hydrographic survey was undertaken to assess sediment accumulation within the Limerick Navigation. Subsequent bathymetric surveys identified continued sediment deposition upstream and downstream of Sarsfield Lock, highlighting the requirement for periodic maintenance dredging to maintain navigational depths. The extent and quantities of material proposed for dredging are described in Section 4.2.

4.1.1 Purpose of the Project

The proposed works involve the excavation of sediment from the riverbed, termed “maintenance dredging”, at locations upstream and downstream of Sarsfield Lock. Maintenance dredging is required to deepen or maintain navigable channels, which are at risk of becoming silted over time due to the transport of suspended sediments into the sheltered waters of the harbour, that in turn deposit on the riverbed. This is required also to allow boats to moor in the marina and other parts of the channel. The project will increase the navigability of the quays and thereby reduce the associated safety concerns for pleasure and commercial boats. The works will focus on maintaining the navigability of the river channel and ensuring safe access for users.

4.1.2 Description of Existing Site

4.1.2.1 General Site Description

The proposed dredging is located in the Abbey River and River Shannon. The proposed dredging site is influenced by the tide, so flows and water levels vary considerably. Flow in the River Shannon is controlled by the ESB using structures installed for the Shannon hydroelectric scheme at Parteen Weir and Ardnacrusha generating station. When water levels fall to their minimum level at the end of the ebb of Spring tide, the wetted area of the river is reduced and much of the river substrate is above water level. This is a feature of the main channel of the River Shannon as far upstream as Thomond Weir and beyond, with the effect diminishing with distance upstream. The Abbey River also experiences this effect but to a lesser degree because of the weir at the lower end of the channel.

The CORINE Land Cover 2018 dataset identifies the study area and surrounding environment as comprising predominantly continuous urban fabric and watercourses. The Abbey River and River Shannon are confined by vertical limestone walls at the study sites. There is a marina at the proposed uppermost dredge site. The Limerick Dock transitional waterbody (IE_SH_060_0900) was assigned Poor ecological status for the 2019–2024 assessment period and is classified as being at risk of not achieving Good status, with hydromorphological pressures identified (MWP, 2026).

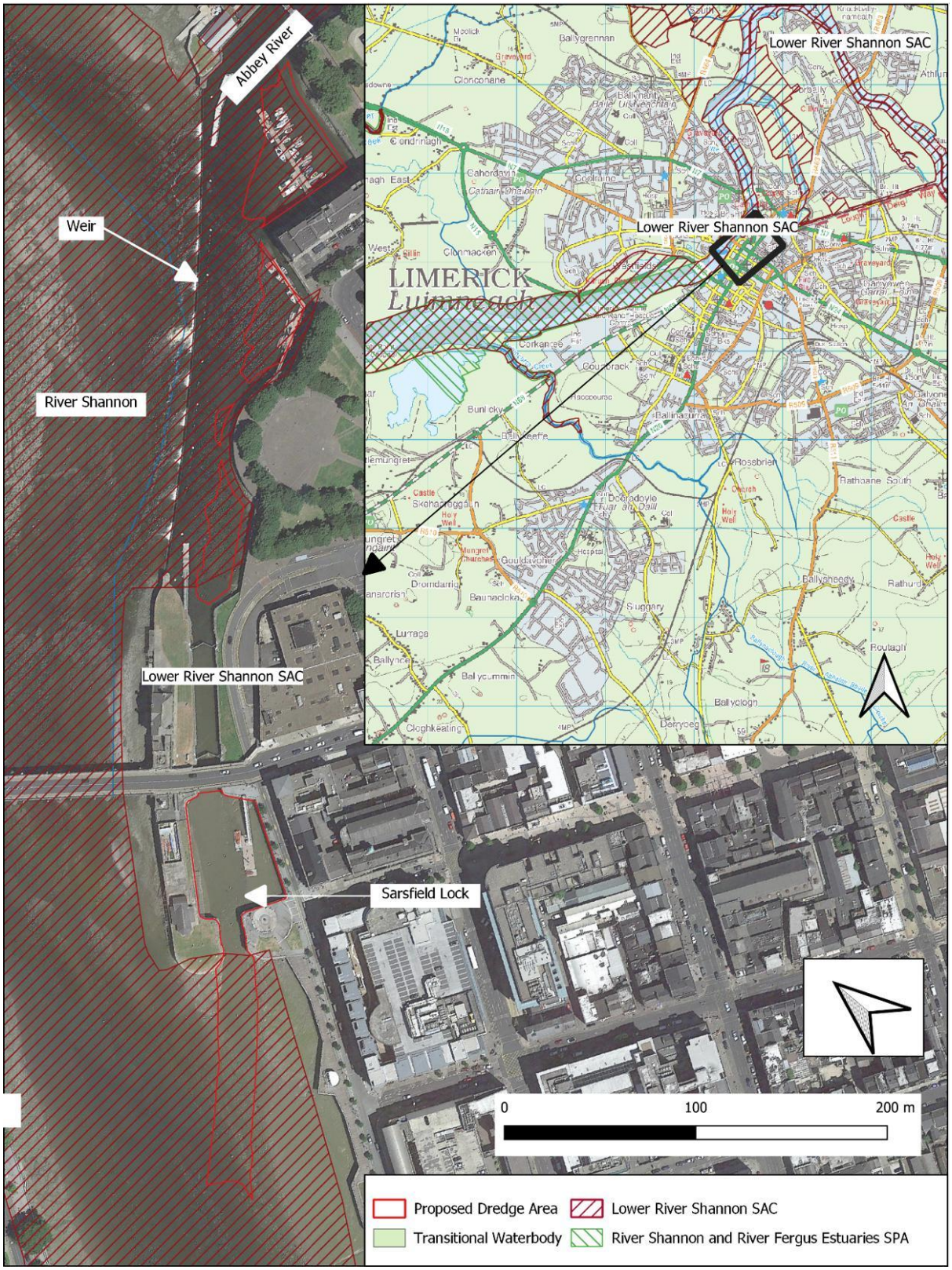

Figure 1 Location of proposed dredging site

4.1.3 Field Surveys

4.1.3.1 Habitats

The habitat at the subject site comprises depositing/lowland rivers - FW2 associated with the lower reaches of the Shannon and Abbey Rivers. This section of the river is tidally influenced but predominantly freshwater, with potential saline intrusion during periods of low river flow and high tides. Under such conditions, the habitat may correspond to tidal river (CW2). At low tide, river substrates are exposed. These consist of mixed sediment with some areas (Sarsfield Lock) entirely of mud. These habitats are classified as Mud shores - LS4 and Mixed sediment shores - LS5 but do not feature the infaunal communities associated with such habitats that are regularly inundated by sea water. A habitat map for the proposed dredging site can be seen in Figure 2 where areas exposed during spring tides at the southern bank of the river have been mapped as Mud shores and Mixed sediment shores. The banks of the waterbodies in the study area are constructed of limestone blocks and classified as Stone walls
- BL1. Terrestrial habitats adjacent to stone walls are classified as Buildings and artificial surfaces (BL3).

During one site visit, otter was observed foraging in the Abbey River next to the weir. No other evidence of otter was recorded during any of the ecological field surveys and no otter breeding or resting places were identified within the study area. The waterbodies in the study area are suitable foraging and commuting habitats, as they are large and support fish populations. Otter is a conservation interest of the Lower River Shannon SAC.

4.1.3.2 Flora

No rare or protected flora species were recorded during any of the ecological surveys. Canadian waterweed (*Elodea canadensis*), a non-native aquatic plant species, was recorded within the proposed dredging area. Although the species is non-native, it is expressly excluded from the *Elodea* species listed in the First Schedule of the European Union (Invasive Alien Species) Regulations 2024 (S.I. No. 374 of 2024). This non-native species was recorded growing in the lower reach of the Abbey River within the proposed works area. Reproduction in *Elodea spp.* in the British Isles is through vegetative means. Water milfoil (*Myriophyllum* sp.) and *Cladophora sp.* were also recorded.

4.1.3.3 Otter

An otter was observed foraging in the Abbey River adjacent to the weir during an ecological field survey. No otter breeding or resting places were identified within the study area.

4.1.3.4 Birds

Common gull *Larus canus* and herring gull *Larus argentatus* were frequently recorded in the study area.

4.1.3.5 Fish

Fish encountered during surveys were sea lamprey (*Petromyzon marinus*), river/brook lamprey (*Lampetra* sp.). European eel (*Anguilla anguilla*), roach (*Rutilus rutilus*), flounder (*Platichthys flesus*), goby (*Gobius* sp.), perch (*Perca fluviatilis*) and three-spined stickleback (*Gasterosteus aculeatus*). Length statistics for other fish recorded during the surveys are presented in the Lamprey Assessment Report **(Appendix 3).** Sea lamprey, brook lamprey (*Lampetra planeri*) and river lamprey (*Lampetra fluviatilis)* are conservation interests of the Lower River Shannon SAC.

European eel occurred less frequently than lampreys and showed preference to vegetated areas and larger substrate sizes. The European eel is subject to European Council Regulation 1100/2007 'Establishing measures for the recovery of the stock of European eel' European eel is classified as Critically Endangered in Ireland (King et al., 2011) and remains classified as Critically Endangered in the updated European Red List of Freshwater Fishes (IUCN, 2026). Survey results are outlined in detail in **Appendix 3.**

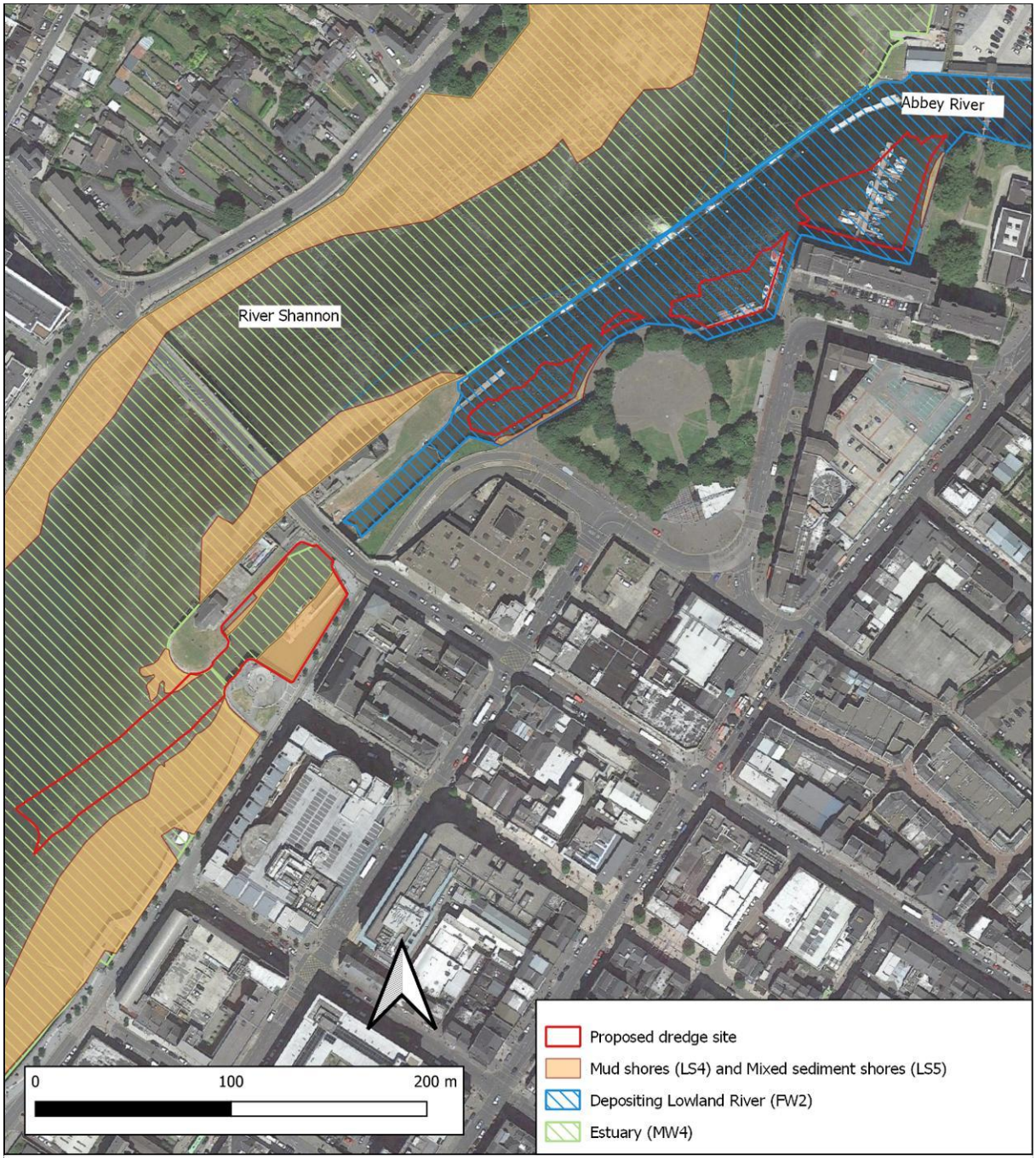

Figure 2 Habitat map

4.1.3.6 Sediments

A Marine Sediment Characterisation report was prepared by AQUAFACT International Services Ltd. on behalf of Waterways Ireland in September 2022. Sediment samples were collected on 20 July 2022 to assess the physical and chemical characteristics of material proposed for dredging and its suitability for disposal at sea or at an authorised waste facility (AQUAFACT, 2022).

The sediment chemistry results were assessed against the lower and upper Irish Action Levels outlined in the *Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters* (Cronin et al., 2006). Concentrations of arsenic, cadmium, chromium, copper, zinc, mercury, aluminium and lithium were reported below the applicable lower guidance values. However, an elevated lead concentration of 1,160 mg/kg dry weight was recorded at sampling station L1, exceeding the upper Irish Action Level of 218 mg/kg. Reanalysis by SOCOTEC confirmed the elevated concentration.

The 2022 assessment also included Waste Acceptance Criteria (WAC) testing to inform potential land-based disposal arrangements. The report identified material meeting inert waste acceptance criteria at several stations, while elevated total organic carbon concentrations affected the classification of material at stations L2, L4, L6 and L8.

Additional sediment sampling was undertaken on 4 March 2025 at 12 locations within the proposed dredging area. The updated sampling included analysis of metals, organotin compounds, organochlorine pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and hydrocarbons, with results presented in the Dumping at Sea Material Analysis Reporting Form (Fitz Scientific, 2025).

The 2025 results recorded lead concentrations ranging from 24.37 to 36.89 mg/kg dry weight across the 12 sampling locations, which are below the lower Irish Action Level of 60 mg/kg. The elevated lead concentration identified at sampling station L1 during the 2022 survey was not replicated during the 2025 sampling programme, which indicates that elevated lead concentrations are not representative of sediments across the proposed dredging area. Nevertheless, the confirmed exceedance recorded during the 2022 investigation has been considered as a potentially localised area of contamination within the assessment. Appropriate mitigation measures to identify, manage and prevent the disposal of any potentially contaminated material are described in Sections 7 and 8 of this NIS. The implications of the updated sediment characterisation results for the proposed dredging and disposal operations, including the identification and management of potentially contaminated material, are considered further in Sections 7 and 8 of this NIS.

4.2 Characteristics of the Project

The following table summarises the characteristics of the proposed maintenance dredging works. The works follow previous dredging undertaken in 2011, during which accumulated sediment was removed to restore navigational depths. Subsequent sediment deposition has necessitated further maintenance dredging to restore and maintain the established navigation channel and associated berthing areas.

Size, scale, area, land-take	The proposed works comprise maintenance dredging within five discrete areas upstream and downstream of Sarsfield Lock, including locations adjacent to Wellsley Pier and Honan's Quay. The dredging will be confined to the existing navigation channel and associated berthing areas, with no permanent land-take proposed. The proposed programme comprises eight annual dredging campaigns within a requested ten-year Maritime Usage Licence period. The initial campaign will involve approximately 6,355 m³ of fine sediment, followed by seven annual campaigns of approximately 2,118 m³ each, giving a total estimated dredging volume of 21,181 m³ over the eight-year programme (MWP, November 2026). Approximately 70 m³ of coarse granular material is also proposed for separate excavation and removal during the initial campaign. The proposed dredging footprint, excavation depths and dredging quantities are defined in the updated Project Description (MWP, November 2026) and form the basis of this assessment.
Details of physical changes that will take place during the various stages of implementing the proposal	The proposed dredging will remove accumulated sediment from the designated navigation areas to restore the required navigational depths. Fine sediments will be removed using a submersible DOP pump and transferred via floating discharge pipelines to three designated in-channel discharge locations within the River Shannon. Discharge will be undertaken during ebb tide conditions to facilitate downstream

	sediment transport and dispersion. Coarse granular material will be excavated separately and transported to an appropriately authorised waste facility. The works will result in localised removal and redistribution of sediment within the river system. The potential effects of sediment dispersion and deposition on downstream aquatic habitats and qualifying interests of European sites are assessed in **Sections 6** and **7.**
Description of resource requirements for proposal (water resources, construction material, human presence etc)	The proposed works will require a crane-mounted submersible DOP pump operating from a pontoon raft, floating discharge pipelines, and associated mooring and anchoring arrangements. A long-reach excavator and barge will be used for the separate removal and transport of coarse granular material. Other requirements will include fuel, oils and ancillary operational and safety equipment.
Description of timescale for the various activities that will take place as a result of implementation (including likely start and finish date)	The proposed maintenance dredging programme comprises eight annual campaigns within a requested ten-year Maritime Usage Licence period, allowing for mobilisation and relevant regulatory approval processes. Dredging is proposed to take place between October and February, inclusive, subject to suitable tidal, river-flow and weather conditions and applicable ecological restrictions. The project description anticipates commencement of the initial campaign in 2027. The duration of individual campaigns will depend on the confirmed dredging quantities, plant capacity and operational requirements.
Description of wastes arising and other residues (including quantities) and their disposal	The material arising from dredging will predominantly comprise fine sediments, including silt, clay and fine sand, with smaller quantities of coarse granular material. Fine sediment is proposed to be discharged at designated locations within the River Shannon, subject to the relevant regulatory authorisations. Coarse granular material and any unsuitable material requiring removal from the river will be managed separately and transferred to an appropriately authorised waste facility.
Identification of wastes arising and other residues (including quantities) that may be of particular concern in the context of the Natura 2000 network	Sediment characterisation undertaken in 2022 identified an elevated lead concentration of 1,160 mg/kg dry weight at sampling station L1, exceeding the upper Irish Action Level of 218 mg/kg (AQUAFACT, 2022). Subsequent sediment sampling undertaken in March 2025 recorded lead concentrations ranging from 24.37 to 36.89 mg/kg dry weight across 12 sampling locations, below the lower Irish Action Level of 60 mg/kg (Fitz Scientific, 2025). The potential implications of sediment contamination for the proposed dredging and deposition activities are considered further in Sections 7 and 8, with reference to the applicable Marine Institute sediment assessment guidance. The suitability of dredged material for the proposed disposal arrangements remains subject to consideration of the complete sediment characterisation dataset, the representativeness of the sampling undertaken and the outcome of consultation with the Marine Institute. **Campaign** — **Proposed sediment volume** Year 1 — 6,355 m³ Years 2–8 — 2,118 m³ per year **Total, eight-year programme** — **21,181 m³**

Description of any additional services required to implement the project or plan, their location and means of construction	N/A

5. Identification of Other Plans, Projects and Activities

5.1.1 Plans

The Limerick Development Plan 2022–2028 (as varied) was considered in the assessment of potential in-combination effects. The proposed dredging areas are located within the River Shannon and Abbey River, adjacent to established urban land uses within Limerick City. Relevant land-use zoning and development objectives for the surrounding area are set out in the Limerick Development Plan 2022–2028. Further details of the original assessment of plans are provided in Section 4.3 of the Screening for Appropriate Assessment report (Appendix 1).

5.1.2 Projects

5.1.2.1 Mulkear European Innovation Partnership[1]

The Mulkear European Innovation Partnership (EIP) was a five-year initiative established in 2019 under the Rural Development Programme 2014–2020. The project focused on farmer-led improvements to water quality, instream habitats and riparian management within the Mulkear Catchment in Counties Limerick and Tipperary.

The initiative promoted catchment-sensitive farming practices, knowledge exchange and collaborative approaches to reducing agricultural pressures on aquatic environments. Although the original programme period has concluded, measures implemented through the project may continue to contribute to improved water quality and habitat conditions within the wider River Shannon catchment..

5.1.2.2 Annacotty Fish Passage Project[2]

The Annacotty Fish Passage Project is an initiative led by Inland Fisheries Ireland (IFI) to improve fish passage at Annacotty Weir on the River Mulkear, a tributary of the River Shannon located within the Lower River Shannon SAC. The existing weir represents a significant barrier to the migration of fish species, including Atlantic salmon, sea lamprey and river lamprey.

In July 2026, IFI submitted a planning application (Planning Ref. 26/60806) proposing the removal of the approximately 34 m-long weir and restoration of approximately 50 m of the river channel to improve ecological connectivity and restore more natural river conditions. Planning permission was refused by Limerick City and County Council on 8 September 2026.

The proposed works have the potential to improve fish passage and aquatic habitat connectivity within the wider River Shannon catchment. The planning status of the project, including any subsequent appeal or revised application, should be considered when determining its potential for in-combination effects with the proposed maintenance dredging.

5.1.3 Permitted and Proposed dredgings in the Locality

An updated review of permitted and proposed developments was undertaken in November 2026 using the planning registers of Limerick City and County Council and An Coimisiún Pleanála, together with the Maritime

[1] https://www.catchments.ie/the-mulkear-european-innovation-project-eip/
[2] https://www.fisheriesireland.ie/what-we-do/conservation-and-development/annacotty

Area Regulatory Authority (MARA) applications and determinations register and the Environmental Protection Agency (EPA) Dumping at Sea permit register.

The review considered developments within the vicinity of the proposed maintenance dredging works and the wider connected River Shannon system where potential pathways for in-combination effects on European sites could arise. Particular consideration was given to developments involving in-channel works, sediment disturbance, water-quality effects, aquatic habitat alteration and disturbance of qualifying interests or special conservation interests.

Relevant developments identified through the review are summarised in **Table 1** and considered further in the in-combination assessment.

[2] https://www.fisheriesireland.ie/what-we-do/conservation-and-development/annacotty

Table Permitted and Proposed Developments and Maritime Activities Considered in the In-combination Assessment

Application No.	Applicant	Location	Proposed Development	Status
312559	Limerick City and County Council	Annacotty, Ballynanty, Castletroy, Corbally, Condell Road, Dock Road and Conigar embankments, Co. Limerick and Athlunkard, Knockballynameath and Quinspool South embankments, Co. Clare.	Ground investigation works to inform the option selection and design of the proposed Limerick City and Environs Flood Relief Scheme.	Approved with conditions, 20 September 2022. Wider scheme remains in development
306270	Limerick City and County Council	King's Island, Limerick.	Flood protection works around King's Island, Limerick City, including flood defence infrastructure and associated works.	Approved with conditions, 21 May 2021. Construction works progressed through 2026
MUL260020	Limerick City and County Council	Limerick City and Environs, including King's Island, Co. Limerick.	Site investigation works associated with the Limerick City and Environs Flood Relief Scheme.	Application received 15/05/2026. Revised NIS received 10/11/2026; determination not confirmed.
312146 / 318302-23	Aughinish Alumina Ltd.	Townlands of Aughinish East, Aughinish West, Island Mac Teige, Glenbane West, and Fawnamore at or adjacent to Aughinish Island, Askeaton, Co. Limerick	Expansion of the Bauxite Disposal Area, extension to the existing Salt Cake Disposal Cell and extension of the permitted borrow pit at Aughinish Alumina Limited.	Original permission quashed in 2023; subsequent March 2025 permission quashed in June 2026 and remitted for reconsideration
JA91.323849	Limerick Twenty Thirty DAC	Cleeves Riverside Quarter, Limerick City, Co. Limerick	Mixed-use redevelopment of the Cleeves Riverside Quarter, including associated infrastructure and public realm works.	Planning application under consideration; June 2026 further-information documentation available. Final determination to be verified.
S0009-03	Shannon Foynes Port Company	Port of Limerick and Foynes, Shannon Estuary, Co. Limerick	Maintenance dredging and associated disposal of dredged material from port facilities.	EPA Dumping at Sea permit S0009-03 authorised maintenance dredging at Ted Russell Dock, Limerick, and Foynes Harbour during the 2020–2026 period. Any subsequent authorisation requires confirmation.

The developments identified in **Table 1** include flood relief works, maritime infrastructure, maintenance dredging and other developments within the wider River Shannon system. Their potential to contribute to in-

combination effects will be considered having regard to their implementation status, spatial and temporal relationship with the proposed works, and potential for overlapping ecological impact pathways

5.1.4 EPA Licenced/Registered Facilities

A review of Environmental Protection Agency (EPA) licensing records identified several existing and historically licensed facilities within the wider environs of the proposed dredging works.

Longpavement Landfill (Waste Licence W0076-01), situated at Monabraher, Longpavement, Limerick, approximately 2 km upstream of the proposed dredging area, is a closed landfill facility subject to historical waste licensing and environmental monitoring requirements.

The former Limerick Gasworks site (Waste Licence W0281-01), located adjacent to Dock Road, Limerick, approximately 1 km southwest of the proposed dredging area, underwent extensive remediation works undertaken by Gas Networks Ireland. The remediation programme is substantially complete, with licence surrender procedures progressing in 2025.

Atlas Aluminium Limited (P0436-01) and James McMahon Limited (P0329-01), located approximately 1.5 km southwest of the proposed dredging area, are associated with historical industrial activities. The IPC licence for Atlas Aluminium Limited was surrendered on 4 December 2015, while James McMahon Limited is associated with historical timber-treatment activities and a licence surrender process.

Limerick Wastewater Treatment Plant, located at Bunlicky, approximately 4 km southwest of the proposed dredging area, serves the Limerick City and Environs agglomeration (EPA Wastewater Discharge Licence D0013-01). The facility discharges treated wastewater to the Shannon Estuary.

The potential for these facilities and associated discharges to contribute to in-combination effects with the proposed maintenance dredging is considered having regard to their operational status, environmental authorisations and potential pathways for effects on the receiving waters and relevant European sites.

5.1.5 Existing Land-use and On-going Activities

Existing land uses within and surrounding the proposed dredging areas are predominantly urban, comprising commercial, residential, recreational, transport and port-related activities associated with Limerick City and the River Shannon. The river also supports navigation, recreational boating and other maritime activities.

Within the wider River Shannon catchment, agriculture, commercial forestry, quarrying and other industrial and commercial activities contribute to existing land-use pressures. These activities have the potential to influence water quality, sediment transport and aquatic habitat conditions within the receiving environment.

[3] https://www.radiokerry.ie/news/environmental-group-successful-in-aughinish-alumina-high-court-challenge-330187
[4] Integrated Pollution Control (IPC) Licence (formerly IPPC Licence), and Industrial Emissions Licence (IEL)
[5] EPA Waste Licence No. W0076-01

5.1.6 Potential for Significant In-combination Effects

Potential in-combination effects may arise where the proposed maintenance dredging interacts with other existing, permitted or proposed activities affecting the same European sites. Relevant activities identified through the desktop review include flood relief works, maritime infrastructure, maintenance dredging, wastewater discharges and other developments within the River Shannon and Shannon Estuary.

The proposed maintenance dredging comprises eight annual campaigns within a requested ten-year licence period. The in-combination assessment therefore considers the potential for temporal overlap between individual dredging campaigns and other relevant plans, projects and activities, including those affecting sediment transport, water quality, aquatic habitats and disturbance of qualifying-interest and special-conservation-interest species.

Potential overlapping impact pathways include sediment disturbance and redistribution, changes in water quality, aquatic habitat alteration and disturbance or displacement of qualifying interests and special conservation interests of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA.

The potential for in-combination effects is considered having regard to the location, nature, scale, timing and environmental effects of the identified activities, together with the proposed maintenance dredging works. The detailed in-combination assessment is presented in Section 7.5.

6. Identification of Natura 2000 Sites

Appropriate Assessment is the consideration of the impact of the project on the integrity of the Natura 2000 site, either alone or in combination with other plans or projects, with respect to the site's ecological structure and function, and conservation objectives. Additionally, mitigation of these impacts can be considered.

In cases where an Appropriate Assessment is required a Natura Impact Statement (NIS) shall be prepared and shall include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for Natura 2000 sites in the view of the conservation objectives of the site. The aim of the assessment is to provide a sufficient level of information to the competent authority on which to base their Appropriate Assessment of the plan or project. The plan or project should be fully described particularly in relation to the aspects that could interact with the surrounding environment. The project has been fully described in Section 4 above.

The screening for Appropriate Assessment report concluded, in the absence of mitigation, that significant impacts as a result of the proposed dredging are likely, or significant impacts could not be ruled out at this stage, for the following Natura 2000 sites, listed in Table 2 below. Please see Appendix 1 for the screening for Appropriate Assessment report which has been prepared.

Table 2 Natura 2000 sites included for Stage 2 Appropriate Assessment

Designated Site	Site Code	Proximity of Designated Site to Nearest Point of Subject Site	Hydrological/Ecological Connection? (Yes/No)
Lower River Shannon SAC	002165	Within the designated site	Yes
River Shannon and River Fergus Estuaries SPA	004077	270 m to south-west	Yes

The focus of this assessment is to now determine whether the proposed dredging will have an adverse effect on the features of interest of the Natura 2000 sites i.e. habitats and species The assessment identifies potential interactions between the proposed works and the ecological requirements of the relevant qualifying interests and special conservation interests, including potential effects on water quality, habitats and species. These

effects are assessed further in Section 7. The test of the assessment is whether the plan or project will have 'an adverse effect on the integrity of the site'. Where potentially significant effects are identified proven mitigation measures will be recommended.

6.1.1 Description of Natura 2000 Sites

6.1.1.1 Lower River Shannon SAC (002165)

The Lower River Shannon SAC is designated for the protection of the following qualifying features of conservation interest.

Habitats

- Sandbanks which are slightly covered by sea water all the time [1110]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150]
- Large shallow inlets and bays [1160]
- Reefs [1170]
- Perennial vegetation of stony banks [1220]
- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
- *Salicornia* and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]

Species

- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106] (QI status pertains only to freshwater phases of life cycle)
- *Tursiops truncatus* (Common Bottlenose Dolphin) [1349]
- *Lutra lutra* (Otter) [1355]

The following text summarises the NPWS site synopsis for this designated site. The full site synopsis is available on the NPWS website.

This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head, a distance of some 120km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon Estuary. This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the

E.U. Habitats Directive, including the priority habitats lagoon and alluvial woodland, the only known resident population of bottle-nosed dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of triangular club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding (NPWS 2013).

6.1.1.2 River Shannon and River Fergus Estuaries SPA (004077)

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry. The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. Macoma-Scrobicularia-Nereis, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: cormorant, whooper swan, light-bellied brent goose, shelduck, wigeon, teal, pintail, shoveler, scaup, ringed plover, golden plover, grey plover, lapwing, knot, dunlin, black-tailed godwit, bar-tailed godwit, curlew, redshank, greenshank and black-headed gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The River Shannon and River Fergus Estuaries SPA is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds. Apart from the wintering birds, large numbers of some species also pass through the site whilst on migration in spring and/or autumn. This site is a designated Special Protection Area (SPA) under the E.U. Birds Directive for the special conservation interest of the following features of interest:

- Cormorant (*Phalacrocorax carbo*) [A017]
- Whooper Swan (*Cygnus cygnus*) [A038]
- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
- Shelduck (*Tadorna tadorna*) [A048]
- Wigeon (*Mareca penelope*) [A050]
- Teal (*Anas crecca*) [A052]
- Pintail (*Anas acuta*) [A054]
- Shoveler (*Spatula clypeata*) [A056]
- Scaup (*Aythya marila*) [A062]
- Ringed Plover (*Charadrius hiaticula*) [A137]
- Golden Plover (*Pluvialis apricaria*) [A140]
- Grey Plover (*Pluvialis squatarola*) [A141]
- Lapwing (*Vanellus vanellus*) [A142]
- Knot (*Calidris canutus*) [A143]
- Dunlin (*Calidris alpina*) [A149]
- Black-tailed Godwit (*Limosa limosa*) [A156]
- Bar-tailed Godwit (*Limosa lapponica*) [A157]
- Curlew (*Numenius arquata*) [A160]

- Redshank (*Tringa totanus*) [A162]
- Greenshank (*Tringa nebularia*) [A164]
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179]
- Wetland and Waterbirds [A999]

Species vary considerably in different aspects of their ecology with regards to trophic (foraging) guild, food/prey requirements, principal supporting habitat within the site, ability to use alternative habitats within the site and site fidelity/faithfulness (NPWS, 2012b). Species will vary in this use of habitats within a site. This may vary between times of day, seasons and between different sites. The following table outlines the ecological characteristics, requirements and specialities for non-breeding waterbird SCIs within the River Shannon and River Fergus Estuaries SPA (table adapted from NPWS, 2012b).

Table 3 Ecological Characteristics, requirements and specialities of non-breeding waterbird SCI species for River Shannon and River Fergus Estuaries SPA[6]

Species	Distribution[A]	Trophic Guild[B]	Food Prey Requirements[C]	Principal Habitat within site[D]	Ability to use alternative habitats[E]
Bar-tailed godwit	Localised	4	Wide	Intertidal mud/sand flats	2
Black-headed gull	N/C	1,2,4,6,7	Wide	Intertidal flats and shallow and sheltered subtidal	2
Black-tailed godwit	Localised	4	Wide	Intertidal mud/sand flats	2
Cormorant	Widespread	3	Highly specialised	Sheltered and shallow subtidal	1
Curlew	Widespread	4	Wide	Intertidal mud/sand flats	2
Dunlin	Intermediate	4	Wide	Intertidal mud/sand flats	3
Golden plover	Intermediate	4	Wide	Intertidal mud/sand flats	2
Green shank	Intermediate	6	Wide	Intertidal mud/sand flats	3
Grey plover	Localised	4	Wide	Intertidal mud/sand flats	3
Knot	Localised	4	Narrower	Intertidal mud/sand flats	3
lapwing	Widespread	4	Wide	Intertidal mud/sand flats	2
Light-bellied Brent Goose	Localised	1,5,7	Highly specialised	Intertidal mud/sand flats	2
Red shank	Intermediate	4	Wide	Intertidal flats and sheltered shallow subtidal	2
Ringed Plover	Localised	4	Wide	Intertidal mud/sand flats	3
Pintail	Localised	1	Wide	Intertidal mud/sand flats, sheltered and shallow subtidal	2
Scaup	Highly Restricted	2	Wide	Subtidal	1
Shelduck	Localised	1,5	Wide	Intertidal mud/sand flats, shallow subtidal	3
Shoveler	Localised	1	Wide	Lagoon, brackish and freshwater lakes, plus intertidal sand and mud flats	3
Teal	Widespread	1	Wide	Intertidal mud/sand flats, shallow subtidal and lagoons	3
Whooper Swan	Widespread	1,7	Wide	Lagoon and associated habitats, intertidal mudflats and shallow subtidal	2
Wigeon	Widespread	1,5	Narrower	Intertidal mud/sand flats, sheltered and shallow subtidal lagoons	2

A: Distribution – Very Widespread (>300 sites), Widespread (200-300 sites), Intermediate (100-200 sites), Localised (50-100 sites), Highly Restricted (<50 sites) (based on Boland & Crowe, 2012).
B: Trophic Guild – 1= surface swimmer, 2= water column diver (Shallow), 3= water column diver (deeper), 4/5= Intertidal walker (out of water), 6= Intertidal walker (in water), 7= terrestrial walker
C: Food/Prey Requirements – species with a wide prey/food range, a narrow prey range (e.g. a species that forage upon a few species/taxa only), and species with highly specialised foraging requirements (e.g. piscivores).
D: Principal Supporting Habitat present within the SPA (Note that this is the main habitat used when foraging with the exception of Whooper Swan that utilise wetland habitats for roosting and forage within terrestrial grasslands outside of the SPA).
E: Ability to Use Alternative Habitat – refers to the species ability to utilise other habitats adjacent to the site: 1= wide-ranging species, 2= reliant on site but highly likely to use alternative habitat at certain times (e.g. high tide), 3= considered totally reliant on wetland habitats due to unsuitable surrounding habitats and/or species limited by habitat requirements.
F: Site fidelity on non-breeding grounds: Unknown; Weak; Moderate; or High.

[6] https://www.npws.ie/sites/default/files/publications/pdf/004077RiverShannonandRiverFergusEstuariesSPASupportingDoc_V1.pdf

6.1.2 Impact prediction

The proposed maintenance dredging will be undertaken using a crane-mounted submersible DOP pump operating from a pontoon raft within the designated dredging areas. Fine sediment will be transferred through floating discharge pipelines to three designated in-channel discharge locations within the River Shannon, with discharge undertaken during ebb-tide conditions. Coarse granular material will be excavated separately and transported to an appropriately authorised waste facility. Works will take place however in an area where sediment has settled and these sediments occur within the SAC where the affected habitats have been identified as depositing lowland river, mud shores and estuary. These habitats have links with some of the habitats listed as qualifying interests of the Lower River Shannon SAC and support some of the species listed as qualifying interests of the Lower River Shannon SAC. Each QI is addressed with regard to direct and indirect impacts, and pathways, and potential effects as set out below.

The following has been taken from the '*Lower River Shannon SAC (site code: 2165) conservation objectives supporting document for marine habitats and species*' (NPWS, 2012c) and is relevant to impact assessment for the proposed works:

"It is worth considering at the outset that in relation to Annex I habitat structure and function, the extent and quality of all habitats varies considerably in space and time and marine habitats are particularly prone to such variation. Habitats which vary naturally, i.e. biotic and/or abiotic variables are changing within an envelope of natural variation, must be considered to have favourable conservation condition. Anthropogenic disturbance may be considered significant when it causes a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes. The capacity of the habitat to recover from this change is obviously an important consideration (i.e. habitat resilience) thereafter".

Some activities may cause significant disturbance but may not necessarily represent a continuous or ongoing source of disturbance over time and space. This may arise for intermittent or episodic activities for which the receiving environment would have some resilience and may be expected to recover within a reasonable timeframe relative to the six-year reporting cycle (as required under Article 17 of the Directive). This Department is satisfied that such activities could be assessed in a context specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

6.1.2.1 Direct impacts

The proposed maintenance works are within the Abbey River navigation channel at Sarsfield's Lock at the confluence of the Abbey River with the River Shannon The proposed maintenance dredging will be undertaken within the existing navigation channel. Although no permanent loss of habitat is proposed, the works will result in temporary disturbance and alteration of riverbed substrates within the dredging footprint, including habitats potentially supporting qualifying interests of the Lower River Shannon SAC.

The dredging of alluvial deposits and disposal to the River Shannon gives rise to the potential for direct water quality impacts arising via the mobilization of suspended solids within the river channel at elevations which may be harmful to habitats, fish and aquatic invertebrates in the River Shannon and Estuary within the Lower River Shannon SAC and the River Sahnnon and River Fergus Estuaries SPA.

The proposed works at the dredge sites are located approximately 270m upstream (east) of the River Shannon and River Fergus Estuaries SPA so there will be no direct impacts on habitats within this SPA.

The transport of hard material from the proposed dredge sites to Limerick Dock, approximately 1km to the west could result in displacement of birds from the river and/or the river margins. This activity however will involve the movement of only 70m^3 of material and therefore be of short duration and intensity. While part of the River Shannon and River Fergus Estuaries would be used to facilitate this movement, this part of the river is

frequented by boats, and within an urban context, and as such, there would be no significant disturbance

impact on birds. The conservation interests of the Lower River Shannon SAC are discussed hereunder with regard to direct impacts.

6.1.2.1.1 *Sandbanks which are slightly covered by sea water all the time [1110]*

The extent of mapped 'sandbanks which are slightly covered by seawater all the time' in the Lower River Shannon SAC is given in NPWS (2012b). This habitat is mapped as occurring south of Rinevella Point, Co. Clare and west of Ballybunion, Co. Kerry in the mouth of the Shannon Estuary. This habitat is in excess of 70km to the west of the proposed dredging so there will be no direct impacts on this habitat.

6.1.2.1.2 *Estuaries [1130]*

The Shannon and Fergus Estuaries form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon Estuary (considered being a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit, there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River (NPWS, 2012a). Mixing in estuaries is influenced by a number of factors including the size and shape of the inflowing river. This mixing is constantly changing as it also depends on the influence of wind, swell and the state of the tide.

Estuarine habitat occurs in the River Shannon within the proposed dredge areas below Sarsfield Lock, and adjacent to the Abbey River, so there will be some direct impacts on this habitat. Estuarine, including tidal mudflats in the main channel of the River Shannon will be directly affected by the proposed works. The conservation objective document for the Lower River Shannon SAC notes that the estuarine habitat area was estimated as 24,273ha. The area proposed for dredging is less than 1 hectare (0.963 ha.) so the area directly affected is less than 0.004% of the entire area of estuarine habitat in the SAC. A significant negative effect is not predicted due to the very small proportion of this habitat directly affected and the temporary nature of the works.

The impacts relate to removal and disturbance of substrates, with consequent reduction in mass of sediment in the works area associated with dredging. There will be water quality impacts associated with dredging and the discharge of sediment to the estuary. Excessive siltation could have negative ecological effects on estuarine habitat and the ecosystems supported by same. It is important to note that no works will be undertaken outside of the original navigation channel works area, as works are limited to the maintenance of this navigation. There will therefore be no direct loss of semi-natural habitat within the study area.

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

'Mudflats and sandflats not covered by seawater at low tide' occur extensively throughout the Lower River Shannon SAC, in particular along the edges of the Shannon Estuary channel. They occur adjacent to the shores of Limerick Docks and the Inner Shannon Estuaries, beginning at Shannon Bridge and increasing in extent further downstream as the estuary channel widens.

During habitat surveys undertaken for the proposed works two small areas of previously unmapped 'Mud shore (LS4) corresponding to mudflats were identified within the enclosure of Sarsfield Lock. The proposal will result in works within these areas of mudflat so there will be direct impacts on this habitat. It is considered that this habitat will re-establish in the short-term post works given the naturally high levels of suspended solids in Limerick Docks and the sluggish waters within the confines of Sarsfield Lock.

The conservation objective document for the Lower River Shannon SAC notes that the estuarine habitat area was estimated as 8,808ha. The area proposed for dredging is less than 1 hectare (0.963 ha.) so the area directly affected is ca. 0.01% of the entire area of estuarine habitat in the SAC. A significant negative effect is not

predicted due to the very small proportion of this habitat directly affected and the temporary nature of the works.

6.1.2.1.4 *Coastal lagoons [1150]*

According to habitat mapping presented in NPWS (2012b), there are four coastal lagoons within the SAC, namely Quayfield and Poulaeala Loughs, Shannon Airport Lagoon, Scattery Lagoon, and Cloonconneen Pool. The nearest of these is Shannon Airport Lagoon, located ca. 20km west of the proposed dredging. There will be no direct impacts on these habitats.

6.1.2.1.5 *Large shallow inlets and bays [1160]*

The habitat 'large shallow inlets and bays' is a large physiographic feature that may wholly or partly incorporate other Annex I habitats including reefs, sandbanks and mudflats and sandflats within its area. In contrast to estuaries, large shallow inlets and bays have limited freshwater influence. This habitat-type, with an estimated area of approximately 25,000ha, is mapped as occurring west of Shannon towards the mouth of the estuary. The habitat comprises the channel south of Kilrush, Co. Clare extending westwards to the outer extent of the estuary (NPWS, 2012a). This habitat is in excess of 40km to the west of the proposed dredging. There will be no direct impacts on this QI.

6.1.2.1.6 *Reefs [1170]*

'Reef' occurs throughout the estuary, mainly as scattered and isolated pockets within the inner estuary and covering more extensive areas towards the middle and outer reaches of the channel. A review of mapping available for this habitat-type determined that the closest areas of reef to the proposed dredging comprises areas located in the Inner and Maigue Estuaries of the greater Shannon Estuary, located approximately 10km from the proposed dredge site. There will be no direct impacts on this QI.

6.1.2.1.7 *Perennial vegetation of stony banks [1220]*

This habitat occurs along the coast where shingle (cobbles and pebbles) and gravel have accumulated to form elevated ridges or banks above the high tide mark. This habitat is recorded in 9 locations along the Shannon River and Estuary. At its closest, this habitat occurs at Ballymacrinan Bay (NPWS, 2012a), a distance in excess of 50km west of the project so there will be no direct impacts.

6.1.2.1.8 *Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]*

'Vegetated sea cliffs of the Atlantic and Baltic coasts' occur at the western extent of the Shannon Estuary. At its closest, this habitat is located at Baurrane on the southern coast of Co. Clare (NPWS, 2012a), in excess of 40km west of the proposed dredging so there will be no direct impacts.

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

Salicornia and other annuals colonizing mud and sand are classified by Fossitt (2000) as lower salt marsh. A review of habitat mapping and the coastal habitats supporting document available for the SAC determined that of the ten sub-sites surveyed, mapped and assessed as part of the Saltmarsh Monitoring Project (McCorry & Ryle, 2009) the closest Salicornia habitat is mapped as occurring is the 'Inishdea, Owenshere' sub-site (SMP 0083)(NPWS, 2012a). Inishdea saltmarsh is located in southern Co. Clare, along the western side of the Fergus Estuary, in excess of 28km west of the proposed dredging so there will be no direct impacts.

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

'Atlantic salt meadows' (ASM) generally occupy the widest part of the salt marsh gradient. A review of habitat mapping and the coastal habitats supporting document available for the SAC determined that of the ten sub-sites surveyed, mapped and assessed as part of the Saltmarsh Monitoring Project (McCorry & Ryle, 2009), the closest habitat to the proposal site is ca. 9km downstream, or ca. 7km west, where the habitat is classified as Potential Atlantic salt meadows. As noted in the conservation objectives for this site, further unsurveyed areas maybe present within the site. There will be no direct impacts on this habitat as it does not occur in the proposed works area. Mediterranean salt meadows (*Juncetalia maritimi*) [1410]

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

'Mediterranean salt meadows' (MSM) occupy the upper zone of salt marshes and usually occur adjacent to the boundary with terrestrial habitats. They are widespread on the Irish coastline; however, they are not as extensive as Atlantic salt meadows. A review of habitat mapping and the coastal habitats supporting document available for the SAC determined that of the ten sub-sites surveyed, mapped and assessed as part of the Saltmarsh Monitoring Project (McCorry & Ryle, 2009), the closest MSM site to the proposal site are associated with the estuaries of the Owenslieve, part of the River Fergus Estuary and the Ahacronane River, part of the Lower Shannon Estuary is the 'Bunratty' sub-site (SMP 0081)(NPWS, 2012a), so there will be no direct impacts.

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

This annexed habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. The full distribution of this habitat and its sub-types within the SAC are currently unknown. The *Groenlandia densa* (L.) Fourr., Opposite-leaved Pondweed sub-type has been identified as a high conservation element in the SAC. In Ireland, this sub-type is associated with tidal reaches of rivers and other periodically disturbed watercourses (e.g. canals and drains) (NPWS, 2012a). *Groenlandia densa* was not identified during habitat surveys carried out at the proposed dredge works sites.

Canadian pondweed occurs in the Abbey River within parts of the proposed dredge sites but this is not confirm to 'Floating river vegetation' as the habitat is commonly known, so there will be no direct impacts to this habitat.

6.1.2.1.13 *Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]*

'Molinia meadows on calcareous, peaty or clayey-silt-laden soils' is represented in Ireland by both fen and grassland communities on nutrient-poor soils. The habitat is either managed as traditional hay meadows or more usually by extensive pasture. *Molinia* meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a marl layer beneath the surface, or on peaty soils both in lowland and upland situations (NPWS, 2019). The full extent of this habitat within the SAC is currently unknown. It has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick NPWS (2012a).

Given the characteristics and location of the project, it is not considered that the proposal has any potential to impact on this habitat-type, which occurs only the terrestrial environments. Thus, the project will not affect the conservation objectives for '*Molinia* meadows' and the habitat is not considered further in the NIS.

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

Alluvial woodland is a priority Annex I habitat. A number of variants of this habitat exist, of which riparian forests of *Fraxinus excelsior* and *Alnus glutinosa* of temperate and Boreal Europe lowland and hill watercourses are the

most common type found in Ireland. The Interpretation Manual of EU habitats (2013) states that all types occur on heavy soils which are periodically inundated by the annual rise of river levels, but which are otherwise well-drained and aerated during low water. In addition, there are gallery forests of tall willows alongside river channels and occasionally on river islands, where the tree roots are almost continuously submerged (NPWS, 2019a).

Alluvial woodlands occur along the Shannon, in the valley bottoms of the tributaries and on seepage zones on valley sides. Within the SAC, five sites have been surveyed as part of the National Survey of Native Woodlands. These are small stands, restricted to narrow bands where the ground is subject to flooding (NPWS, 2012a). The nearest mapped area of this habitat is at Clare Glen along the main channel of the Clare River, approximately 15km east of the proposed works. Given the characteristics and location of the project, it is not considered that the proposal has any potential to significantly impact on this habitat-type. Thus, the project will not affect the conservation objectives for 'Alluvial forests' and the habitat is not considered further in the NIS.

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

The freshwater pearl mussel is a large, long-lived bivalve mollusc found in clean, fast-flowing, well-oxygenated rivers with unconsolidated substrates. Stable, clean gravel and sand with adequate availability of dissolved oxygen provides ideal habitat for juveniles. Water pH and hardness is also important with distribution mainly restricted to acidic, soft waters over-lying non-calcareous rock-types. Low nutrient status is also critical such that excess macrophyte and algal growth is prevented; therefore oligotrophic waterbodies are required. Conservation objectives for this species within the SAC apply to the freshwater pearl mussel population in the Cloon River, County Clare. This population is confined to the main channel and is distributed from Croany Bridge to upstream of Clonderalaw Bridge (NPWS (2012a). The Cloon River enters the main Shannon Estuary in excess of 40km west of the proposal site.

Given the characteristics and location of the project, and the ecology of this species, it is not considered that the proposal has any potential to significantly impact on freshwater pearl mussel. Thus, the project will not affect the conservation objectives for 'Freshwater Pearl Mussel' and the species is not considered further in the NIS.

6.1.2.1.16 *Petromyzon marinus (Sea Lamprey) [1095], Lampetra planeri (Brook Lamprey) [1096] and L. fluviatilis (River Lamprey) [1099]*

The three lamprey species likely to occur at the proposed dredge locations: sea lamprey, river lamprey, and brook lamprey. The depositing areas at the proposed dredge locations provides some suitable habitat for larval lampreys which have probably drifted downstream from suitable spawning areas in the main channel in the River Shannon upstream. The proposed dredge locations are on a stretch of fresh water identified as the lower limit/range of suitable juvenile habitat in the Shannon and comprises marginal habitat with low densities of lamprey larvae. Lampreys were not detected in the proposed dredge sites downstream of Sarsfield Lock so the proposed works in these areas would not incur direct impact on lampreys or their habitats. The habitats affected by dredging will start to build up fine sediment when the River Shannon experiences floods and associated high suspended solids levels, so any reduction in suitable habitat for juvenile lampreys will be temporary, lasting only weeks.

The lamprey report (Appendix 3) maps the optimal juvenile lamprey habitats and provides estimated lamprey densities at survey locations within the proposed dredge sites. Three of the four proposed dredge locations within the Abbey River were found to support juvenile lampreys. All locations where lampreys were recorded coincided with areas identified as optimal habitats for same. The one proposed dredge location not identified as providing optimal juvenile lamprey habitat (Site 3) was an area that was not sheltered and subject to strong flows. Using results for sites where optimal habitats occurred within the proposed dredge areas, the average

juvenile lamprey density is considered to be in the order of 0.34/m^2. The area of optimal habitats that occurred within the proposed dredge areas was calculated as 2640 m^2, or 0.264 ha. Using these data, it is estimated that 880 juvenile lampreys occur in the optimal habitats directly affected by dredging. The greatest density of lampreys was found to be in the shallows near the margin of the river, outside the proposed dredge areas, with density generally decreasing with depth. Without mitigation, it is likely that hundreds of juvenile lampreys would be lost by the proposed dredging due to the mechanical action associated with the cutting head of the dredger, or if they are drawn into the dredger and discharged without being injured, they would be transferred to the main River Shannon where they would likely be washed downstream and expire in the brackish water of the estuary. It is possible that most lampreys can be removed from affected optimal habitats however before dredging and therefore such a loss can be avoided.

Table 4 Potential loss of lamprey and habitats within the proposed dredge areas

Designated Site	Area (m^2)	Estimated No. of lampreys
Optimal	2640	880
Suboptimal / unsuitable	4410	0
Total area within proposed dredge area (i.e. areas upstream of Sarsfield Lock)	7050	880

The works area does not provide suitable spawning habitat for lampreys within the Abbey River or the Lower Shannon at the lower end of the study area, so there will be no direct impacts on lamprey spawning areas. Migratory sea and river lampreys pass upstream through the River Shannon main channel during their spawning runs and it is considered that only a small proportion use the Abbey River to reach favourable spawning grounds upstream. There could be some disturbance impacts for lampreys migrating through the lower River Shannon should they be passing through at the time dredging is taking place by way of noise and elevated suspended solids in the water column. Theis could impede upstream or downstream movements, with the effect of energy wastage and increased risk of predation respectively. Elevated levels of suspended solids in the water column could also impact movement of this species through the impacted area and hydrocarbon pollution, if it occurred could affect dissolved oxygenation and therefore lamprey survival if oxygen concentrations were too low. The effects are not considered significant however taking account of the width of the River Shannon adjacent to the works (and related unimpacted area available to navigate the channel) and the episodic nature of the dredging (only taking place with the ebb tide).

There would be direct habitat loss for juvenile lampreys in the short-term arising from the proposed works, with the removal of silt deposits within the existing navigation channel. However, the relatively low numbers of lamprey juveniles and proposed mitigation measures for these species are considered to negate the potential for any significant effects on these species with regard to the integrity of the Lower River Shannon SAC.

The proposed maintenance works would not affect the distribution of lamprey species within the SAC, and with the exception of short term sub-optimal habitat loss, there would be no net impact on the abundance of lamprey species, provided the mitigation measures proposed are implemented.

6.1.2.1.17 *Salmo salar (Salmon) [1106] QI status pertains only to freshwater phases of life cycle)*

Adult salmon occur in the Shannon Estuary prior to returning to natal streams to spawn, and smolts occur in the estuary on their journey from influent rivers to the sea. It is noted that conservation objectives for the Lower

River Shannon SAC are only for salmon in fresh waters, and that the proposed works are within the WFD transitional waterbody 'Limerick Dock' so the proposed works area does not pertain to a freshwater environment. However, it is considered that the proposed dredge areas upstream of Sarsfield Lock, in the Abby River, are within freshwater.

The Abbey River is considered likely to support low numbers of juvenile salmon, and the proposed dredge areas would not be used by spawning salmon with reference to Hendry and Cragg-Hine (2003), which describes the ecology of the Atlantic salmon. It is likely that occasional salmon smolts move through the Abbey River during their downstream migration and some adult salmon may also use the Abbey River as they re-enter fresh water to spawn in upstream areas. Most migrating salmon will use the River Shannon as opposed to the Abby River given its relatively large size however.

The proposed works may therefore give rise to disturbance impacts affecting this species due to noise and elevated suspended solids, but the effect is not considered significant taking account of the width of the River Shannon adjacent to the works (and related unimpacted area available to navigate the channel) and the episodic nature of the dredging (only taking place with the ebb tide). Elevated levels of suspended solids in the water column could also impact movement of this species through the impacted area and hydrocarbon pollution, if it occurred could affect dissolved oxygenation and therefore salmon survival if oxygen concentrations were too low. High suspended solids concentrations can affect the feeding and health of individual species either indirectly through increased turbidity of the water, or directly through clogging of gills (Naden e*t al,* 2003). Taking account of the large flow rates at the proposed works locations, the mobility of salmon, and the extent of river available, pollution via suspended solids or hydrocarbons will highly unlikely to be of a magnitude that results in damage to fish.

There will be no impacts affecting salmon with appropriate mitigation measures for the protection of water quality, and timing to avoid times when smolts are moving downstream.

6.1.2.1.18 *Tursiops truncatus (Common Bottlenose Dolphin) [1349]*

There is a resident population of bottle-nosed dolphin in the Shannon Estuary. This is the only known resident population of this Annex II species in Ireland. The majority of the Shannon Estuary is considered to comprise suitable habitat for this species, apart from the inter-tidal areas of the Fergus Estuary and the inner estuary channel in the vicinity of Shannon town stretching east towards Limerick; however, a review of on-line species records shows that sightings are concentrated in the outer channel. Within the SAC two 'critical areas', representing habitat used preferentially by bottlenose dolphin, have been identified. These are located in the vicinity of Tarbert/Killimer and further west towards the mouth of the estuary in the vicinity of Ballybunion and Kilcredaun Point (NPWS, 2012). A review of studies (unpublished reports) available on the NPWS website on the Shannon Estuary bottlenose dolphin population determined that previous surveys have focussed on the outer estuary channel, including these 'critical areas', rather than in the inner estuary in the vicinity of Shannon and the proposed works.

Given the characteristics and location of the project including the localised nature, extent and scale of the proposed works, the dilution potential of the River Shannon and estuary and the distribution of bottlenose dolphin habitat and records within the outer estuary beyond the zone of influence of the proposed dredging, there is no potential to significantly impact on this species. Thus, the project will not affect the conservation objectives for 'Common Bottlenose Dolphin' and the species is not considered further in the NIS.

6.1.2.1.19 *Lutra lutra (Otter) [1355]*

Otter are widespread in Ireland throughout freshwater and coastal habitats. Otter has two basic requirements: aquatic prey and safe refuges in which to rest. In Ireland, otters are found along rivers, lakes and coasts, where

fish and other prey are abundant, and where the bank-side habitat offers sufficient cover. The presence of freshwater, a sufficient prey-base and suitable sites for holts/couches are key factors in determining otter distribution.

The proposed works would be located within Limerick City centre and subject to background lighting, noise, traffic and human disturbance along the existing river walls and bridges. The Abbey River at the proposed dredge sites is bounded by artificial surfaces that include footpaths and pontoons which are used by pedestrians while the Abbey River is used by boat and kayak users. The proposed works are considered likely to give rise to limited disturbance impacts on otter foraging and commuting within the study area due to the presence of machinery and elevated levels of suspended solids via substrate removal. Taking account of the size of the River Shannon at Limerick, otter would likely continue to utilise the watercourse within the works; however, they may not use the lower Abbey River during the works period. Overall, nocturnal movement of otter within the works area is not likely to be affected by the proposed works any more than the existing background influence of city activity, in the context of boat traffic, urban traffic, hard infrastructure and low cover at the proposed dredge locations and immediate environs.

In respect of potential for some very localized and temporary disturbance and/or displacement to otter potentially foraging in the area, Chanin (2003) indicates that otters will rest under roads, in industrial buildings, close to quarries, and at other sites close to high levels of human activity, clearly indicating that otters are very flexible in their use of resting sites and do not necessarily avoid 'disturbance' in terms of noise or proximity to human activity. Increased human presence could reduce the occurrence of otter in the study area for the duration of the works but no couch sites or holts occur in the environs of the dredge sites and bearing in mind the wide availability of suitable habitat in the vicinity of the works, this impact is not considered significant.

The range, distribution and abundance of this species within the Lower River Shannon will not be affected by direct impacts proposed works as works are temporary, will not significantly reduce the amount of animals preyed upon by otter, and a relatively small area of any otters hunting territory will be impacted and only for a short duration.

6.1.2.1.20 *Other considerations*

Integrity of the Lower River Shannon SAC is also dependent on other ecological features in addition to the species and habitats listed as qualifying interests. One species identified as an important component of the Lower River Shannon ecosystem is Smelt (Osmerus eperlanus), which is mentioned in the SAC site synopsis but is not a qualifying interest of the SAC.

Adult Smelt migrate upstream into the tidal freshwater reaches of rivers during spring to spawn. Spawning may occur within the Abbey River, although the precise spawning locations within the study area have not been confirmed. Smelt may therefore be affected by increased suspended sediment concentrations, sediment disturbance or changes in water quality associated with the proposed dredging.

The proposed October–February dredging window is intended to avoid the principal spring spawning period. However, the potential for disturbance during migration and effects on suitable spawning habitat should be considered in the context of the proposed works and relevant ecological restrictions.

6.1.2.2 Indirect impacts

The proposed disposal of sediments from dredge sites to the main channel of the River Shannon introduces the potential for changes to estuarine habitats downstream through deposition of sediment in areas where the dredged material settles out of suspension. A numerical modelling study was undertaken to assess potential sediment transport and deposition associated with the proposed maintenance dredging (MaREI, 2022; Appendix 5). The assessment simulated sediment discharge under specified tidal and river-flow conditions to predict potential changes in suspended sediment concentrations and downstream deposition patterns.. The model included both river flow and tidal forcings to simulate the hydrodynamics responsible for sediment transport in the River Shannon. It should be noted that the model was set up to simulate the transport of finer sediment

particles of clay and silt, which represent the greatest threat to smothering of benthic habitat. The model domain covered the entire Shannon Estuary from the western coastline of Kilbaha in Co. Clare, eastwards as far as the Parteen weir in Limerick, in effect, the entire Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA in the zone of influence of the proposed works. The model was configured to yield greatest accuracy in close proximity to the dredge sites. The model utilised a river flow of 176.6m^3/s as an input condition, this representing the 25th percentile winter flows of the River Shannon between 2009 and 2019.

The bed level at the end of the model run for the dredging campaign for clay, silt and sand is presented in Figures 3 – 5. From analyses of Figure 3 - 5 below and Figures 12 and 18 of the numerical modelling study (Appendix 5), most of the sediments disposed to the River Shannon at Limerick will be deposited at the following locations along the River Shannon Estuary downstream (to the west) of the proposed works:

1. the southern shore from the works location to ca. 3km west. This referred to Limerick Docks[7] (EU code IE_SH_060_0900) henceforth; and
2. northern and southern shore ca. 12km west, associated with the Owenogarney and Maigue River estuaries, respectively and small bays associated with the northern shore from ca. 14km to 18km west. This part of the estuary is referred to as the Upper Shannon Estuary (EU code IE_SH_060_0800) and the Maigue Estuary (EU code IE_SH_060_0700).

Clay, being the smallest fraction of the sediment will be dispersed to the greatest extent. In general, the thickness of disposed sediment deposited decreases with distance downstream.

Where it is predicted to be deposited, clay net bed level thickness is estimated to vary from below 0.05mm to 0.75mm. The deposited depth of clay in the middle estuary will be 0.5mm – 0.15mm. The greatest accumulations will be along the southern shore of the Limerick Docks section of the Estuary, to ca. 3km west of the dredge location at Sarsfield Lock.

Silt net bed level thickness along reach of the middle estuary is predicted to vary from below 0.05mm to 0.6mm. The greatest accumulations will be along the southern shore of the Limerick Dock component of the Estuary in areas ca. 300m, 900m and 1800m west of the works site at Sarsfield Lock.

The prediction for sand deposition indicates that all sand will fall out of the water column in the Limerick Dock part of the Estuary. The greatest concentration of sand deposition will be within 600m of the proposed dredge site at Sarsfield Lock, where some accumulations of above 190mm are predicted in the environs of the R527 (Shannon Bridge), less than 300m downstream of the works, on the southern side of the river. Accumulations of sand beyond 1km are sparse and predicted to be less than 30mm.

The gradient in salinity along the River Shannon Estuary, from the mouth of the estuary to the limit of the tidal influence, likely dictates the diversity of species present along the length of the estuary. Sediment deposition on the estuary bed and suspended solids within the water column also greatly influence species distribution and abundance within the habitat (NPWS, 2019). The proposed dredging will have no influence of salinity levels but will affect sediments to some degree within Limerick Docks, the Upper Shannon Estuary and the northern extent of the Maigue Estuary.

It is important to note that, based on WFD monitoring, some 73,417 kg of suspended solids enter the Shannon Estuary on a daily basis from the main rivers entering the transitional waterbody. According to an Application for a Dumping at Sea Permit from Shannon Foynes Port Company[8], suspended solids levels of 80 mg/l are

[7] The Shannon Estuary is the largest estuarine complex in Ireland, covering an area of 501 km^2 of transitional water. The estuary is divided into a number of transitional waterbodies for the purposes of the Water Framework Directive (WFD).
[8] https://epawebapp.epa.ie/licences/lic_eDMS/090151b280476a10.pdf

common from Limerick City to 40 km down estuary (westwards) and particularly in the upper estuary due to large riverine inputs of suspended material, with the turbidity maximum generally occurring at the freshwater/seawater interface.

Temporary increases in turbidity associated with the proposed dredging and sediment deposition may result in localised reductions in light penetration and photosynthetic activity within the receiving waters. The magnitude, duration and spatial extent of these effects will depend on the proposed discharge conditions and associated sediment dispersion. Impacts on phytoplankton will be localised and decrease significantly with distance downstream of the operation and will only be present during the physical acts of dredging and dumping. The level of impact on phytoplankton will not be at a level that affects the functioning of the estuarine ecosystem, or the dependent flora within the ecosystem, or indeed the conservation interests of the Lower River Shannon SAC or the River Shannon and River Fergus Estuaries SPA.

Given the naturally high background levels of suspended solids in the estuary (approximately 80 mg/l in the vicinity of Limerick City), the short-lived increase in suspended solids is considered unlikely to have any significant negative impact on the Annex I habitats or infauna in the part of the estuary affected by disposed material. This is because of the nature of the material being dredged, with total organic carbon values ranging from 1.52% to 2.89%, based on the Marine Sediment Characterisation report (Appendix 4). Following concerns over how differences in dredged material properties affects recovery following dredged material deposition on mudflats, Bolam *et al.* (2004) conducted a field manipulation experiment to investigate the effects of increased sediment organic content (from 0.9% to 2.8%) and sand content (from 12.0% to 47.0%) on macrofaunal recolonization and sediment properties on an intertidal mudflat in the UK. The results suggested that while increased sand content had no discernible effect on sediment property changes, increased organic content resulted in marked reductions in redox potential at 1-, 2- and 4-cm sediment depths. These sediments exhibited a distinct 'cracking' appearance on their surfaces. Similarly, while macrofaunal recovery was only affected by increased sand content in the short-term (1 month), total numbers of individuals, number of species and diversity took longer to recover in sediments with increased organic contents. The numerical modelling predicts that dredged sediment will be dispersed and deposited across various locations within the Shannon Estuary, with the extent and depth of deposition varying according to sediment particle size. The potential effects of increased sediment deposition and associated organic loading on benthic communities will depend on the characteristics of the deposited material, the predicted deposition depths and the sensitivity of the receiving habitats.

The sediment dredged from the navigation channel will settle out largely on mudflat where the community is mapped as '*intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex*'. This community is dominated by polychaetes and the bivalve *Macoma balthica*, invertebrates adapted to life in muddy environments. Based on the depths of deposited sediment predicted in the modelling report, the dumping operation will be unlikely to adversely affect benthic infauna, even where deposition depths are greatest. Birds listed as conservation interests using the mudflats will not be affected in terms of foraging opportunities. The River Shannon naturally transports substantial quantities of suspended sediment into the estuary. However, the potential effects of additional sediment released during dredging depend on the quantity, rate, timing and location of discharge, together with the characteristics of the receiving environment. These factors have been considered in the numerical modelling assessment (MaREI, 2022), subject to confirmation that the modelled scenario remains representative of the proposed works.

As mentioned above in Section 6.1.2, some activities may cause significant disturbance but may not necessarily represent a continuous or ongoing source of disturbance over time and space. The proposed maintenance dredging will involve periodic disturbance of the receiving environment. The potential for ecological recovery between dredging campaigns will depend on the duration and frequency of disturbance, the nature of the affected habitats and species, and the extent of sediment deposition.[9]

[9] http://www.serbd.com/MultiDownloads/Creport/Chapters/Physical%20Description%20Ch3.pdf

The potential for direct impacts arising with regard to hydrological effects were considered as part of the current assessment The proposed dredging is intended to restore navigational depths within previously maintained sections of the river channel. Although the works are not intended to alter the established channel configuration, the potential for localised changes in bed morphology, flow conditions and adjacent sediment habitats must be considered in relation to the proposed dredging footprint and maximum excavation depths. Dredging is required where silt has settled because of the low energy associated with sheltered parts of the river, dictated by walls and strong flows away from walls. Most water flowing through the River Shannon and Abbey River in the environs of the proposed dredge sites is via the deeper areas with little accumulations of fine sediment, so the proposed dredging will have no significant impacts on adjacent areas due to alterations of flow. Downstream of Sarsfield Lock, there will be dredging adjacent to mudflat, so this introduces the risk of alteration of mudflat beyond the footprint of works. This could happen if water flow rates increased, especially where an artificial edge has been created by dredging and where shear stress could result in erosion. Large tidal alongshore flows, which could lead to high shear stresses, do not feature along the margins of the River Shannon Estuary below Sarsfield Lock. This is because flows are largely confined to the center of the channel at low tide, which corresponds to times when the mudflat is not in contact with moving water, and because flows are negligible at times when the mud is covered with water, due to shelter provided by Sarsfield Lock.

There will be ex-situ indirect impacts on the SPA with regard to alterations of estuarine habitats as described above for the Lower River Shannon SAC. These physical impacts could have a negative effect on the infauna of mudflats and therefore potentially affect some feeding grounds of birds within Limerick Docks, the Inner Estuary and the Maigue Estuary i.e. due to deposition of sediments from the dredge sites on these areas during high tide and reduced feeding opportunities for birds that use these areas at low tide. The level of impact is considered insignificant however, taking account of the depth of deposition on bird foraging habitats, the temporary nature of the works and the resilience of estuarine habitats with respect to fallout of suspended materials in the water column.

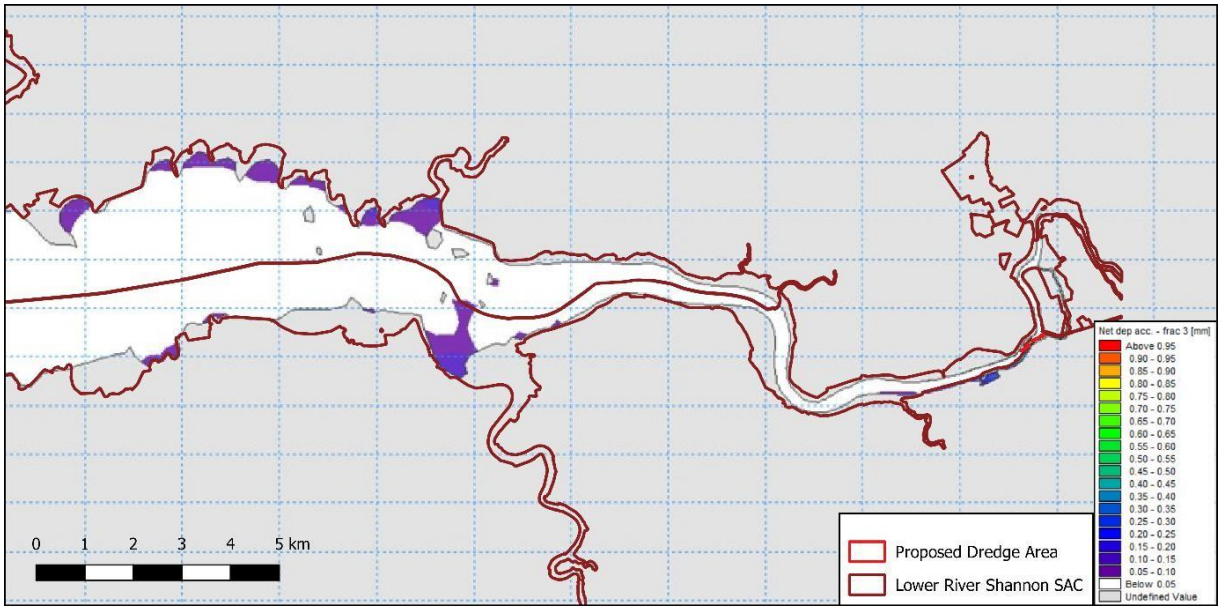

Figure 3 Clay net deposition at the end of the model run for the dredging campaign

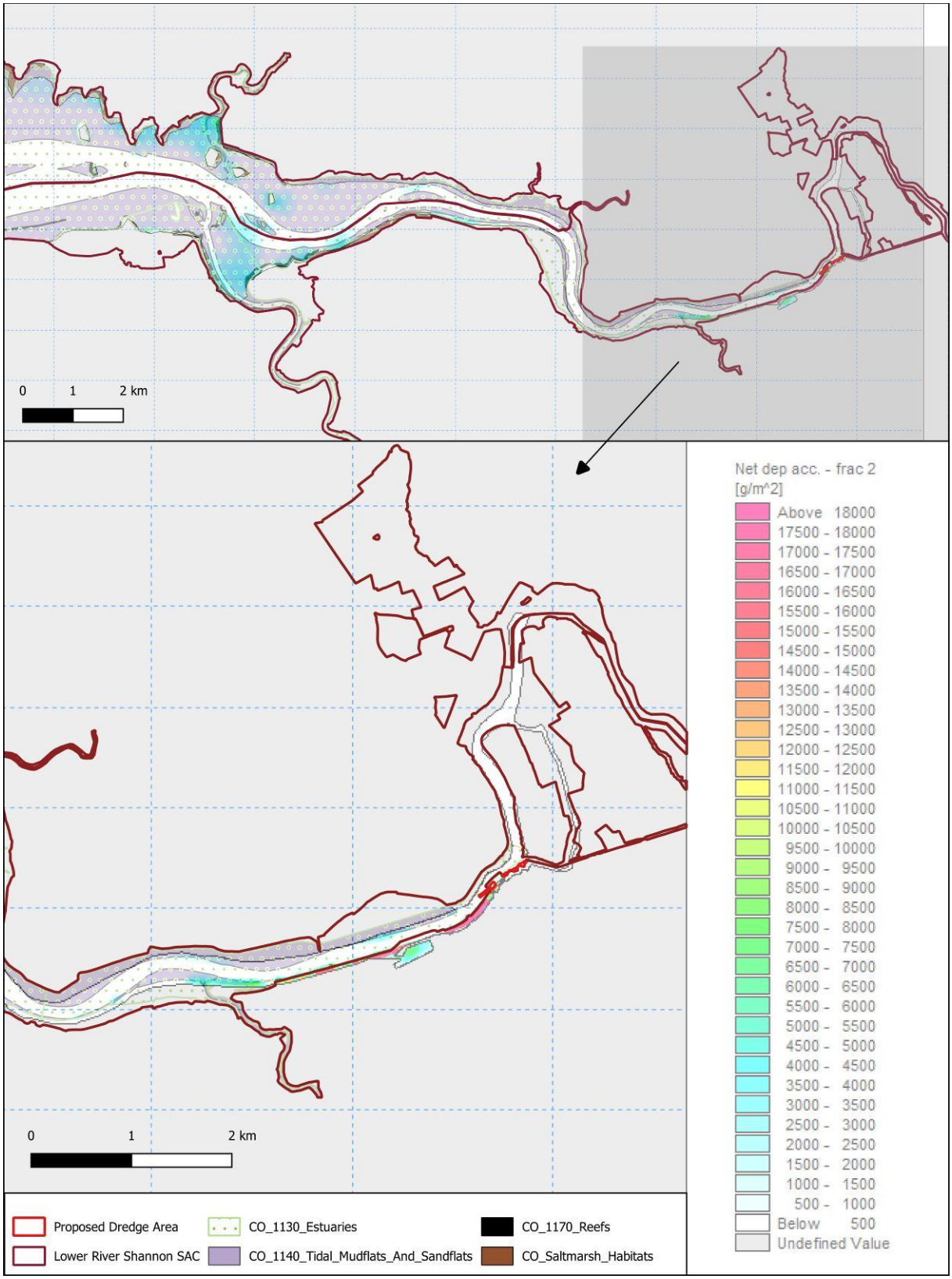

Figure 4 Silt net deposition at the end of the model run for the dredging campaign

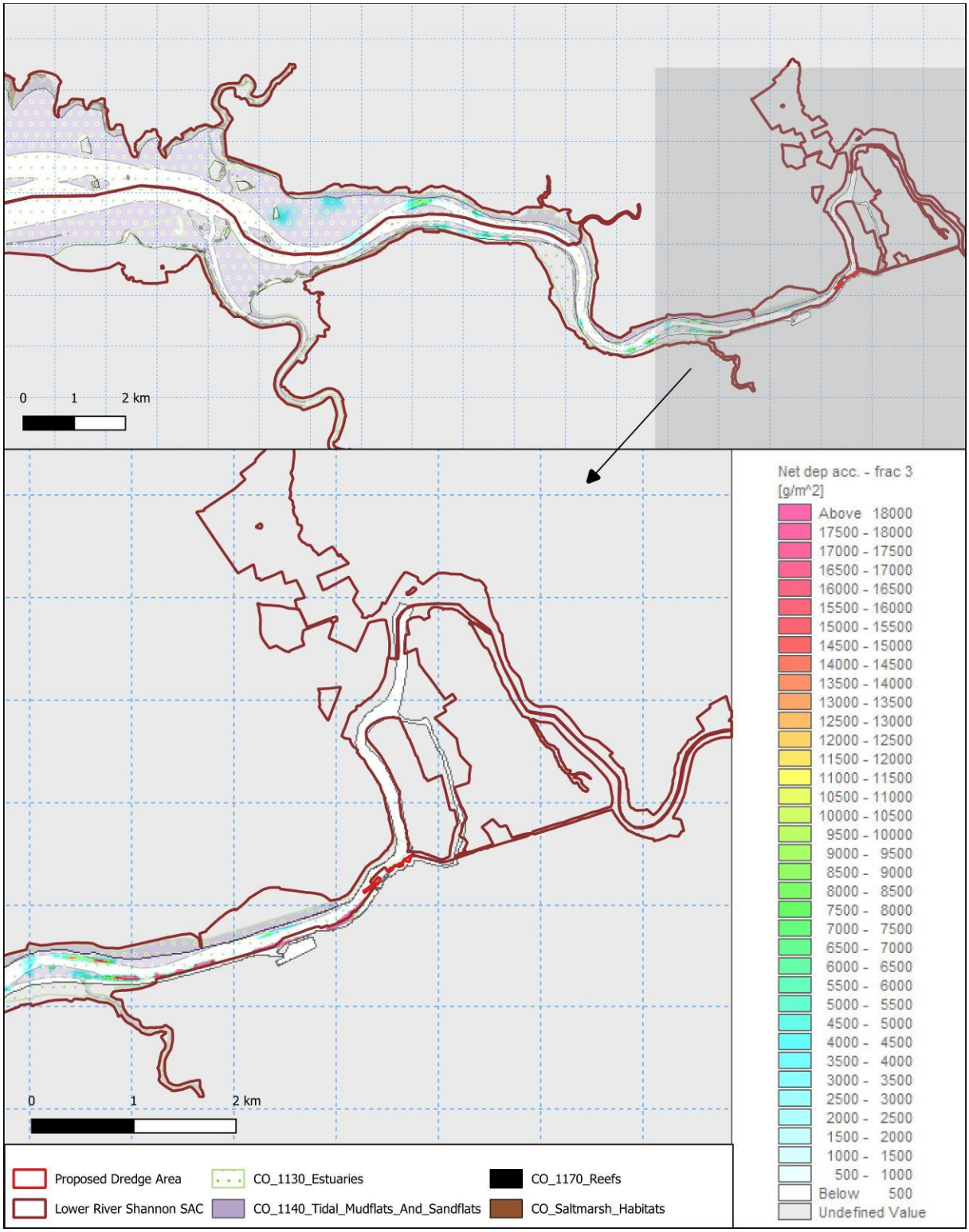

Figure 5 Sand net deposition at the end of the model run for the dredging campaign

Sediment characterisation undertaken by AQUAFACT (2022) identified an elevated lead concentration of 1,160 mg/kg dry weight at sampling station L1, exceeding the upper Irish Action Level of 218 mg/kg for dredged material. The elevated concentration was confirmed through laboratory reanalysis, indicating the potential for localised sediment contamination within the proposed dredging area.

Consultation with the Marine Institute was undertaken in February 2025 regarding both the elevated lead concentration recorded in 2022 and the requirement for updated sediment sampling, given that the previous survey data were more than three years old. The Marine Institute advised that additional sediment sampling should be undertaken to confirm the current chemical status of sediments within the proposed dredging area.

In response to this recommendation, additional sediment sampling was completed in March 2025 at 12 locations within the proposed dredging area. Analysis undertaken by Fitz Scientific recorded lead concentrations ranging from 24.37 to 36.89 mg/kg dry weight, which are below the lower Irish Action Level of 60 mg/kg (Fitz Scientific, 2025). No exceedances of the Irish Action Levels for lead were recorded during the updated sampling programme.
The updated sampling results indicate that elevated lead concentrations are not representative of sediments across the proposed dredging area. However, given the confirmed exceedance recorded during the 2022 investigation, the assessment adopts a precautionary approach and considers the potential presence of localised contamination during dredging operations. The potential for mobilisation of contaminated sediments, associated effects on water quality and benthic communities, and implications for the qualifying interests and special conservation interests of the relevant European sites are assessed in Section 7. Mitigation measures relating to sediment management, monitoring and disposal are outlined in Section 8.

6.1.2.2.1 *Sandbanks which are slightly covered by sea water all the time [1110]*

The extent of mapped 'sandbanks which are slightly covered by seawater all the time' in the Lower River Shannon SAC is given in NPWS (2012b). This habitat is mapped as occurring south of Rinevella Point, Co. Clare and west of Ballybunion, Co. Kerry in the mouth of the Shannon Estuary. This habitat is in excess of 70km to the west of the proposed dredging. Given the intervening distance between the proposal and this habitat, it is considered that the project does not have potential for significant effects on sandbanks. The hydrodynamic modelling study indicates that substrates from dredge works will not be transported to the outer estuary, all deposited in either Limerick Docks or the upper Shannon Estuary. Thus, the project will not affect the conservation objectives for 'sandbanks which are slightly covered by sea water all the time' and the habitat is not considered further in the NIS.

6.1.2.2.2 *Estuaries [1130]*

Resuspension and release of sediment will take place during dredging, increasing the suspended solids concentration in the estuary. It is considered that any potential water quality impacts will be localised in view of the localised nature, extent and scale of the proposed works and due to the dilution potential of the River Shannon and estuary. Sediment mobilised during the works will be carried out towards the sea, or west due to the flow of the River Shannon and because works will take place during the ebb tide. The hydrodynamic modelling study indicates that some substrates from dredge works will be transported to the Upper Shannon Estuary, around the estuaries of the Fergus and Maigue, but most sediment will be deposited to Limerick Docks within 3km of the proposed works. Excessive siltation can have negative ecological effects on estuarine habitat and the ecosystems supported by same but the magnitude of increased deposition as a result of the proposed dredging is so low that it is considered physically imperceptible and ecologically insignificant.

An impact of the proposed dredging that is not possible to quantify is that related to the remobilisation of Lead. As outlined above, this toxic metal is of concern at only one location and its release to the water column of the River Shannon could have effects on animal life in the estuary downstream. Due to this water quality uncertainty, this CI will be considered further in the NIS. While some other CIs of the SAC are a subset of the CI 'Estuaries', the subject of Lead will not discussed hereto forth with respect to impacts, given the low probability of significant effects. Mitigation will be required in relation to Lead, and this is discussed in Section 8.

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

With alteration of bed levels, there is also some potential for erosion of mudflats due to localised changes in flow adjacent to the dredge areas. This impact will not be of high magnitude however because the overall aim of the dredging is to level the bed at the works areas, so no abrupt changes and therefore no significant erosion is predicted.

Beyond the zone of the proposed dredging, the works will not cause a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes within the estuary, taking account of background environmental conditions (large river giving rise to massive dilution of discharged sediment, naturally high levels of sediment) and the extent and resilience of mudflats.

The impact is considered imperceptible, given the localised and temporary nature of the works and the fact that the sediment will be dispersed over a very large area, based on modelling. The most extensive impact will be on the mudflats associated with the Inner estuary and the Maigue Estuary, where deposits of clay will be no more than 0.15mm. Furthermore, the greatest accumulation of disposed sediment pertains to sand, and this will generally not be deposited on mudflat, as per the predictive model, due to speed of currents and shape of the channel. The model that was used to predict deposition depths used a flow of 176.6m^3/s as an input condition. When flow is greater than this (the River Shannon has a long-term average flow rate of 208.1 m^3/s at Limerick), the dispersion rates can be expected to be even greater so the depths of accumulated sediment in the Shannon Estuary downstream would be generally less than that predicted by the model.

Target 1 of the conservation objectives for 'mudflats and sandflats not covered by seawater at low tide' refers to the stability of the permanent habitat area, subject to natural processes (NPWS, 2012a). 'Mudflats and sandflats not covered by seawater at low tide' area was estimated using OSI data as 8,808ha. The ex-situ effects will be limited to a small fraction of this area, with the most intense effects on the narrow strip of this habitat in the Limerick Dock component of the estuary. Overall, the impact is not considered significant as the proposed dredging will not undermine biodiversity conservation objectives for the Lower River Shannon SAC i.e. the habitat area will not decrease and intertidal communities will be conserved.

6.1.2.2.4 *Coastal lagoons [1150]*

According to habitat mapping presented in NPWS (2012b), there are four coastal lagoons within the SAC, namely Quayfield and Poulaeala Loughs, Shannon Airport Lagoon, Scattery Lagoon, and Cloonconneen Pool. The nearest of these is Shannon Airport Lagoon, located ca. 20km west of the proposed dredging and this lagoon is disconnected from the greater estuary via sluice gates. The other lagoons are beyond the zone of influence of the sediments mobilised during the dredging. Therefore, the project does not have the potential to affect the lagoons conservation objectives and thus 'Coastal lagoon' habitat will not be considered further in the NIS.

6.1.2.2.5 *Large shallow inlets and bays [1160]*

This QI is mapped as occurring west of Shannon towards the mouth of the estuary, in excess of 40km to the west of the proposed dredging. Given the intervening distance between the proposal and this habitat it is considered that the project does not have potential for significant effects on this habitat. Thus, the project will not affect the conservation objectives for 'large shallow inlets and bays' and the habitat is not considered further in the NIS.

6.1.2.2.6 *Reefs [1170]*

The closest areas of reef to the proposed dredging are located approximately 10km to the west. Modelling indicates deposition of some clay and silt to this part of the estuary but deposited depths are very shallow. The model predicts that, where clay will potentially be deposited on reef habitat, depths will range from 0.02 mm to 0.05 mm.

The numerical modelling assessment (MaREI, 2022) predicts limited deposition of fine sediment in the vicinity of mapped reef habitats, with clay deposition depths ranging from approximately 0.02 mm to 0.05 mm under the modelled scenario.

The updated project description (MWP, November 2026) identifies an initial dredging volume of approximately 6,355 m³ of fine sediment, followed by seven annual maintenance campaigns of approximately 2,118 m³ each. The original suspended-solids calculation was based on historical dredging quantities and operational assumptions, and its applicability to the revised dredging programme requires confirmation.

The predicted sediment deposition depths in the vicinity of mapped reef habitats are low under the conditions assessed by MaREI (2022). Given the separation distance between the proposed dredging areas and mapped reef habitats, together with the predicted sediment transport and deposition patterns, adverse effects on the relevant reef community types are not anticipated under the modelled dredging scenario.

The applicability of these predictions to the revised maintenance dredging programme, including the potential for repeated sediment deposition over successive campaigns, requires confirmation before a definitive conclusion can be reached regarding effects on Reefs [1170] and the relevant conservation objectives.

6.1.2.2.7 *Perennial vegetation of stony banks [1220]*

At its closest, this habitat occurs at a distance in excess of 50km west of the project. Given the distance intervening, the proposal has no potential to significantly impact on this habitat-type. Thus, the project will not affect the conservation objectives for 'perennial vegetation of stony banks' and the habitat is not considered further in the NIS.

6.1.2.2.8 *Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]*

At its closest, this habitat is in excess of 40km west of the proposed dredging. Given the characteristics of the project, and the distance intervening, it is not considered that the proposal has any potential to significantly impact on this habitat-type. Thus, the project will not affect the conservation objectives for 'Vegetated sea cliffs of the Atlantic and Baltic coasts' and the habitat is not considered further in the NIS.

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

The nearest area of this habitat is along the western side of the Fergus Estuary, in excess of 28km west of the proposed dredging and to the west of any influence of the disposed sediment.

Given the characteristics of the project including the localised nature, extent and scale of the proposed works, and the distance intervening, it is not considered that the proposal has any potential to significantly impact on this habitat-type. Thus, the project will not affect the conservation objectives for 'Salicornia and other annuals colonizing mud and sand' and the habitat is not considered further in the NIS.

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

With reference to conservation objectives, estuary type saltmarsh over a mud substrate is what typically characterises the substrate associated with this habitat. The clay component of the dredge material discharged to the River Shannon may be some deposition of mud on ASM (Atlantic Salt Meadows), but the quantity will be negligible. It is noteworthy, as per NPWS (2019a), that the accumulation of muddy sediments is what leads to the development of saltmarsh, so a very small addition of clay, the same material that is deposited naturally onto saltmarsh and which allows for the development of saltmarsh will not affect any of the attributes or contravene and targets set out in the conservation objectives for this habitat with respect to the conservation objectives for the Lower River Shannon SAC. With the minimal increase to clay deposition, as projected by modelling, structural variation within sward, transitional zones and sub-communities with typical species will be maintained as is Atlantic salt meadows contain several distinctive zones that are related to elevation and submergence frequency, and the lowest part along the tidal zone is generally dominated by common saltmarsh-grass (NPWS, 2019a). It is this lower zone of the ASM that will be subject to the greatest exposure to clay deposition and this fraction of the ASM will only be inundated at high tide.

Particle modelling does not predict deposition of sand or any substantial amounts of silt on ASM, so these particles will not affect ASM habitat as they will not be deposited to any significant degree. The natural circulation of sediments and organic matter will not be affected, so the physical structure of the ASM, including the pan structure will be maintained, with refence to the proposed dredging and deposition.

For reasons outlined above, it is considered that there is no potential for significant effects to occur, and as such, 'Atlantic salt meadows' will not be considered further in the NIS.

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

The closest MSM sites to the proposal site are associated with the estuaries of the Owenslieve, part of the River Fergus Estuary and the Ahacronane River, part of the Lower Shannon Estuary), 32 km and 36km from the proposed dredge site respectively and both beyond the zone of influence.

Given the characteristics of the project including the localised nature, extent and scale of the proposed works, and the distance intervening, it is not considered that the proposal has any potential to significantly impact on this habitat-type. Thus, the project will not affect the conservation objectives for 'Mediterranean salt meadows' and the habitat is not considered further in the NIS.

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

Canadian pondweed occurs in the study area so must be considered in terms of it outcompeting other plants by shading. This plant is aquatic, so is at its lower limit in the Abbey River upstream of Sarsfield Lock. 'Floating river vegetation' is not considered to be within the zone of influence of the project and thus, there is no potential for significant indirect impacts to this habitat.

It is likely that fragments of this plant are frequently washed downstream during high flows but perish when exposed to brackish waters. The proposed works will cause an influx of Canadian pondweed to the River Shannon but the plant will not survive in the marine environment and therefore will not recolonise other freshwater habitats within the SAC.

6.1.2.2.13 *Petromyzon marinus (Sea Lamprey) [1095], Lampetra planeri (Brook Lamprey) [1096] and L. fluviatilis (River Lamprey) [1099]*

There may be indirect impacts on lamprey nursery areas adjacent to proposed dredge areas, if soft substrates destabilise, and get washed away by river flow. This could result in juvenile lampreys being carried downstream and into brackish water where they would perish.

6.1.2.2.14 *Salmo salar (Salmon) [1106] QI status pertains only to freshwater phases of life cycle)*

The component of proposed works within the Abbey River are at the lower extent of the freshwater reach of the River Shannon, the Abbey River being a distributary and reconnecting with the main channel of the Shannon at Sarsfield Lock. All indirect impacts of the proposed works are in the downstream direction and it is noted that the River Shannon downstream of Sarsfield Lock is brackish, so there will be no indirect impacts on salmon, as the QI status of the species only pertains to freshwater phases.

6.1.2.2.15 *Lutra lutra (Otter) [1355]*

Any water quality impacts associated with dredging via machinery (hydrocarbon source) and sediment disturbance could affect the feeding efficiency of otter in downstream areas via increased suspended solids levels (reducing visibility) and reduction in prey biomass if pollution was significant. This impact is predicted to be insignificant given the temporary nature of the works, the naturally high suspended solids levels that feature in the River Shannon Estuary, large river flow and that machinery used will be operating according to best practice.

6.1.2.2.16 *Other considerations*

There is potential for the resuspension and transport of sediment-associated contaminants, including metals, hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), during the proposed dredging and in-channel sediment deposition.

Sediment characterisation undertaken by AQUAFACT in July 2022 identified an elevated lead concentration of 1,160 mg/kg dry weight at sampling station L1, exceeding the upper Irish Action Level of 218 mg/kg applicable

to dredged material. The elevated concentration was confirmed through laboratory reanalysis. The 2022 assessment also included Waste Acceptance Criteria (WAC) testing to inform potential land-based disposal arrangements; however, these criteria are distinct from the Irish Action Levels used to assess dredged material.

Following consultation with the Marine Institute in January and February 2025, additional sediment sampling was undertaken in March 2025. Lead concentrations ranged from 24.37 to 36.89 mg/kg dry weight across the 12 sampling locations, below the lower Irish Action Level of 60 mg/kg. Although the updated results indicate lower lead concentrations at the locations sampled in 2025, the potential for localised contamination and mobilisation of sediment-associated contaminants remains relevant, having regard to the historical exceedance, sampling representativeness and proposed dredging methodology.

According to Eggleton and Thomas (2004):

- sediment disturbance can lead to changes in the chemical properties of sediment that stimulate the mobilisation of contaminants
- remobilisation of sediment-associated contaminants can occur during natural events, such as tidal movement and storms, or during human activities such as dredging and dredge disposal and
- the fate of contaminants in undisturbed sediments and in sediments that subjected to major disturbances is not fully understood.

The potential ecological effects of sediment-associated lead mobilisation depend on the concentration and bioavailability of contaminants within the dredged material, the quantity and rate of sediment release, and the characteristics of the receiving environment. Although dilution and downstream sediment dispersion may reduce contaminant concentrations in the water column, these processes do not independently demonstrate the absence of adverse ecological effects.

The historical elevated lead concentration recorded at station L1 must therefore be considered alongside the March 2025 sediment results and the proposed dredging and in-channel deposition arrangements. Mitigation measures addressing potentially contaminated sediment, including confirmation of material suitability and exclusion of unsuitable material from in-channel disposal, are outlined in **Section 8.6.** The assessment of residual effects on the relevant conservation objectives is presented in **Section 9.**.

Smelt (Osmerus eperlanus) form part of the wider aquatic ecosystem of the Lower River Shannon SAC, although they are not a designated qualifying interest. Juvenile Smelt feed on plankton and small aquatic invertebrates before transitioning to a predominantly piscivorous diet. The proposed dredging may result in temporary increases in suspended sediment concentrations affecting Smelt habitat and feeding conditions. The magnitude of potential effects will depend on the extent and duration of sediment mobilisation and the timing of works relative to seasonal migration and spawning activity..

[10] Waste Acceptance Criteria (WAC) analysis involves testing the solid sample for contamination and pollutants before disposal in landfills. Water is passed through the material to form a leachate. The leachate is then analysed for the various harmful elements. A certificate of analysis is produced detailing all of the results. The results are compared to established limits and the material is classed as inert, stable non-reactive or hazardous.

[11] http://www.serbd.com/MultiDownloads/Creport/Chapters/Physical%20Description%20Ch3.pdf

[12] https://19january2021snapshot.epa.gov/sites/static/files/2015-06/ny_al_394_03121998.pdf

6.1.3 Selection of Qualifying Features for Impact Assessment

Following the identification of European sites requiring Stage 2 Appropriate Assessment, their qualifying interests (QIs) and special conservation interests (SCIs) are examined to determine the potential for adverse effects on site integrity, having regard to the conservation objectives of each site. However, when assessing impact, qualifying features are only considered relevant where a credible or tangible source-pathway-receptor link exists between the proposed dredging and a protected species or habitat type. In order for an impact to occur there must be a risk initiated by having a 'source' (e.g. nearby watercourse), a 'receptor' (e.g. a protected species associated aquatic or riparian habitats), and an impact pathway between the source and the receptor (e.g. a watercourse which connects the proposed dredging site to the site designated for the protection of habitats or species).

Identifying a risk that could, in theory, cause an impact does not automatically mean that the risk event will occur, or that it will cause or create an adverse impact. However, identification of the risk does mean that there is a latent possibility of ecological or environmental damage occurring, with the level and significance of the impact depending upon the nature of the risk, the extent of the exposure to the risk and the characteristics of the receptor. Therefore, bearing in mind the scope, scale, nature and size of the proposed maintenance works, its location relative to the distribution of the species and habitats listed and the degree of connectedness that exists between the proposed works and the potential receptors, it is considered that not all of them are within the zone of potential impact.

An evaluation was undertaken to identify the qualifying interests and special conservation interests potentially affected by the proposed maintenance dredging, based on the nature and extent of the proposed works, relevant ecological evidence and the presence of credible impact pathways, without reliance on measures intended to avoid or reduce adverse effects. Table 5 lists the qualifying features of the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077) and evaluates through a scientific examination of evidence and data whether or not these features are plausible ecological receptors and thus should or should not be selected for further assessment in the NIS. The qualifying features that are selected for further assessment are discussed further in Table 5 followed by an assessment of potentially significant adverse effects arising from the proposed maintenance dredging works.

I-WeBS count subsites and roost locations within the ZOI of proposed dredging locations are illustrated in Figure 6. There is a terrestrial black-headed gull roost site at Sarsfield Lock (roost ID PT3) and another ca. 270m south of Sarsfield Lock (PT6) in the Cathedral subsite (Code 0I448). There is a mute swan terrestrial / subtidal roost site (PT7) on the north shore of the Shannon in the Cathedral subsite. There is a herring gull and terrestrial black-headed gull roost site (PT1) in the Cathedral subsite ca. 900m north of the nearest proposed dredge location. These roosts are east / upstream of the SPA.

Within the SPA, the nearest roost location to the proposed dredge works is ca. 3.4km west / downstream at a terrestrial black-headed gull and redshank roost (PT8) within Coonagh Point subsite. There is a subtidal black-headed gull roost (PT9) within Coonagh Point subsite (OI457) ca. 4.3 km west / downstream of the proposed dredge site. There is a subtidal common gull roost (PT10) within Coonagh Point subsite ca. 5.6 km downstream of the proposed dredge site.

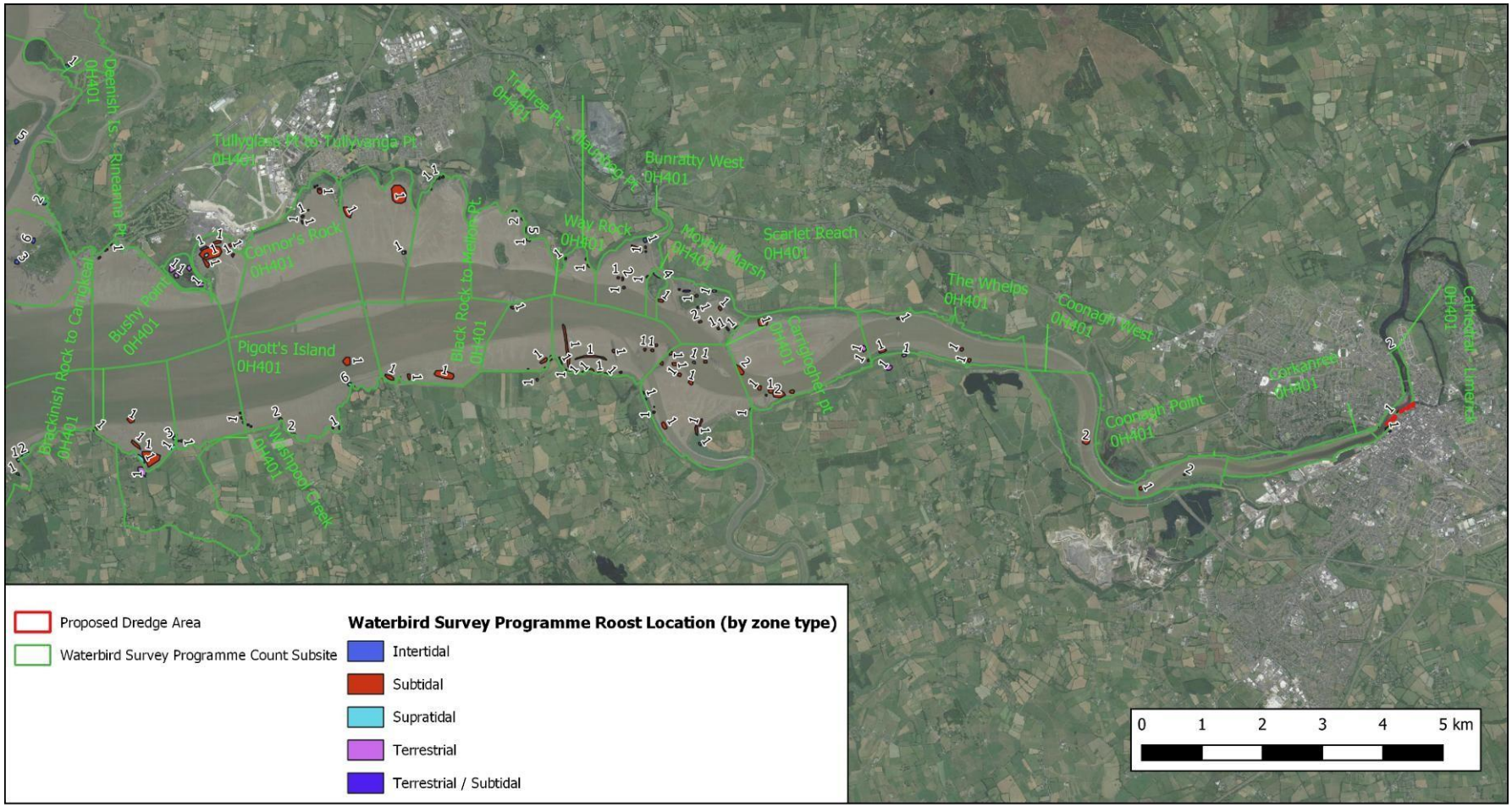

Figure 6 I-WeBS count subsites and roost locations within the ZOI of the proposed dredging

Table 5 Selection of qualifying features for impact assessment[13]

Qualifying Features	Potential for Significant Impacts	Rationale
Lower River Shannon SAC (002165)		
Sandbanks which are slightly covered by sea water all the time [1110]	No	The extent of mapped 'sandbanks which are slightly covered by seawater all the time' in the Lower River Shannon SAC is given in NPWS (2012b). This habitat is mapped as occurring south of Rinevella Point, Co. Clare and west of Ballybunion, Co. Kerry in the mouth of the Shannon Estuary. This habitat is located in the outer Shannon Estuary, a considerable distance downstream of the proposed dredging works. Given the separation distance between the proposed works and the mapped sandbank habitat, and the sediment transport and deposition patterns predicted by the numerical modelling assessment (MaREI, 2022), no credible pathway for effects on Sandbanks [1110] has been identified under the modelled dredging scenario. Accordingly, this qualifying interest is not selected for further detailed assessment, subject to confirmation that the modelling assumptions remain representative of the proposed dredging programme.
Estuaries [1130]	Yes	The Shannon and Fergus Estuaries form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon Estuary (considered being a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit, there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River (NPWS, 2012a). Mixing in estuaries is influenced by a number of factors including the size and shape of the inflowing river. This mixing is constantly changing as it also depends on the influence of wind, swell and the state of the tide. Estuarine habitat occurs in the River Shannon within the proposed dredge areas below Sarsfield Lock, and adjacent to the Abbey River. The proposed dredging and in-channel deposition of sediment have the potential to increase suspended sediment concentrations and alter sediment deposition patterns within the receiving estuarine environment. The spatial extent and magnitude of these effects have been examined through numerical modelling (MaREI, 2022), the applicability of which to the revised dredging programme requires confirmation. The hydrodynamic modelling study indicates that some substrates from dredge works will be transported to the Upper Shannon Estuary, around the estuaries of the Fergus and Maigue, but most sediment will be deposited to Limerick Docks within 3km of the proposed works. Sediment characterisation undertaken in 2022 identified an elevated lead concentration at one sampling location, while additional sampling undertaken in March 2025 recorded lead concentrations below the lower Irish Action Level at all 12 sampling locations. Notwithstanding the updated results, the potential for localised sediment contamination and associated mobilisation during dredging requires consideration. Given the potential for direct habitat disturbance, increased suspended sediment concentrations, downstream sediment deposition and contaminant mobilisation, Estuaries [1130] is selected for further assessment in the NIS.
Mudflats and sandflats not covered by seawater at low	Yes	'Mudflats and sandflats not covered by seawater at low tide' occur extensively throughout the site, in particular along the edges of /the Shannon Estuary channel. They occur adjacent to the shores of Limerick Docks and the Inner Shannon Estuaries, beginning at Shannon

[13] Information on distribution of birds listed as SCIs of the River Shannon and River Fergus Estuaries SPA is from a review of waterbird distribution for SCI species within the SPA carried

out as part of the sub-site assessments for the 2010/11 Waterbird Survey Programme, as outlined in NPWS (2012d). This data is applicable with respect to various bird species usage of the specific parts of the SPA, in cognisance that birds tend display fidelity/preference to areas that provide suitable roosting and foraging habitats and that there has been no significant change to the estuarine habitats supporting wading birds since the 2010/11 Waterbird Survey.

Qualifying Features	Potential for Significant Impacts	Rationale
tide [1140]		Bridge and increasing in extent further downstream as the estuary channel widens. During habitat surveys undertaken for the proposed works, two small areas of previously unmapped Mud shores (LS4) were identified within the enclosure of Sarsfield Lock. These areas may correspond to Annex I Mudflats and sandflats not covered by seawater at low tide [1140], subject to confirmation of their habitat characteristics and relationship with the mapped SAC habitat. The proposed dredging has the potential to result in direct disturbance and alteration of intertidal sediment habitats within the dredging footprint, together with indirect effects associated with downstream sediment deposition. Although the area directly affected is relatively small in the context of the Lower River Shannon SAC, the potential implications for the extent, distribution, structure and function of Mudflats and sandflats [1140] require consideration in view of the site's conservation objectives. This qualifying interest is therefore selected for further assessment.
Coastal lagoons [1150]	No	According to habitat mapping presented in NPWS (2012b), there are four coastal lagoons within the SAC, namely Quayfield and Poulaeala Loughs, Shannon Airport Lagoon, Scattery Lagoon, and Cloonconneen Pool. The nearest of these is Shannon Airport Lagoon, located approximately 20 km west of the proposed dredging works. The lagoon is separated from the main estuary by an artificial barrier, which restricts direct hydrological exchange. Given the separation distance, lagoon characteristics and modelled extent of sediment transport and deposition, no credible pathway for adverse effects on Coastal lagoons [1150] has been identified. This qualifying interest is therefore not selected for further assessment.
Large shallow inlets and bays [1160]	No	The habitat 'large shallow inlets and bays' is a large physiographic feature that may wholly or partly incorporate other Annex I habitats including reefs, sandbanks and mudflats and sandflats within its area. In contrast to estuaries, large shallow inlets and bays have limited freshwater influence. This habitat-type, with an estimated area of approximately 25,000ha, is mapped as occurring west of Shannon towards the mouth of the estuary. The habitat comprises the channel south of Kilrush, Co. Clare extending westwards to the outer extent of the estuary (NPWS, 2012a). This habitat occurs within the outer Shannon Estuary, more than 40 km west of the proposed dredging works. Given the separation distance and the sediment transport and deposition patterns predicted by the numerical modelling assessment (MaREI, 2022), no credible pathway for adverse effects on Large shallow inlets and bays [1160] has been identified under the modelled dredging scenario. Accordingly, this qualifying interest is not selected for further assessment.

Reefs [1170]	No	'Reef' occurs throughout the estuary, mainly as scattered and isolated pockets within the inner estuary and covering more extensive areas towards the middle and outer reaches of the channel. A review of available habitat mapping identified the nearest mapped reef habitats within the Inner Shannon and Maigue Estuaries, approximately 10 km from the proposed dredging works. Modelling indicates deposition of some clay and silt to this part of the estuary but deposition depths are predicted to be less than 0.1mm. Any potential water quality impacts will be minimal in view of the dilution potential of the River Shannon and estuary and also with reference to naturally high suspended solids concentrations that periodically exist in the waterbody (spring tides in combination with westerly winds result in conditions that increase mobilisation of

Qualifying Features	Potential for Significant Impacts	Rationale
		clay in the water column). Suspended solids levels of 80 mg/l are common from Limerick City to 40 km down estuary (westwards). The numerical modelling assessment (MaREI, 2022) predicts limited deposition of fine sediment in the vicinity of the nearest mapped reef habitats, with deposition depths of less than 0.1 mm. The updated project information identifies approximately 6,355 m³ of fine sediment for removal and in-channel deposition during the initial dredging campaign. The applicability of the modelled deposition predictions to the revised maintenance dredging programme requires confirmation, including the discharge rates, operating durations and potential for repeated sediment deposition over the proposed ten-year licence period. The predicted sediment deposition depths in the vicinity of mapped reef habitats are low under the conditions assessed by MaREI (2022). Given the separation distance between the proposed works and mapped reef habitats, together with the modelled sediment transport and deposition patterns, significant effects on Reefs [1170] are not predicted under the assessed scenario. However, this conclusion is subject to confirmation that the numerical modelling remains representative of the revised dredging programme and that the conservation objective attributes and targets for the relevant reef communities will not be adversely affected.
Perennial vegetation of stony banks [1220]	No	This habitat occurs along the coast where shingle (cobbles and pebbles) and gravel have accumulated to form elevated ridges or banks above the high tide mark. This habitat is recorded in 9 locations along the Shannon River and Estuary. At its closest, this habitat occurs at Ballymacrinan Bay (NPWS, 2012a), a distance in excess of 50km west of the project. Given the separation distance between the proposed works and the mapped habitat, together with the predicted extent of downstream sediment transport and deposition, no credible pathway for effects on Perennial vegetation of stony banks [1220] has been identified under the modelled dredging scenario. This qualifying interest is therefore not selected for further assessment in the NIS.
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No	'Vegetated sea cliffs of the Atlantic and Baltic coasts' occur at the western extent of the Shannon Estuary. At its closest, this habitat is located at Baurrane on the southern coast of Co. Clare (NPWS, 2012a), in excess of 40km west of the proposed dredging. Given the substantial separation distance, the location of the mapped sea-cliff habitats and the nature and extent of the proposed maintenance dredging, no credible pathway for adverse effects on Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] has been identified. Accordingly, this qualifying interest is not selected for further assessment in the NIS.
Salicornia and other annuals colonising mud and sand [1310]	No	*Salicornia* and other annuals colonising mud and sand [1310] comprise pioneer saltmarsh vegetation occurring on intertidal mud and sand substrates, generally within the lower saltmarsh zone. A review of NPWS habitat mapping and the coastal habitats supporting document identified Salicornia habitat at the Inishdea/Owenshere subsite (SMP 0083), located along the western side of the Fergus Estuary (NPWS, 2012a). Inishdea saltmarsh is located in southern Co. Clare, along the western side of the Fergus Estuary, in excess of 28km west of the proposed dredging and to the west of any influence of the disposed sediment. Within the sub-site, Salicornia habitat is not well-developed occupying a single patch of ground of 0.003ha (NPWS, 2012a). The numerical modelling assessment (MaREI, 2022) does not predict sediment deposition extending to the mapped Salicornia habitat at Inishdea/Owenshere. Given the separation distance and modelled extent of sediment transport, no credible pathway for effects on Salicornia and other annuals colonising mud and sand [1310] has been identified under the assessed dredging scenario. This qualifying interest is therefore not selected for further assessment in the NIS.
Atlantic salt meadows	No	'Atlantic salt meadows' (ASM) generally occupy the widest part of the salt marsh gradient. A review of habitat mapping and the coastal

Qualifying Features	Potential for Significant Impacts	Rationale
(*Glauco-Puccinellietalia maritimae*) [1330]		habitats supporting document available for the SAC determined that of the ten sub-sites surveyed, mapped and assessed as part of the Saltmarsh Monitoring Project (McCorry & Ryle, 2009) the closest habitat to the proposal site is ca. 9km downstream, or ca. 7km west, where the habitat is classified as Potential Atlantic salt meadows. As noted in the conservation objectives for this site, further unsurveyed areas maybe present within the site. There will be no direct impacts on this habitat. With reference to conservation objectives, estuary type saltmarsh over a mud substrate is what typically characterises the substrate associated with this habitat, and while there may be some deposition of mud on ASM, the quantity will be negligible. It is noteworthy, as per NPWS (2019a), that the accumulation of muddy sediments is what leads to the development of saltmarsh, although the potential implications of additional clay deposition for the relevant conservation objective attributes and targets require consideration. It is noted that the increased turbidity from dredging works are associated with the naturally occurring substrates that comprise the deposition for saltmarsh habitat, so there will be no material change to the habitat. Particle modelling does not predict deposition of sand on ASM. Atlantic salt meadows contain several distinctive zones that are related to elevation and submergence frequency, and the lowest part along the tidal zone is generally dominated by common saltmarsh-grass (NPWS, 2019a). The numerical modelling assessment (MaREI, 2022) predicts limited clay deposition within areas supporting Atlantic salt meadows [1330], with deposition depths estimated to be less than 0.2 mm under the modelled dredging scenario. The potential for effects on sediment circulation, habitat structure, vegetation zonation and associated conservation objective attributes is considered low on the basis of these predictions. Accordingly, this qualifying interest is not selected for further detailed assessment, subject to confirmation that the modelling remains representative of the definitive maintenance dredging programme.
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	No	NPWS coastal habitat mapping identifies Mediterranean salt meadows [1410] at locations within the wider Shannon and Fergus Estuary system, including the Bunratty subsite (SMP 0081). These mapped areas are outside the proposed dredging footprint. Given their location, the nature of the proposed works and the predicted extent of sediment transport and deposition, no credible pathway for effects on this qualifying interest has been identified under the assessed dredging scenario. Mediterranean salt meadows [1410] are therefore not selected for further detailed assessment.
Water courses of plain to montane levels with the *Ranunculion fluitantis* and	No	This annexed habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. The full distribution of this habitat and its sub-types within the SAC are currently unknown. The *Groenlandia densa* (L.) Fourr., Opposite-leaved Pondweed sub-type has been identified as a high conservation element in the SAC. In

Qualifying Features	Potential for Significant Impacts	Rationale
Callitricho-Batrachion vegetation [3260]		Ireland, this particular sub-type is associated with tidal reaches of rivers and other periodically disturbed watercourses (e.g. canals and drains) (NPWS, 2012a). *Groenlandia densa* was not identified during habitat surveys carried out at the proposed dredge works sites. The NPWS conservation objectives supporting document identifies several high-conservation-value subtypes of this Annex I habitat within the Lower River Shannon SAC, including communities associated with *Groenlandia densa* and *Schoenoplectus triqueter.* These communities occur within tidally influenced sections of the River Shannon, including areas in the wider environs of Limerick City (NPWS, 2012). *Groenlandia densa* was not recorded during the ecological surveys of the proposed dredging areas. However, its absence from the surveyed areas does not exclude the potential for indirect effects on associated habitat communities elsewhere within the SAC. The proposed works may alter local suspended sediment concentrations and sediment deposition patterns, which are relevant to the conservation objectives for this habitat. The potential for effects on Water courses with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] therefore requires consideration having regard to the known distribution of relevant habitat subtypes, hydrological connectivity and the sediment transport predictions. 'Floating river vegetation' as the habitat is commonly known is not considered to be within the zone of influence of the project and thus, there is no potential for significant effects to this habitat.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	No	'Molinia meadows on calcareous, peaty or clayey-silt-laden soils' is represented in Ireland by both fen and grassland communities on nutrient-poor soils. The habitat is either managed as traditional hay meadows or more usually by extensive pasture. *Molinia* meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a marl layer beneath the surface, or on peaty soils both in lowland and upland situations (NPWS, 2019). The full extent of this habitat within the SAC is currently unknown. This habitat has been recorded on the eastern bank of the River Shannon, north of Castleconnell, Co. Limerick (NPWS, 2012b). Given the location of the known habitat upstream of the proposed dredging works, the absence of direct land disturbance and the predominantly downstream direction of sediment transport, no credible pathway for adverse effects on Molinia meadows [6410] has been identified. This qualifying interest is therefore not selected for further assessment in the NIS.

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	No	Alluvial woodland is a priority Annex I habitat. Several variants of this habitat occur in Ireland, including riparian woodland dominated by *Fraxinus excelsior* and *Alnus glutinosa* along lowland and upland watercourses. The Interpretation Manual of EU habitats (2013) states that all types occur on heavy soils which are periodically inundated by the annual rise of river levels, but which are otherwise well-drained and aerated during low water. In addition, there are gallery forests of tall willows alongside river channels and occasionally on river islands, where the tree roots are almost continuously submerged (NPWS, 2019a). Alluvial woodlands occur along the Shannon, in the valley bottoms of the tributaries and on seepage zones on valley sides. Within the SAC, five sites have been surveyed as part of the National Survey of Native Woodlands. These are small stands, restricted to narrow bands where the ground is subject to flooding (NPWS, 2012a). The nearest mapped occurrence of this habitat identified in the NPWS woodland supporting documentation is at Clare Glen, approximately 15 km upstream of the proposed dredging works. Given the absence of direct habitat disturbance, the location of the mapped woodland and the predominantly downstream nature of sediment transport associated with the works, no credible pathway for adverse effects on Alluvial forests [91E0] has been identified. This qualifying interest is therefore not selected for further assessment in the NIS.

Qualifying Features	Potential for Significant Impacts	Rationale
Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	No	The freshwater pearl mussel is a large, long-lived bivalve mollusc found in clean, fast-flowing, well-oxygenated rivers with unconsolidated substrates. Stable, clean gravel and sand with adequate availability of dissolved oxygen provides ideal habitat for juveniles. Water pH and hardness is also important with distribution mainly restricted to acidic, soft waters over-lying non-calcareous rock-types. Low nutrient status is also critical such that excess macrophyte and algal growth is prevented; therefore oligotrophic waterbodies are required. Conservation objectives for this species within the SAC apply to the freshwater pearl mussel population in the Cloon River, County Clare. This population is confined to the main channel and is distributed from Croany Bridge to upstream of Clonderalaw Bridge (NPWS (2012b). The Cloon River enters the main Shannon Estuary in excess of 40km west of the proposal site. Given the characteristics and location of the project, and the ecology of this species, it is not considered that the proposal has any potential to significantly impact on freshwater pearl mussel. Thus, the project will not affect the conservation objectives for 'Freshwater Pearl Mussel' and the species is not considered further in the NIS.
Sea Lamprey (*Petromyzon marinus*) [1095]	Yes	The life cycle of the sea lamprey (Petromyzon marinus) contains both a marine phase and a freshwater phase. Sea lampreys spend their adult life in marine and estuarine waters, living as external parasites on other fish species. They migrate up rivers in spring to spawn in areas of clean gravel, after which they die. Sea lamprey is known to spawn within the Lower Shannon and its tributaries (Kelly and King, 2001). The two 10km grid squares, R35 and R36, which encompass the proposal site, are included within the current known range for sea lamprey (NPWS, 2019b). This distribution is based on records in freshwater habitats, but adult sea lamprey, and transformers (intermediate stage between larvae and adult) occur in the Shannon Estuary. The early life stages of this species require clean substrates in fast flowing freshwater habitats during spawning and ova development. The proposed dredging will not adversely affect these habitats as there are no suitable spawning habitat occurs. This species must pass through the River Shannon at Limerick to reach freshwater spawning grounds in the River Shannon and Mulkear Rivers and also on their seaward outmigration. Sea lamprey ammocoetes were recorded in very low densities within the proposed dredge areas upstream of Sarsfield Lock (0.07/m^2) but not downstream of same. The density of juvenile sea lampreys recorded from the study area confirms that the proposed works area is not particularly important for this species in terms of the COs of the SAC as a whole. The conservation status of sea lamprey in Ireland is classified as near threatened, and issues that may have an impact on their long-term future include pollution and instream works in river channels[14]. The proposed dredge sites in the Abbey River are of importance for juvenile lampreys in the context of local biodiversity, and every effort needs to be made to preserve this species. The proposed dredging could result in mortaility of sea lampreys from the proposed dredge areas within the freshwater reach of the

[14] https://www.fisheriesireland.ie/species/sea-lamprey-petromyzon-marinus#:~:text=They%20spend%20up%20to%20three,channels%20and%20barriers%20to%20migration.

Qualifying Features	Potential for Significant Impacts	Rationale
		Abbey River by the action of suction dredging. Juvenile lampreys could be washed into the brackish waters of the Shannon Estuary and as such 'Sea lamprey' will be considered further in the NIS. Mitigation will be required to avoid mortaility and prevent juvenile lampreys being carried into the main flow of the River Shannon.
Brook Lamprey (*Lampetra planeri*) [1096]	Yes	Unlike sea and river lamprey, brook lamprey is not parasitic and is non-migratory, spending its entire life in freshwater. Species distribution within river catchments is dependent on the availability of suitable habitat; adults require fine sand/gravel areas in which to spawn while the juvenile form needs clean, fine sediment into which to burrow (King, et al., 2011). It is considered that any potential water quality impacts will be localised in view of the localised nature, extent and scale of the proposed works and the dilution potential of the River Shannon Estuary. The early life stages of this species require clean substrates in fast flowing freshwater habitats during spawning and ova development. The proposed dredging will not adversely affect these habitats. River/brook lampreys were recorded in low densities (0.53/m^2) within the proposed dredge areas upstream of Sarsfield Lock but not downstream of same. It is likely that a portion of the juvenile lampreys recorded (See Appendix 3) were brook lamprey. The proposed dredging will likely result in the loss of brook lampreys from the freshwater reach of the Abbey River to the brackish waters of the Shannon Estuary, and as such 'brook lamprey' will be considered further in the NIS. To mitigate this, juvenile lampreys can be removed from works areas prior to dredging by electrical fishing.
River Lamprey (*Lampetra fluviatilis*) [1099]	Yes	River lamprey has a similar life history to sea lamprey. River lampreys spend their adult life in marine and estuarine waters, living as external parasites on other fish species. River lamprey is known to spawn within the lower Shannon and its tributaries (Kelly and King, 2001). The two 10km grid squares, which encompass the proposal site, are included within the current known range for river lamprey (NPWS, 2019b). This distribution is based on records in freshwater habitats, but adult river lamprey, and transformers (intermediate stage between larvae and adult) occur in the Shannon Estuary. It is considered that any potential water quality impacts will be localised in view of the localised nature, extent and scale of the proposed works and the dilution potential of the River Shannon Estuary. The early life stages of this species require clean substrates in fast flowing freshwater habitats during spawning and ova development. The proposed dredging will not adversely affect these habitats. River lampreys were recorded in low densities within the proposed dredge areas upstream of Sarsfield Lock (0.13/m^2) but not downstream of same. It is likely that a portion of the juvenile lampreys recorded (See Appendix 3) were river lamprey. The proposed dredging will likely result in the loss of river lampreys from the freshwater reach of the Abbey River to the brackish waters of the Shannon Estuary, and as such 'river lamprey' will be considered further in the NIS. To mitigate this, juvenile lampreys can be removed from works areas prior to dredging by electrical fishing.
Salmon (*Salmo salar*) [1106]	No	Salmon is an anadromous species, living in freshwater for at least the first two or three years of life before migrating to sea. Most Irish

Qualifying Features	Potential for Significant Impacts	Rationale
		fish spend one winter at sea before returning to their natal rivers. Salmon has been observed spawning in the lower Shannon and its tributaries. The 10km grid square which encompasses the proposal site is included within the current known range and distribution for Atlantic salmon (NPWS, 2019b). This distribution is based on records in freshwater habitats. Adult salmon occur in the Shannon Estuary prior to returning to natal streams to spawn, and smolts occur in the estuary on their journey from influent rivers to the sea. It is noted that conservation objectives for the Lower River Shannon SAC are only for salmon in fresh waters, and that the proposed works are within the WFD transitional waterbody 'Limerick Dock' so the proposed works area does not pertain to a freshwater environment. However, it is considered that the proposed dredge areas upstream of Sarsfield Lock are within freshwater. Any water quality impacts that could potentially affect freshwater will be localised and limited to the lower 350m of the Abbey River, which is identified as an unsuitable / suboptimal habitat for juvenile salmon, with reference to Hendry and Cragg-Hine (2003), which describes the ecology of the when adults are returning from the sea. Taking account of the large flow rate of the Abbey River at the proposed works locations, the mobility of salmon, and the extent of river available, pollution via suspended solids or hydrocarbons will highly unlikely to be of a magnitude that results in damage to fish. In addition, due to the fact that smolts outmigrate at times of high flow, 'Atlantic salmon' is not likely to be affected. On the basis of precaution, potential for significant impacts when smolts are outmigrating will be required and this species will therefore be considered further.
Common Bottlenose Dolphin (*Tursiops truncatus*) [1349]	No	There is a resident population of bottle-nosed dolphin in the Shannon Estuary. This is the only known resident population of this Annex II species in Ireland. The majority of the Shannon Estuary is considered to comprise suitable habitat for this species, apart from the inter-tidal areas of the Fergus Estuary and the inner estuary channel in the vicinity of Shannon town stretching east towards Limerick; however, a review of on-line species records shows that sightings are concentrated in the outer channel. Within the SAC two 'critical areas', representing habitat used preferentially by bottlenose dolphin, have been identified. These are located in the vicinity of Tarbert/Killimer and further west towards the mouth of the estuary in the vicinity of Ballybunion and Kilcredaun Point (NPWS, 2012). A review of studies (unpublished reports) available on the NPWS website on the Shannon Estuary bottlenose dolphin population determined that previous surveys have focussed on the outer estuary channel, including these 'critical areas', rather than in the inner estuary in the vicinity of Shannon and the proposed works. Given the characteristics and location of the project including the localised nature, extent and scale of the proposed works, the dilution potential of the River Shannon and estuary and the distribution of bottlenose dolphin habitat and records within the estuary, it is not considered that the proposal has any potential to significantly impact on this species. Thus, the project will not affect the conservation objectives for 'Common Bottlenose Dolphin' and the species is not considered further in the NIS.
Otter (*Lutra lutra*) [1355]	No	Otter are widespread in Ireland throughout freshwater and coastal habitats. Otter has two basic requirements: aquatic prey and safe refuges in which to rest. In Ireland, otters are found along rivers, lakes and coasts, where fish and other prey are abundant, and where

Qualifying Features	Potential for Significant Impacts	Rationale
		the bank-side habitat offers sufficient cover. The presence of freshwater, a sufficient prey-base and suitable sites for holts/couches are key factors in determining otter distribution. The 10km grid square which encompasses the proposal site, is included within the current known range and distribution for otter (NPWS, 2019b). Based on the ubiquitous nature of this species and the abundance of suitable foraging and commuting habitat in the area, it is considered that otter are likely to occur in the general vicinity of the proposed works, and as such may be subject to some disturbance impacts. Such impacts will be low however in the context of the already highly disturbed nature of the study area. There is, therefore, no potential for significant impacts to otter, and as such 'Otter' will not be considered further in the NIS.
River Shannon and River Fergus Estuaries SPA (004077)		
Cormorant (*Phalacrocorax carbo*)	No	Cormorant are a common sight on the River Shannon in Limerick, a species that uses a wide range of foraging habitats and with a wide prey/food range. They area a highly versatile species that forage in marine, estuarine and freshwater habitats depending on environmental conditions. Based on its adaptability, this species is will be considered further in the NIS.
Whooper swan (*Cygnus cygnus*)	No	Whooper swan have been known to utilise Shannon Airport Lagoon as a roost location. Shannon Airport Lagoon has been noted previously as a regularly-used site during autumn (Robinson *et al.* 2004a). There are no records of Whooper swan foraging near the proposed dredging site and this species does not utilise the areas of the Shannon Estuary within the ZOI for foraging. Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Light-bellied brent goose (*Branta bernicla hrota*)	No	This species is amber-listed as the majority winter at less than ten sites and the Irish population is also internationally significant. It winters on coastal estuaries during the autumn and early winter as well as on grasslands from mid-winter before departing to breeding grounds in Canada in late April. Brent Geese are grazers and are known for their preference for foraging in intertidal areas with the Eelgrass *Zostera* sp. (Robinson et al. 2004b). Where this food source is absent the birds feed upon algae and saltmarsh plants and the species also grazes terrestrially. A review of waterbird distribution for SCI species within the SPA determined that Brent geese exhibited a relatively restricted distribution occurring in only seven sub-sites, and were associated mostly with the outer section of the site. Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Shelduck (*Tadorna tadorna*)	No	A review of waterbird distribution for SCI species within the SPA determined that shelduck was recorded within the vicinity of the River Fergus Estuary (0H510, 0H511, 0H512), which is beyond the ZOI of the proposed dredging. Based on this, this species is not considered further in the NIS.

Qualifying Features	Potential for Significant Impacts	Rationale
Wigeon (*Anas penelope*)	No	A review of waterbird distribution for SCI species within the SPA determined that wigeon was recorded within the vicinity of the River Fergus Estuary (0H510, 0H511, 0H512), which is beyond the ZOI of the proposed dredging. Based on this, this species is not considered further in the NIS.
Teal (*Anas crecca*)	No	A review of waterbird distribution for SCI species within the SPA determined that teal was recorded within the vicinity of the River Fergus Estuary (0H510, 0H511, 0H512), which is beyond the ZOI of the proposed dredging. Based on this, this species is not considered further in the NIS.
Pintail (*Anas acuta*)	No	Pintail is red-listed due to a decline in its non-breeding (wintering) population. It is an extremely rare breeding species with records from the Midlands and north (Dempsey and O' Cleary, 2002). Wintering takes places primarily within estuaries or coastal brackish lagoons. Pintail feed on a variety of plant and animal material obtained from shallow water although they can be observed foraging on land. A review of waterbird distribution for SCI species within the SPA determined that pintail was recorded in only two sub-sites: 0H519 (Poulnasherry outer bay) and 0K509 (Carrig Island), both in the outer section of the SPA. Pintail populations were not recorded in the Inner Shannon River Estuary during winter Low Tide Counts in 2010. Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Shoveler (*Anas clypeata*)	No	A review of waterbird distribution for SCI species within the SPA determined that shoveler was recorded in six sub-sites overall including in the River Fergus Estuary, where peak numbers were recorded during low tide surveys. Shoveler was also recorded here during high tide surveys. Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Scaup (*Aythya marila*)	No	Scaup are a winter visitor to Ireland, arriving from breeding sites to the north between November and April to coastal areas, estuaries, brackish lagoons and freshwater lakes close to the coast. They forage in sub-tidal areas, diving to hunt for molluscs and crustaceans as well as feeding on marine plants in areas typically with a depth of less than 10m. Scaup is amber-listed for its small breeding population and its localised wintering range. A review of waterbird distribution for SCI species within the SPA determined that scaup was recorded in only three sub-sites: 0H519 (Poulnasherry outer bay), 0H521 (Clonderlaw Bay outer) and 0H522 (Clonderlaw Bay inner). Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Ringed plover (*Charadrius*	No	Ringed plovers are 'visual foragers' searching the sediment surface for the visible signs of prey such as worms, crustaceans and insects.

Qualifying Features	Potential for Significant Impacts	Rationale
hiaticula)		A substantial proportion of ringed plovers occur on non-estuarine coasts, the species exhibiting a degree of plasticity in habitat choice and being found in habitats such as shingle shores, saltmarsh and short grassland as well as artificial habitats. They breed on shingle and sandy beaches (Dempsey and O'Cleary, 2002) and rough ground around the coast. They are found in the outer estuary on intertidal mudflats. A review of waterbird distribution for SCI species within the SPA determined that ringed plover was not recorded anywhere in the vicinity of the proposal site. Based on this, this species is not considered to be within the zone of potential influence of the proposal and will not be considered further in the NIS.
Golden plover (*Pluvialis apricaria*)	No	A review of waterbird distribution for SCI species within the SPA determined that golden plover was recorded regularly (three low tide surveys or more) within 12 sub-sites including 0H512 (Connor's Rock), where significant numbers (>1500 individuals) were recorded. Based on this, golden plover is considered to be foraging within within the zone of potential influence of the proposal, as the principal foraging habitat for this species within the SPA corresponds to 'Intertidal mud/sand flats', which though has been identified as being potentially significantly impacted, will not be impacted to a degree that affects foraging for this species i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.
Grey plover (*Pluvialis squatarola*)	No	A review of waterbird distribution for SCI species within the SPA determined that grey plover was recorded regularly (three low tide surveys or more) within 0H510. The February 2011 roost survey recorded birds in 0H511 (Rinnanna South) in the inner estuary. Supratidal roosting was recorded in 0H512 (Connor's Rock). Based on this, this species is considered to be within the zone of potential influence of the proposal, but will not be impacted to a degree that affects foraging for this species i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.
Lapwing (*Vanellus vanellus*)	No	A review of waterbird distribution for SCI species within the SPA carried out as part of the sub-site assessments for the 2010/11 Waterbird Survey Programme, as outlined in NPWS (2012d) determined that lapwing was regularly recorded foraging inter-tidally in 0H512 (Connor's Rock). This sub-site also supported roosting birds. Lapwings were also recorded in 0H510 and 0H511. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging for this species i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.
Knot (*Calidris canutus*)	No	A review of waterbird distribution for SCI species within the SPA determined that knot was recorded in the sub-sites 0H510, 0H511 and 0H512. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging for this species i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.

Qualifying Features	Potential for Significant Impacts	Rationale
Dunlin (*Calidris alpina*)	No	A review of waterbird distribution for SCI species within the SPA suggest that dunlin have a widespread foraging distribution across the site and as a versatile species, they are likely to exploit a variety of intertidal food resources. Dunlin was found to occur regularly during low tide surveys within sub-sites 0H510 and 0H512. Dunlin was also recorded in 0H511. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging for this species i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS..
Black-tailed godwit (*Limosa limosa*)	No	A review of waterbird distribution for SCI species within the SPA found that black-tailed godwits were relatively widespread in their distribution within the site. The species was found to occur in all four sub-sites in the vicinity of the River Fergus Estuary. They were found to occur regularly within 0H510 (Brackinish Rock to Carrigkeal) with peak numbers recorded during low tide surveys. 0H512 (Connor's Rock) held peak numbers during low tide surveys in October. Records of black-tailed godwits in roosting/other behaviour during low tide surveys were irregular (of note was the count of 2,400 roosting within 0H512 (Connor's Rock) on 21/10/10. Although relatively versatile in terms of habitat choice, black-tailed godwits are generally found in muddier sediments within inner estuaries, favouring biotopes that support favoured prey such as bivalves *Macoma balthica, Scrobicularia plana* or polychaete *Hediste diversicolor*. This is in agreement with the pattern of distribution noted above i.e. the preference for inner estuary sub-sites. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging for this species i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS..
Bar-tailed godwit (*Limosa lapponica*)	No	Bar-tailed godwits forage by probing within intertidal sediment for invertebrate species, predominantly large polychaete worms such as *Arenicola marina* and *Nepthys* sp. They often feed at the tide edge with their heads in water. The species is characteristic of sites with sandy substrates (e.g. Hill et al. 1993) or sections of a site that have sandy (as opposed to muddy) sediment. The dominant intertidal benthic community type across the site is 'intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans' (NPWS, 2012b). This broad community type has a wide variability in sediment type from gravel to fine sand to muds. Of note are high abundances of *Nephtys hombergii* that occur from the lower Fergus Estuary westwards, this polychaete a known prey species of bar-tailed godwits. A review of waterbird distribution for SCI species within the SPA found bar-tailed godwits to have a relatively restricted foraging distribution within the site. They were not recorded in any of the sub-sites in the vicinity of the proposal site. The habitats used by this species but will not be impacted to a degree that affects foraging i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.

Qualifying Features	Potential for Significant Impacts	Rationale
Curlew (*Numenius arquata*)	No	A review of waterbird distribution for SCI species within the SPA found that curlew exhibited a widespread foraging distribution across the site. Curlews were recorded in the sub-sites 0H510, 0H511 and 0H512. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS..
Redshank (*Tringa totanus*)	No	A review of waterbird distribution for SCI species within the SPA found that redshank to be widespread within the site. Redshanks were recorded roosting in the sub-site 0H511 (Rinnanna South) where a single intertidal roost of 90 individuals was recorded. Redshanks were recorded regularly (three or more low tide surveys) in 0H512. Redshank was also recorded in 0H510. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.
Greenshank (*Tringa nebularia*)	No	A review of waterbird distribution for SCI species within the SPA determined that greenshank were recorded in the sub-site 0H512. Based on this, this species is considered to be within the zone of potential influence of the proposal but will not be impacted to a degree that affects foraging i.e. less than 0.2mm of clay deposited on some of its foraging habitat following the dredge regime of 15 days. This species will not be considered further in the NIS.
Black-headed gull (*Chroicocephalus ridibundus*)	No	A review of waterbird distribution for SCI species within the SPA determined that black-headed gull was recorded in all four sub-sites in the vicinity of ZOI of the works. Based on this, this species is considered to be within the zone of potential influence of the proposal but this. One roost site of this species occurs at Sarsfield Lock and another ca. another ca. 270m south of Sarsfield Lock. This species where has become accustomed to human disturbance within the city and while there may be some increased noise the increase compared to background levels will be of a magnitude that disturbs this species. The dredge operation is expected to last only 15 days and there are alternative roost sites in the vicinity of Limerick city, therefore this species will not be considered further in the NIS.
Wetlands & waterbirds	Yes	The River Shannon and River Fergus Estuaries SPA is designated for the protection of Wetlands and a range of waterbird species. The proposed maintenance dredging has the potential to result in indirect effects on wetland habitats through the mobilisation, transport and deposition of suspended sediment within Limerick Docks, the Inner Shannon Estuary and the Maigue Estuary. The numerical modelling assessment (MaREI, 2022) predicts generally shallow sediment deposition within the receiving estuarine habitats. However, the applicability of these predictions to the updated eight-year maintenance dredging programme, including the potential for repeated sediment deposition and associated effects on benthic prey resources, requires confirmation. Sediment characterisation undertaken in 2022 identified an elevated lead concentration at station L1. Although additional sampling in March 2025 recorded concentrations below the lower Irish Action Level, the potential mobilisation of sediment-associated contaminants remains relevant, subject to confirmation of sampling representativeness and material suitability. Given the potential for sediment deposition, changes in benthic prey availability and contaminant mobilisation to affect wetland

habitats and associated waterbird foraging resources, Wetlands and Waterbirds are selected for further assessment in the NIS. .

7. Assessment of Potentially Significant Effects

There follows an evaluation of potentially significant effects which may arise as a result of the proposed dredging on the qualifying features that have been selected for impact assessment in Section 6 above. Following this, a determination is made as to whether the proposal is likely to have adverse effects on the integrity of the Natura 2000 sites selected for assessment. The likelihood of adverse effects to a Natura 2000 site from the proposed dredging has been determined based on a number of indicators including:

- Water quality
- Habitat loss or alteration
- Disturbance and/or displacement of species
- Habitat or species fragmentation

The potential for in-combination effects with other plans and projects is assessed in Section 7.5.

7.1 Water quality

The principal potential water-quality impacts associated with the proposed maintenance dredging relate to the mobilisation and in-channel deposition of dredged sediment, including increased suspended sediment concentrations, sediment deposition and potential contaminant mobilisation. Additional water-quality risks arise from accidental releases of hydrocarbons or other polluting substances associated with the operation of dredging plant, pontoons, barges and ancillary equipment. There is potential for uncontrolled discharge of polluting substances from the following activities:

- Accidental release of hydrocarbons from dredging plant, vessels and associated equipment
- Increased suspended sediment concentrations, sediment deposition and potential nutrient mobilisation
- Potential mobilisation of sediment-associated contaminants, including lead

Potential water-quality effects are considered in relation to the qualifying interests and special conservation interests identified for further assessment in Section 6, including estuarine and intertidal habitats, aquatic species and wetland habitats supporting SPA waterbirds.

Estuaries support a diverse range of plant and animal species dependent on good water quality for optimum ecological functioning. There is potential for significant water quality impacts to occur to the estuarine habitat type and associated dependent species.

Maitland (2003) points out that significant pollution can eliminate whole populations of river lamprey from rivers, and in such cases, it is usually severe pollution in the lower reaches that prevents upstream migration and kills downstream migrants. In addition to direct toxic effects, pollution can have a major impact on lamprey by smothering both spawning gravels and nursery silts. Taking account of the fact that the proposed works area is located at the downstream extent of the known distribution of the freshwater life stages of river lamprey and sea lamprey, and at the downstream extent of the recorded distribution of brook lamprey within the Lower River Shannon SAC, the principal potential effects relate to habitat disturbance, increased suspended sediment concentrations, contaminant mobilisation and temporary disturbance of migratory movements. The potential for direct effects on juvenile lampreys is primarily associated with suitable habitat within the proposed dredging areas. Indirect effects may also arise through increased suspended sediment concentrations, contaminant mobilisation and disturbance of migratory pathways. These potential effects are considered in the context of the recorded lamprey populations and habitat suitability within the Lower River Shannon SAC.

In the event a relatively large accidental spillage of fuels/oils occurred from machinery and equipment being used to facilitate the proposed works, this may have a significant impact on water quality. An accidental release of hydrocarbons or other polluting substances from dredging plant, vessels or associated equipment could result in localised deterioration of water quality, with potential adverse effects on aquatic habitats and species within the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA. Given the direct hydrological connectivity between the proposed works and these European sites, the potential for significant effects cannot be excluded in the absence of appropriate pollution prevention and control measures.

Elevated suspended sediment concentrations within the River Shannon Estuary could temporarily interfere with the migratory movements of lampreys and other fish species. To this end, the proposed dredging could have water quality impacts that alter fish movements. The updated project description (MWP, November 2026) specifies that dredging and sediment discharge will be undertaken during ebb-tide conditions. Although tidal conditions influence fish movements and sediment dispersion, potential interactions between dredging activities and migratory fish must be considered having regard to species-specific migration periods, the extent and duration of suspended sediment plumes and the proposed operational programme.

NPWS (2019) note that Atlantic salt marsh is an important habitat for wildlife including wintering waders and wildfowl. The mudflats within the estuary, to the upper zones subject to the least submergence frequency, along with the avifauna they support, are considered to represent 'wetlands and waterbirds' an SCI for the River Shannon and River Fergus Estuaries SPA. The proposed maintenance dredging has the potential to affect wetland habitats supporting the special conservation interests of the River Shannon and River Fergus Estuaries SPA through increased suspended sediment concentrations, sediment deposition and potential mobilisation of contaminants. Such changes could indirectly affect waterbird foraging opportunities through alterations to benthic invertebrate communities and associated prey availability.

Sediment characterisation undertaken by AQUAFACT International Services Ltd. (2022) identified an elevated lead concentration at one sampling location, exceeding the upper Irish Action Level. Following consultation with the Marine Institute, additional sediment sampling undertaken in March 2025 recorded lead concentrations below the lower Irish Action Level at all 12 sampling locations (Fitz Scientific, 2025). The updated results indicate that elevated lead concentrations are not representative of sediments across the proposed dredging area. Notwithstanding this, a precautionary approach has been adopted in relation to the historical exceedance through the mitigation measures described in Section 8.6.

The risk associated with sediment-associated contaminants is considered low, having regard to the results of the March 2025 sediment characterisation programme, which recorded lead concentrations below the lower Irish Action Level at all sampled locations. In addition, the mitigation measures described in Section 8.6 provide for the identification, segregation and exclusion from in-channel disposal of any material subsequently found to exceed the applicable Irish Action Levels. Consequently, significant adverse water-quality effects arising from sediment-associated contaminants are not predicted.

Overall, while maintenance dredging and associated in-channel sediment deposition have the potential to result in temporary increases in suspended sediment concentrations and localised disturbance of water quality, the effects are expected to be limited in extent and duration. Taking account of the updated sediment characterisation results and the mitigation measures outlined in Section 8, significant adverse water-quality effects on the qualifying interests of the Lower River Shannon SAC or the special conservation interests of the River Shannon and River Fergus Estuaries SPA are not predicted.

7.2 Habitat loss/alteration

The proposed dredging occurs along the lower reach of the Abbey River upstream of Sarsfield Lock and the main channel of the River Shannon below Sarsfield Lock. As the proposed dredging areas occur within or adjacent to the Lower River Shannon SAC, the works have the potential to result in direct alteration of intertidal sediment habitats downstream of Sarsfield Lock, together with disturbance of freshwater sediment habitats upstream of the lock.

There will be a reduction in the quantity of silt and other fine substrates at the proposed dredge sites. The removal of fine sediment will result in the temporary reduction or alteration of suitable juvenile lamprey habitat within the affected freshwater dredging areas. Natural sediment deposition may allow suitable habitat conditions to re-establish following dredging, although the extent and rate of recovery will depend on sediment transport processes, the depth and extent of excavation, and the frequency of subsequent maintenance campaigns.

The proposed dredging has the potential to result in localised alteration of sediment habitats within the Lower River Shannon SAC. The significance of these effects is considered in relation to the extent and sensitivity of affected habitats, the potential for natural recovery and the relevant conservation objectives, including the implications of repeated maintenance dredging over the proposed programme.

7.3 Disturbance and/or displacement of species

There is potential for juvenile lampreys occupying fine sediment habitats within the proposed dredging areas to be injured, killed or displaced during dredging operations. The original lamprey assessment (Appendix 3) identified approximately 2,640 m² of optimal juvenile lamprey habitat within the surveyed dredging areas upstream of Sarsfield Lock, with an estimated 880 juvenile lampreys occurring within these habitats. These figures relate to the original survey footprint and require confirmation against the revised dredging areas.

The removal of fine sediment has the potential to reduce the availability of suitable juvenile lamprey habitat and affect local juvenile densities, with implications for the conservation objective attributes relating to juvenile density in fine sediment and the availability of juvenile habitat. The potential for significant effects on Sea Lamprey [1095], Brook Lamprey [1096] and River Lamprey [1099] is therefore identified, with measures to avoid or reduce these effects addressed in Section 8.

7.4 Habitat or species fragmentation

Habitat fragmentation has been defined as 'reduction and isolation of patches of natural environment' (Hall, *et al*., 1997) cited in (Franklin *et al*., 2002) which results in spatial separation of habitat areas which had previously been in a state of greater continuity. Adverse effects of habitat fragmentation on species include the increased isolation of populations which can detrimentally impact on the resilience or robustness of the populations.

The proposed maintenance dredging will be undertaken within existing navigation areas of the River Shannon and Abbey River, without introducing permanent physical barriers to aquatic species movement or permanently severing habitat connectivity. Although the works will temporarily alter sediment habitats and may result in localised disturbance or displacement of aquatic species, permanent habitat or species fragmentation is not anticipated.

The updated project description (MWP, November 2026) provides for eight annual maintenance dredging campaigns within a requested ten-year Maritime Usage Licence period. Potential temporary disruption to species movement during individual dredging campaigns is considered separately under disturbance and displacement, including the potential for repeated effects over the proposed programme.

7.5 Assessment of Potentially Significant Cumulative Effects

In accordance with Article 6(3) of the Habitats Directive (92/43/EEC), the potential effects of the proposed maintenance dredging must be considered both individually and in combination with other relevant plans or projects. The assessment considers existing, permitted and reasonably foreseeable activities that may affect the same European sites through overlapping ecological impact pathways. Relevant plans, projects and activities have been identified in Section 5, with particular consideration given to potential cumulative effects on water quality, sediment deposition, aquatic habitats and qualifying-interest and special-conservation-interest species. Aughinish Alumina Limited operates a marine jetty within the Shannon Estuary, approximately 30 km downstream of the proposed dredging works at Limerick City. Maintenance dredging at the jetty is authorised under Maritime Usage Licence LIC230004 (MARA, 2025) and EPA Dumping at Sea Permit S0026-02, which permits dredging and associated disposal activities until 31 December 2032. Maintenance dredging was undertaken at Aughinish during July and August 2025, as documented in the 2025 Annual Environmental Report.

The potential for in-combination effects arises primarily through sediment disturbance and deposition, changes in water quality and disturbance of aquatic species within the wider Shannon Estuary. The spatial separation between the two dredging operations and the sediment transport patterns predicted by the MaREI (2022) modelling are relevant to determining the potential for overlapping effects. However, the absence of significant in-combination effects cannot be established from separation distance alone and must be considered in relation to the authorised activities, receiving habitats, potential ecological pathways and timing of the respective dredging campaigns.

Other relevant plans, projects and activities identified in Section 5 include flood relief works, maritime site investigations, port maintenance dredging, wastewater discharges and development proposals within the wider River Shannon and Shannon Estuary. Potential in-combination effects may arise where these activities affect the same European sites through overlapping pathways, including increased suspended sediment concentrations, sediment deposition, aquatic habitat disturbance and disturbance or displacement of qualifying-interest and special-conservation-interest species.

The proposed maintenance dredging at Sarsfield Lock comprises eight annual campaigns within a requested ten-year Maritime Usage Licence period, with approximately 21,181 m³ of sediment identified for dredging over the programme (MWP, November 2026). The potential for in-combination effects must therefore be considered over the full programme, having regard to the location, timing, duration and nature of other relevant activities, the sensitivity of affected ecological receptors and the proposed measures to avoid or reduce adverse effects.

8. Mitigation

Table 6 identifies the qualifying interests (QIs) and special conservation interests (SCIs) potentially affected by the proposed maintenance dredging, as identified in Section 6.1.3. Mitigation measures proposed to avoid or reduce adverse effects on these ecological receptors are summarised in Table 6 and described in further detail below.

Additional measures are proposed to minimise potential ecological effects on the wider receiving environment, including disturbance of migratory fish species. Where these measures contribute to the protection of qualifying interests or special conservation interests of the relevant European sites, they are considered as part of the mitigation assessment. Measures addressing ecological receptors outside the European site designations are identified separately, where applicable.

Table 6 Qualifying Interests and Special Conservation Interests identified as being potentially significantly affected, and mitigation measures

Natura 2000 Site	Conservation interest	Impact due to proposed dredging	Impact mechanism	Possible effect (pre mitigation)	Mitigation
Lower River Shannon SAC (002165)	Estuaries [1130]	Estuarine habitat occurs in the River Shannon within the proposed dredge areas below Sarsfield Lock, and adjacent to the Abbey River. The proposed dredging and in-channel deposition of sediment have the potential to affect water quality through increased suspended sediment concentrations, downstream sediment deposition and the mobilisation of sediment-associated contaminants, including lead.	Disturbance and resuspension of sediment during dredging, including potentially contaminated material, followed by transfer through floating discharge pipelines and deposition within the River Shannon. Sediment transport may result in downstream redistribution of fine material and associated contaminants.	Increased suspended sediment concentrations and downstream deposition could affect the structure and function of estuarine benthic communities. Sediment characterisation undertaken in 2022 identified a confirmed elevated lead concentration of 1,160 mg/kg at station L1, potentially presenting a risk to aquatic biota if contaminated material is mobilised. Additional sampling undertaken in March 2025 recorded lead concentrations below the lower Irish Action Level at all 12 locations sampled. However, the potential for localised contamination requires consideration having regard to the representativeness of the updated sampling.	The area surrounding AQUAFACT (2022) sampling station L1, where an elevated lead concentration of 1,160 mg/kg dry weight was recorded, will be subject to further assessment prior to dredging. Additional sediment sampling undertaken in March 2025 recorded lead concentrations below the lower Irish Action Level of 60 mg/kg at all 12 sampling locations. Following consultation with the Marine Institute, additional sediment sampling was undertaken in March 2025 to reassess sediment quality within the proposed dredging area. No exceedances of the Irish Action Levels were identified during the updated sampling programme. A precautionary approach will nevertheless be adopted in relation to the historical exceedance recorded at station L1. Prior to each dredging campaign, Waterways Ireland shall review the most recent sediment characterisation data and confirm its

				continued applicability to the proposed dredging footprint. Should additional sediment characterisation, environmental monitoring, visual inspection or regulatory consultation identify sediments suspected of exceeding the applicable Irish Action Levels, such material will be delineated, segregated and excluded from in-channel disposal pending further assessment. Any sediment identified as unsuitable for in-channel disposal shall be removed separately and managed in accordance with the requirements of the relevant regulatory authority and applicable waste legislation, including disposal at an appropriately authorised facility where required.
Sea Lamprey (*Petromyzon marinus*) [1095]	Sea lamprey ammocoetes were recorded in very low densities within the proposed dredge areas upstream of Sarsfield Lock (0.07/m^2) but not downstream of same. Although juvenile sea lampreys were recorded at relatively low densities, the proposed dredging areas upstream of Sarsfield Lock provide suitable juvenile habitat, and disturbance of these sediments may affect local juvenile densities and habitat availability. The conservation status of sea lamprey in Ireland is classified as near threatened, and issues that may have an impact on their long-term future include pollution and instream works in river	Operation of the submersible DOP pump within fine sediment habitats occupied by juvenile lampreys may result in direct injury, mortality or displacement through suction and sediment disturbance. Dredging will also reduce the availability of suitable fine sediment habitat within the affected areas. Juvenile lampreys entrained within the dredged material may be transported through the discharge pipelines into the River Shannon.	The density of lampreys in the dredge sites within the Abbey River would be reduced and there will be less juvenile habitat available to lampreys, so the CO attributes 'Juvenile density in fine sediment' and 'Availability of juvenile habitat' would be affected so this effect is considered significant.	Prior to dredging within suitable juvenile lamprey habitat upstream of Sarsfield Lock, a suitably qualified aquatic ecologist will undertake juvenile lamprey salvage using an appropriate depletion electrofishing methodology, informed by Harvey and Cowx (2003) and agreed with IFI. Salvage will involve a minimum of three electrofishing passes within defined sampling areas, with captured lampreys transferred to suitable receptor habitats upstream of the proposed dredging works, subject to agreement with IFI. All electrofishing will be undertaken by appropriately authorised personnel following receipt of the necessary

	statutory permissions. The requirement for repeat pre-dredging salvage will be assessed for each subsequent maintenance campaign where suitable juvenile lamprey habitat is present within the proposed works area.

Natura 2000 Site	Conservation interest	Impact due to proposed dredging	Impact mechanism	Possible effect (pre mitigation)	Mitigation
		channels[15]. The proposed dredge sites in the Abbey River are of importance for juvenile lampreys in the context of local biodiversity, and every effort needs to be made to preserve this species.	The proposed dredging could result in mortality of lampreys from the proposed dredge areas within the freshwater reach of the Abbey River by the action of suction dredging. Juvenile lampreys could be washed into the brackish waters of the Shannon Estuary.		
	Brook Lamprey (*Lampetra planeri*) [1096]	River/brook lampreys were recorded in low densities (0.53/m^2) within the proposed dredge areas upstream of Sarsfield Lock but not downstream of same. It is likely that a large portion of the juvenile lampreys that occur in the sediment that will be excavated are brook lamprey. The proposed dredging will likely result in the loss of brook lampreys from the freshwater reach of the Abbey River to the brackish waters of the Shannon Estuary.	As for sea lamprey	As for sea lamprey	As for sea lamprey
	River Lamprey (*Lampetra*	River lampreys were recorded in low densities	As for sea lamprey	As for sea lamprey	As for sea lamprey

[15] https://www.fisheriesireland.ie/species/sea-lamprey-petromyzon-marinus#:~:text=They%20spend%20up%20to%20three,channels%20and%20barriers%20to%20migration.

Natura 2000 Site	Conservation interest	Impact due to proposed dredging	Impact mechanism	Possible effect (pre mitigation)	Mitigation
River Shannon and River Fergus Estuaries SPA (004077)	*fluviatilis*) [1099]	within the proposed dredge areas upstream of Sarsfield Lock (0.13/m^2) but not downstream of same. It is likely that a portion of the juvenile lampreys that occur in the sediment that will be excavated are river lamprey. The proposed dredging will likely result in the loss of river lampreys from the freshwater reach of the Abbey River.			
	Wetlands & waterbirds	The proposed maintenance dredging and in-channel sediment deposition may result in increased suspended sediment concentrations, deposition within downstream intertidal habitats and potential mobilisation of sediment-associated contaminants. These changes could indirectly affect wetland habitats and foraging resources supporting the special conservation interests of the River Shannon and River Fergus Estuaries SPA.	Resuspension and downstream transport of fine sediment and associated contaminants, with potential alteration of intertidal and subtidal benthic communities supporting waterbird foraging habitats.	Sediment deposition and potential contaminant mobilisation could affect benthic invertebrate communities and prey availability for waterbirds utilising intertidal habitats within the SPA. Although March 2025 sediment sampling recorded lead concentrations below the lower Irish Action Level, the historical elevated concentration recorded in 2022 requires consideration. The magnitude and significance of potential effects depend on the extent, duration and frequency of sediment mobilisation and deposition.	The sediment characterisation, contaminated-material avoidance and disposal controls specified for Estuaries [1130] will also apply to the protection of SPA wetland habitats. The proposed timing of dredging and operational controls to minimise sediment-related effects are detailed in **Sections 8.1, 8.4 and 8.6.**

8.1 Method statements

The Contractor's Works Method Statement will detail the proposed dredging plant and methodology, including the measures required to prevent accidental releases of hydrocarbons, protect water quality and implement the environmental commitments identified in this NIS. These are measures aimed at providing environmental awareness for a prospective contractor. Implementation of the full mitigation will be required by the appointed contractor. A works method statement will be prepared by the appointed dredging contractor which will include the specifications and commitments set out below and incorporating these details with regard to the machinery and methodology to be employed to undertake the required dredging. This will include details on how water quality will be protected with the avoidance of spills and the use of bio-degradable oils, using best practice approaches.

The method statement will also include for the protection of the site with regard to the cleaning of machinery and the avoidance of the dispersal of non-native species (see Section 8.3).

A method statement will also be required for the electrical fishing required to remove juvenile lampreys from the proposed dredge areas (see Section 8.2).

8.2 Juvenile lamprey salvage

Juvenile lampreys will be relocated to alternative suitable locations prior to dredging. Lampreys will be removed by electric fishing at the proposed dredge sites (corresponding to those areas upstream of Sarsfield Lock) in advance of the works. A 1-meter buffer around the shallow margins of the proposed dredge areas will also be fished to remove lampreys that may be indirectly affected by removal of adjacent sediments. A significant proportion of older age groups present can be expected to be removed, but small larvae will not. The removal method will involve depletion fishing, using methodology outlined in Harvey & Cowx (2003). Lamprey removal will focus on an area of $1m^2$ at a time. Each of these areas would be fished a minimum of three times: three passes. Juvenile lamprey salvage will be undertaken in advance of dredging within suitable freshwater sediment habitats. The timing of salvage operations will be agreed with Inland Fisheries Ireland (IFI), having regard to water levels, capture efficiency, the proposed dredging programme and the potential for recolonisation between salvage and dredging.

Lampreys will be released upstream to habitats suitable to the requirements of juvenile lampreys with reference to Maitland (2003), in consultation with IFI. All electrofishing will be undertaken following receipt of the necessary authorisation under Section 14 of the Fisheries (Consolidation) Act 1959, subject to any conditions attached to that authorisation and in consultation with IFI. All electric fishing, lamprey identification and lamprey relocation will be carried out by a suitably qualified ecologist with experience in juvenile lamprey identification. The requirement for juvenile lamprey salvage prior to subsequent dredging campaigns will be assessed in consultation with IFI, taking account of the presence of suitable sediment habitat and the potential for recolonisation between maintenance campaigns.

8.3 Non-native species

It Measures will be implemented to prevent the introduction or spread of aquatic invasive species and pathogens during the proposed dredging works, including Zebra Mussel (*Dreissena polymorpha*) and non-native aquatic plant species recorded within the study area.

All plant, vessels, equipment, footwear and ancillary materials that may come into contact with water or sediment will be subject to appropriate biosecurity procedures before arrival on site and following completion of works, prior to transfer to another waterbody. These procedures will follow the Check, Clean, Dry approach, with disinfection where necessary, in accordance with relevant Inland Fisheries Ireland biosecurity guidance.

Biosecurity procedures, including the management of potentially contaminated equipment, sediment and plant fragments, will be detailed in the Contractor's Works Method Statement.

8.4 Timing of the works

The proposed maintenance dredging will be undertaken between October and February, inclusive, as identified in the updated Project Description (MWP, November 2026). This seasonal restriction is intended to reduce potential disturbance to sensitive fish life stages and migratory movements, including the spring downstream migration of Atlantic Salmon smolts and lamprey transformers, and the spawning period of Smelt.

However, some migratory fish may be present within the River Shannon and Abbey River during the proposed dredging window. The timing of works will therefore be subject to relevant ecological restrictions and consultation with Inland Fisheries Ireland, with consideration given to species-specific migration periods and prevailing environmental conditions.

The proposed dredging upstream of Sarsfield Lock will commence at the downstream end and proceed in the upstream direction. This will lessen the potential for any water quality impacts on juvenile lampreys in sediments.

8.5 Ecological monitoring

The proposed dredging works will be monitored by a suitably qualified ecologist with experience in the aquatic ecological interests of the Lower River Shannon SAC. The ecologist will be appointed by the client and will undertake independent ecological supervision to verify implementation of the mitigation measures specified in this NIS, Appendix 6 (Environmental Commitments) and the Contractor's Works Method Statement.

Ecological supervision will include oversight of relevant biosecurity measures, juvenile lamprey salvage where required, and compliance with agreed ecological restrictions during dredging operations. Any non-compliance or unforeseen ecological effects will be reported to the client, with appropriate corrective action undertaken in accordance with the agreed environmental procedures.

8.6 Contaminated sediment

Sediment Sediment characterisation undertaken by AQUAFACT (2022) identified an elevated lead concentration of 1,160 mg/kg dry weight at sampling station L1 (latitude 52.66681, longitude -8.62514), exceeding the upper Irish Action Level of 218 mg/kg for dredged material. The elevated concentration was confirmed through laboratory reanalysis. Following consultation with the Marine Institute in January and February 2025, additional sediment sampling was undertaken on 4 March 2025 at 12 locations within the proposed dredging area. The updated results recorded lead concentrations ranging from 24.37 to 36.89 mg/kg dry weight, below the lower Irish Action Level of 60 mg/kg (Fitz Scientific, 2025). Following the March 2025 sediment characterisation programme, no exceedances of the Irish Action Levels were identified within the proposed dredging area. Notwithstanding this, a precautionary approach will be adopted in respect of the historical exceedance recorded at sampling station L1. Prior to each dredging campaign, Waterways Ireland shall review the most recent sediment characterisation data and confirm its continued applicability to the proposed dredging footprint.

Should additional sediment characterisation, environmental monitoring, visual inspection, or regulatory consultation identify sediments suspected of exceeding the applicable Irish Action Levels, such material will be delineated, segregated and excluded from in-channel disposal pending further assessment. Any sediment identified as unsuitable for disposal at the designated in-channel deposition areas shall be removed separately and managed in accordance with the requirements of the relevant regulatory authority and applicable waste legislation. Where required, such material shall be transported to an appropriately authorised waste facility following suitable waste characterisation and in accordance with an approved method statement. These measures will ensure that any potentially contaminated sediment is identified, managed appropriately and excluded from the proposed in-channel disposal operation.

9. Assessment of effect on conservation objectives

Site-specific conservation objectives (COs) have been established for the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077). Section 6.1.3 identifies the qualifying interests (QIs) and special conservation interests (SCIs) potentially affected by the proposed maintenance dredging, based on the available ecological evidence and identified impact pathways.

The potential effects of the proposed dredging on these features have been assessed in view of the conservation objectives of the respective European sites, taking account of the mitigation measures identified in Section 8. The assessment of residual effects on the relevant conservation objective attributes and targets is presented in the following tables.

The following tables assess the residual effects of the proposed maintenance dredging on the conservation objectives of the qualifying interests and special conservation interests identified for further assessment in Section 6.1.3. The assessment considers the potential effects identified in Section 7 and the effectiveness of the mitigation measures specified in Section 8. Within the River Shannon and River Fergus Estuaries SPA, which largely overlaps with the Lower River Shannon SAC, these habitats can be interpreted as, or correspond to the wetlands component of the SCI 'wetlands and waterbirds' of the River Shannon and River Fergus Estuaries SPA. The target for this CO is that the 'permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation' (NPWS, 2012d).

The River Shannon and River Fergus Estuaries SPA substantially overlaps with the Lower River Shannon SAC, and the estuarine habitats considered in the SAC assessment also provide wetland habitat supporting the SPA's waterbird special conservation interests.

The conservation objective for Wetland and Waterbirds [A999] includes maintaining the permanent area occupied by wetland habitat, with a target of no significant reduction from the identified baseline area of 32,261 ha, other than changes arising from natural patterns of variation (NPWS, 2012d).

The potential effects of the proposed dredging on wetland habitat extent, sediment characteristics, benthic communities and associated waterbird foraging resources are considered in the assessment of residual effects presented in Table 10.

Table 7 Assessment of residual impacts of the project on 'Estuaries'

Attribute/ Measure	Target	Assessment of Potentially Significant Effects	Significance affecting the integrity of the SAC
Habitat area/ hectares	Area stable or increasing, subject to natural processes	Estuarine habitat occurs in the River Shannon within the proposed dredge areas below Sarsfield Lock, and adjacent to the Abbey River. The proposed maintenance dredging will result in localised disturbance and alteration of estuarine sediment habitats within the dredging footprint. The works are intended to restore existing navigational depths rather than permanently convert estuarine habitat to another habitat type. No permanent reduction in the extent of Estuaries [1130] is anticipated, although the potential effects of repeated sediment disturbance over the eight-year dredging programme require consideration. Mudflats and sandflats [1140] and Reefs [1170] are separately designated qualifying interests that may occur within the wider estuarine habitat. Potential effects on these habitats are considered with reference to their respective conservation objectives where credible impact pathways have been identified.	Not significant, not affecting the integrity of the SAC
Community distribution/ hectares	To conserve the community types for which this habitat is designated in a natural condition	The hydrodynamic modelling study indicates that some substrates from dredge works will be transported to the Upper Shannon Estuary, around the estuaries of the Fergus and Maigue, but most sediment will be deposited to Limerick Docks within 3km of the proposed works. The proposed dredging and in-channel sediment deposition have the potential to increase suspended sediment concentrations and result in downstream deposition within estuarine benthic communities. Sediment characterisation undertaken in 2022 identified an elevated lead concentration of 1,160 mg/kg dry weight at station L1, while additional sampling in March 2025 recorded lead concentrations below the lower Irish Action Level at all 12 locations sampled. The potential for localised contamination and mobilisation of sediment-associated contaminants remains relevant to the assessment, subject to confirmation of sampling representativeness and the implementation of the mitigation measures identified in **Section 8.6.**	No adverse effect on the integrity of the SAC is predicted. The March 2025 sediment characterisation programme recorded lead concentrations below the lower Irish Action Level at all sampling locations, indicating that elevated lead concentrations are not representative of sediments within the proposed dredging area. In addition, mitigation measures provide for the identification, segregation and exclusion of any material subsequently found to be unsuitable for in-channel disposal. The proposed dredging will not adversely affect the distribution, extent or natural condition of

	estuarine communities supporting this qualifying interest.

Table 8 Assessment of residual impacts of the project on 'brook lamprey' and 'river lamprey'.

Attribute/ Measure	Target	Assessment of potentially significant effects, with mitigation considered	Significance affecting the integrity of the SAC
Distribution/ % of river accessible	Access to all watercourses down to first order streams	The proposed maintenance dredging will not introduce permanent physical barriers to lamprey migration or prevent access to upstream watercourses. Temporary disturbance associated with dredging operations, including increased suspended sediment concentrations and underwater noise, may affect fish movement locally. However, the works will be undertaken within existing navigation areas and will not permanently alter the connectivity of the river system.	Not significant, not affecting the integrity of the SAC
Population structure of juveniles/ Number of age/size groups	At least 3 age/size groups present	Juvenile lampreys were recorded within suitable fine sediment habitats upstream of Sarsfield Lock during the original ecological surveys. The proposed dredging has the potential to result in injury, mortality or displacement of juvenile lampreys, including individuals from different age/size groups. Pre-dredging lamprey salvage and relocation to suitable upstream habitats are proposed to reduce these effects, as detailed in **Section 8.2.** However, the salvage methodology acknowledges that smaller larvae may not be effectively captured.	Not significant and not affecting the integrity of the SAC. While some juvenile lampreys may remain within affected sediments despite salvage efforts, the proposed mitigation measures are considered sufficient to maintain the conservation objective relating to juvenile population structure having regard to the limited area affected and the availability of suitable habitat elsewhere within the SAC.
Juvenile density in fine sediment/ Juveniles per m^2	Mean catchment Juvenile density at least 2 per m^2	The proposed dredging will temporarily remove or alter fine sediment habitats supporting juvenile Brook and River Lamprey upstream of Sarsfield Lock. The original lamprey assessment identified 2,640 m^2 of optimal juvenile habitat within the surveyed dredging areas and estimated approximately 880 juvenile lampreys within these habitats. Pre-dredging salvage and relocation are proposed to reduce direct mortality, although some juvenile lampreys may remain within the affected sediments.	Not significant and not affecting the integrity of the SAC. The affected habitat represents a very small proportion of available lamprey habitat within the SAC. Implementation of the proposed salvage measures, together with the temporary nature of habitat disturbance and the capacity for recolonisation, will ensure that the conservation objective for juvenile density is maintained.
Extent and distribution of spawning habitat/ m^2 and occurrence	No decline in extent & distribution of spawning beds	The original lamprey assessment did not identify suitable spawning habitat within the proposed dredging areas. The works primarily affect fine sediment habitats used by juvenile lampreys rather than the gravel substrates required for spawning. No direct loss of identified lamprey spawning beds is anticipated, subject to confirmation that the updated dredging footprint remains within the areas previously assessed.	Not significant, not affecting the integrity of the SAC.
Availability of juvenile habitat / Number of positive sample sites in second-order and larger watercourses downstream of	More than 50% of sample sites positive.	The proposed dredging will result in temporary removal or alteration of fine sediment habitats supporting juvenile lampreys within the freshwater reaches of the Abbey River. Natural sediment deposition may facilitate habitat recovery following dredging; however, the rate and extent of recovery will depend on local sediment dynamics and the frequency of subsequent maintenance campaigns. Pre-dredging salvage will reduce the risk of direct mortality but will not prevent the temporary loss of suitable	Not significant and not affecting the integrity of the SAC. Habitat loss will be temporary and localised, and fine sediment habitats suitable for juvenile lampreys remain widely available within the Lower River Shannon SAC. The proposed works will not adversely affect the long-term

spawning areas	juvenile habitat.	availability of suitable habitat.

Table 9 Assessment of residual impacts of the project on 'Sea lamprey'

Attribute/ Measure	Target	Assessment of potentially significant effects, with mitigation considered	Significance affecting the integrity of the SAC
Distribution/ % of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	The proposed maintenance dredging will not introduce permanent physical barriers to Sea Lamprey migration or restrict access to upstream watercourses. Temporary disturbance associated with dredging operations, including underwater noise and increased suspended sediment concentrations, may affect migratory movements locally. The proposed October–February dredging window is intended to reduce overlap with sensitive migration periods, although some migratory activity may occur during this period.	Not significant, not affecting the integrity of the SAC
Population structure of juveniles/ Number of age/size groups	At least 3 age/size groups present	Juvenile Sea Lamprey were recorded at low densities within fine sediment habitats upstream of Sarsfield Lock during the original ecological surveys. The proposed dredging has the potential to result in injury, mortality or displacement of juvenile lampreys, including individuals of different age/size groups. Pre-dredging electrofishing and relocation to suitable upstream habitats are proposed to reduce these effects, as detailed in Section 8.2. However, the effectiveness of salvage may vary between age/size groups, particularly for smaller larvae.	Not significant and not affecting the integrity of the SAC. The proposed mitigation measures are considered sufficient to maintain the conservation objective for juvenile sea lamprey population structure. The scale of habitat affected is small in the context of the overall SAC population and available habitat.
Juvenile density in fine sediment/ Juveniles per m^2	Juvenile density at least 1 juvenile/m^2	Juvenile Sea Lamprey occupy fine sediment habitats within the freshwater reaches of the Abbey River. The proposed dredging will temporarily remove or alter suitable juvenile habitat, with the potential for direct mortality and local reductions in juvenile density. Pre-dredging salvage and relocation are proposed to reduce direct mortality; however, some larvae may remain within the affected sediments. Natural sediment accumulation may facilitate subsequent recolonisation, subject to local sediment dynamics and the frequency of maintenance dredging.	Not significant and not affecting the integrity of the SAC. Taking account of the limited extent of suitable habitat affected, the proposed pre-dredging salvage measures and the capacity for natural recolonisation, the conservation objective for juvenile density will be maintained.
Extent and distribution of spawning habitat/ m^2 and occurrence	No decline in extent & distribution of spawning beds	The original lamprey assessment did not identify suitable Sea Lamprey spawning habitat within the proposed dredging areas. The works are predominantly associated with fine sediment habitats rather than the clean gravel substrates used for spawning. No direct loss of identified spawning habitat is anticipated, provided the updated dredging footprint remains within the areas previously assessed.	Not significant, not affecting the integrity of the SAC

Table 10 Assessment of residual impacts of the project on 'wetlands and waterbirds' of the River Shannon and River Fergus Estuaries SPA

Attribute/ Measure	Target	Assessment of potentially significant effects, with mitigation considered	Significance affecting the integrity of the SPA
Wetland habitat area/hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation	The proposed maintenance dredging and in-channel sediment deposition have the potential to affect wetland habitats supporting the special conservation interests of the River Shannon and River Fergus Estuaries SPA through increased suspended sediment concentrations, downstream sediment deposition and potential mobilisation of sediment-associated contaminants. Changes to benthic communities could indirectly affect prey availability for foraging waterbirds. Sediment characterisation undertaken in 2022 identified an elevated lead concentration of 1,160 mg/kg dry weight at station L1, exceeding the upper Irish Action Level of 218 mg/kg. Additional sediment sampling undertaken in March 2025 recorded lead concentrations below the lower Irish Action Level of 60 mg/kg at all 12 sampling locations. The proposed mitigation measures in **Section 8.6** provide for confirmation of sediment suitability prior to dredging and the exclusion of unsuitable material from in-channel disposal. The potential for residual effects is considered having regard to these measures, the sediment transport predictions and the proposed eight-year dredging programme.	The proposed dredging is not anticipated to result in a permanent reduction in the area of wetland habitat within the SPA, as the works will involve maintenance of existing navigation areas rather than permanent conversion or reclamation of wetland habitat. However, the potential for indirect effects on wetland habitat quality and waterbird foraging resources requires consideration in relation to sediment deposition, contaminant mobilisation and repeated dredging activities. No adverse effect on the integrity of the SPA is predicted. The proposed dredging will not result in a permanent reduction in the extent of wetland habitat within the SPA. Sediment deposition is predicted to be limited in extent and magnitude, while the March 2025 sediment characterisation programme indicates that contaminants are not present at concentrations exceeding the relevant Irish Action Levels within the proposed dredging area. Mitigation measures provide for the identification, segregation and exclusion of any material subsequently identified as unsuitable for in-channel disposal. The proposed works will not adversely affect wetland habitat function, benthic prey resources or waterbird foraging opportunities to a degree that would undermine the conservation objectives of the SPA.

10. Conclusion

The proposed works comprise maintenance dredging within existing navigation areas of the Abbey River and River Shannon, upstream and downstream of Sarsfield Lock. The updated project description (MWP, November 2026) provides for eight annual dredging campaigns within a requested ten-year Maritime Usage Licence period, involving an estimated 21,181 m³ of sediment over the programme.

The proposed October–February dredging window is intended to minimise potential disturbance to sensitive fish life stages and migratory movements. This seasonal restriction, together with the ecological protection measures identified in Section 8, forms part of the proposed mitigation strategy for the maintenance dredging programme.

The proposed works comprise maintenance dredging within existing navigation areas of the Abbey River and River Shannon, upstream and downstream of Sarsfield Lock. The updated project description (MWP, November 2026) provides for eight annual dredging campaigns within a requested ten-year Maritime Usage Licence period, involving an estimated 21,181 m³ of sediment over the programme.

The dredging methodology involves the removal of fine sediment using a submersible DOP pump operating from a pontoon raft, with sediment transferred through floating discharge pipelines to three designated in-channel discharge locations. Coarse granular material will be removed separately for disposal at an appropriately authorised facility. The detailed implementation of the works will be set out in the Contractor's Works Method Statement, incorporating the environmental protection and mitigation measures identified in Section 8 of this NIS.

The proposed October–February dredging window is intended to minimise potential disturbance to sensitive fish life stages and migratory movements. This seasonal restriction, together with the ecological protection measures identified in Section 8, forms part of the proposed mitigation strategy for the maintenance dredging programme.

The assessment has considered the potential direct, indirect and in-combination effects of the proposed maintenance dredging on the qualifying interests and special conservation interests of the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077), having regard to their site-specific conservation objectives.

The assessment identifies measures intended to avoid or reduce potential adverse effects associated with sediment disturbance and deposition, contaminant mobilisation, aquatic habitat alteration and disturbance of protected species. The March 2025 sediment characterisation programme undertaken following consultation with the Marine Institute recorded lead concentrations below the lower Irish Action Level at all sampling locations within the proposed dredging area. Appropriate mitigation measures have been incorporated to ensure that any potentially contaminated sediment subsequently identified during the licence period is segregated and excluded from in-channel disposal. The mitigation measures identified in this NIS are considered effective and capable of implementation throughout the proposed maintenance dredging programme.

The proposed development, alone and in combination with other plans and projects, will not adversely affect the integrity of the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA in view of their conservation objectives

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Appendix 1

Screening for Appropriate Assessment report

Appendix 2

Method Statement for the removal of silt upstream and downstream of Sarsfield Lock

BACKGROUND:

After the most recent flood event of 2015/2016 a Hydrographic survey was carried out at the request of locals and users on the navigation to determine if the Limerick navigation had silted up. Siltation is an annual event on the lower sections of the Limerick navigation. From the most recent Bathymetric survey (2021) cross sections were taken at 10 metre intervals on both upstream and downstream of the Lock and from that approx. 3361m³ of material was shown upstream of the Lock (with an estimated 10m³ of material containing solids) and 5374m³ of material below the Lock (with an estimated 70m³ of material containing solids) on the approach channel to the Dock and the Dock area.

The total Volume of material is estimated at 8735 m³.

Method:

It is proposed to place 10mm mesh over the DOP pump to suck the silt only from the area and leave the solid material on the River bed. In advance of any dredging the floating jetties at Custom House Quay (area1) and Arthur Quay (area 2) will be removed.

The DOP pump will be attached to a crane on a pontoon raft (See figure 3) operating at 14 set ups upstream of the weir and 14 set ups downstream of the weir. The crane has a full extension reach with the Dop pump attachment of 13.5 metres and the locations shown are based on the crane working at 12 metres radius. The raft has 2 spud legs that hold the raft at a designated set up point. The silt will be pumped via a 200mm floating discharge pipe to the discharge area shown below on an ebbing tide. The discharge pipes will be connected to the pump and floating on the surface. Concrete anchor blocks located at 10 metre intervals on the River bed fastened to the discharge pipe via a light chain to hold it in position.

In Appendix 2 Areas 1, 2 and 3 (Plant set up Locations 1 to 14) will Pump to the discharge area 1 upstream of Sarsfield Bridge. In Appendix 1 Area 4 and 5 (set up locations 15 to 28) will pump to discharge area 2 Upstream of Shannon Bridge.

The percentage water to silt ratio is expected to be 80/20. The operating window to carry out works based on tide tables for the area is expected to be 5 hours. From the quantities above It is estimated that 108 hours of pumping will be required.

To remove the granular material a long reach excavator with a perforated bucket on the pontoon raft as in Figure 3 will excavate the material and fill a clay barge (Figure 4) with a capacity of 10m³ that will travel to Limerick Port where it will be removed by excavator, loaded into trucks and roll on/off sealed steel skips, and removed to a licensed landfill site. The total estimated of hard material is approximately 70m³. This material (mainly in the downstream approach channel) will be removed at full tide when the flows are low.

Operating at a daily discharge of 80m³ /hour this equates to 15 days of excavation.



Figure 3 – Typical crane on a 4 unit pontoon raft



Figure 4 - Clay Barge

DOP® PUMP

GENERAL INFORMATION

		DOP1515	DOP1815	DOP2320
PERFORMANCE	Mixture capacity (m³/hr)	200 - 500	300 - 600	500 - 1000
	Pump speed approx. (rpm)	1200	1000	850
	Max. power at shaft (kW)	65	95	150
HYDRAULIC REQUIREMENTS	Oil flow (l/min)	190	260	430
	Oil pressure (bar)	225	225	225
CUTTER / AUGER DRIVE	Max. power at shaft (kW)	12	16	26
	Oil flow (l/min)	35	45	75
	Oil pressure (bar)	225	225	225
JETWATER	Connection (diameter in mm)	75	75	100
	Advised capacity (m³/hr)	50 - 125	75 - 150	125 - 250
	Pressure (bar)	5	5	5
DIMENSIONS	Suction bore (mm)	150	180	230
	Discharge connection (mm)	180	200	250
	Spherical passage (mm)	75	110	125

DOP Pump details

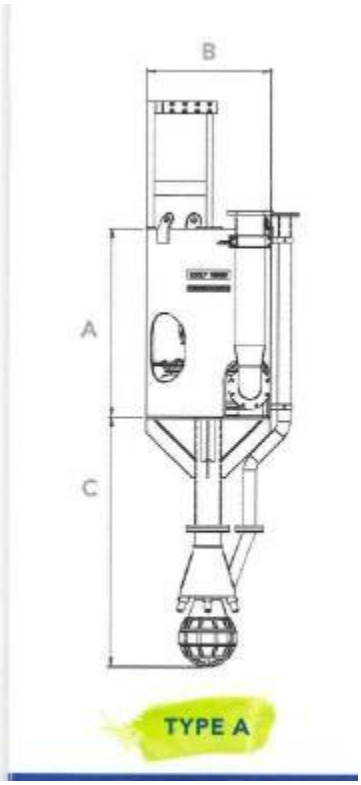


Figure 4 - Cutting- head

		DOP1515	DOP1815	DO
WEIGHT BASIC PUMP UNIT	Hydraulic driven (kgs)	900	1400	
	Electric driven (kgs)	1400	2100	
DIMENSIONS	A (height in mm)	1010	1360	
	B (diameter in mm)	830	910	
	C (height in mm)	1600	1805	
	D (height in mm)	930	1075	
	E (height in mm)	990	1140	
	F (height in mm)	1290	1450	
	G (height in mm)	1100	1240	

Figure 5 - Pump dimensions

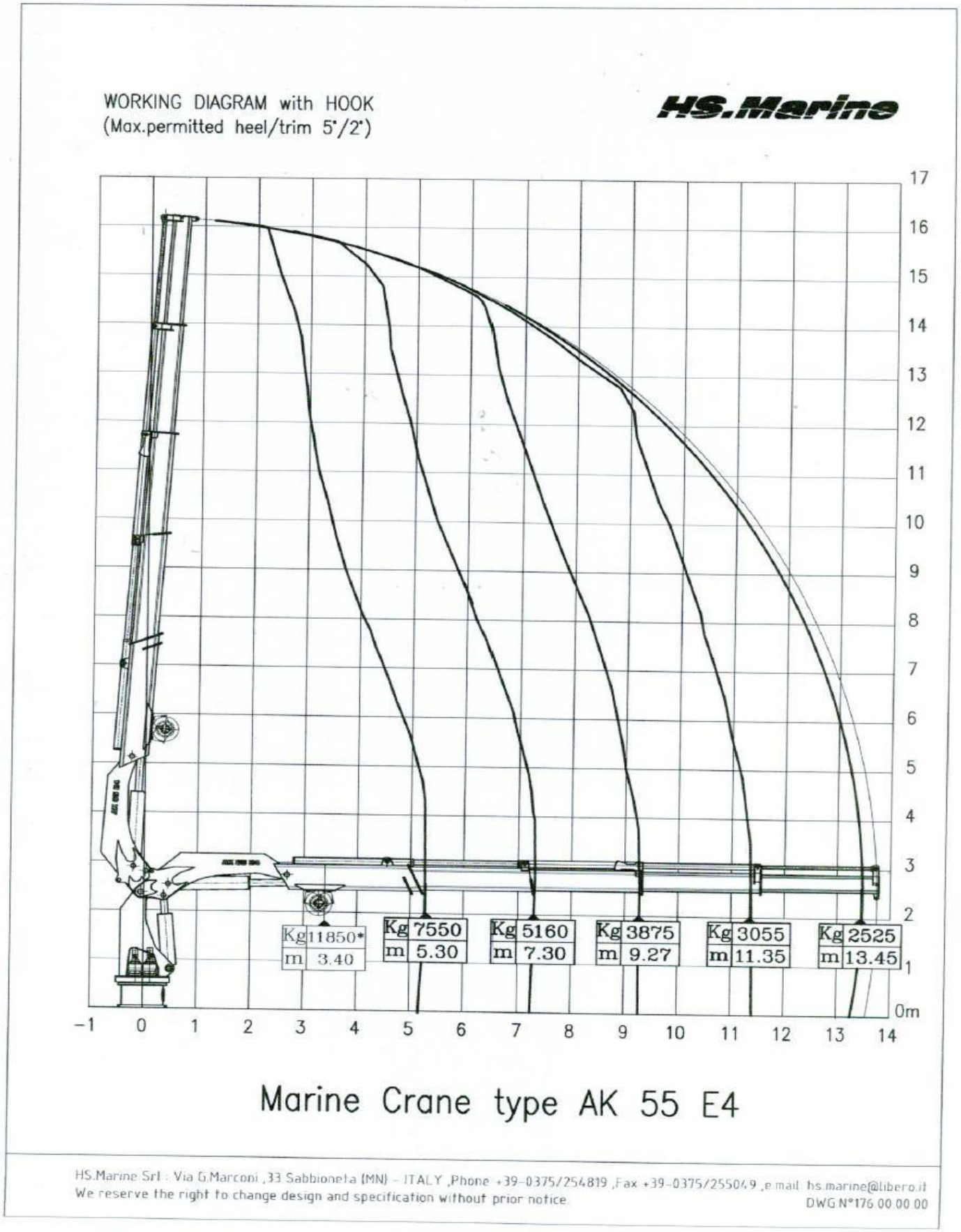
Vessel 'Kismet' Specifications

- Department of Transport approved Class VIIIa.
- Load-lined
- Passenger licence
- D.O.T approved crane operation, cargo carriage 42 tonnes to sea and carriage of passenger simultaneously.
- D.O.T. approved stability booklet

Length	14.5 metres
Draft	1 metre
Beam	8.5 metres
Propulsion	2 no. Caterpillar 3208 NA 210HP Twin disc transmission MG5061SC 3:1
Equipment	13 tonnes winch
	47 tonnes/metre H.S. Marine Crane
	Loading Ramp
Clear Deck Area	115 Sq Metres
Cargo capacity	42 tonnes to sea



Figure 6 - Raft spec and details


WORKING DIAGRAM with HOOK
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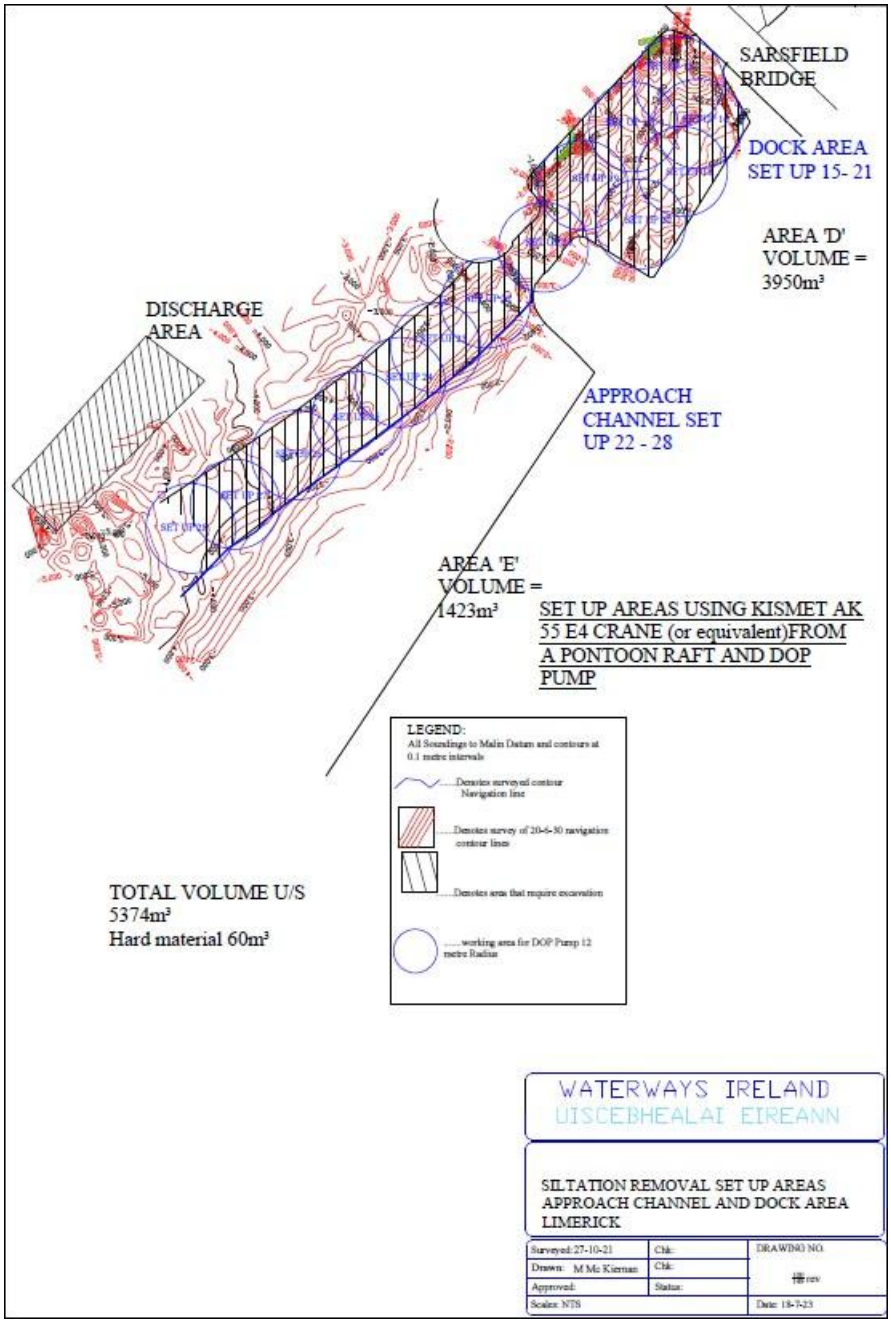
HS.Marine Srl : Via G.Marconi ,33 Sabbioneta (MN) - ITALY ,Phone +39-0375/254819 ,Fax +39-0375/255049 ,e.mail: hs.marine@libero.it
We reserve the right to change design and specification without prior notice.
DWG N°176.00.00.00

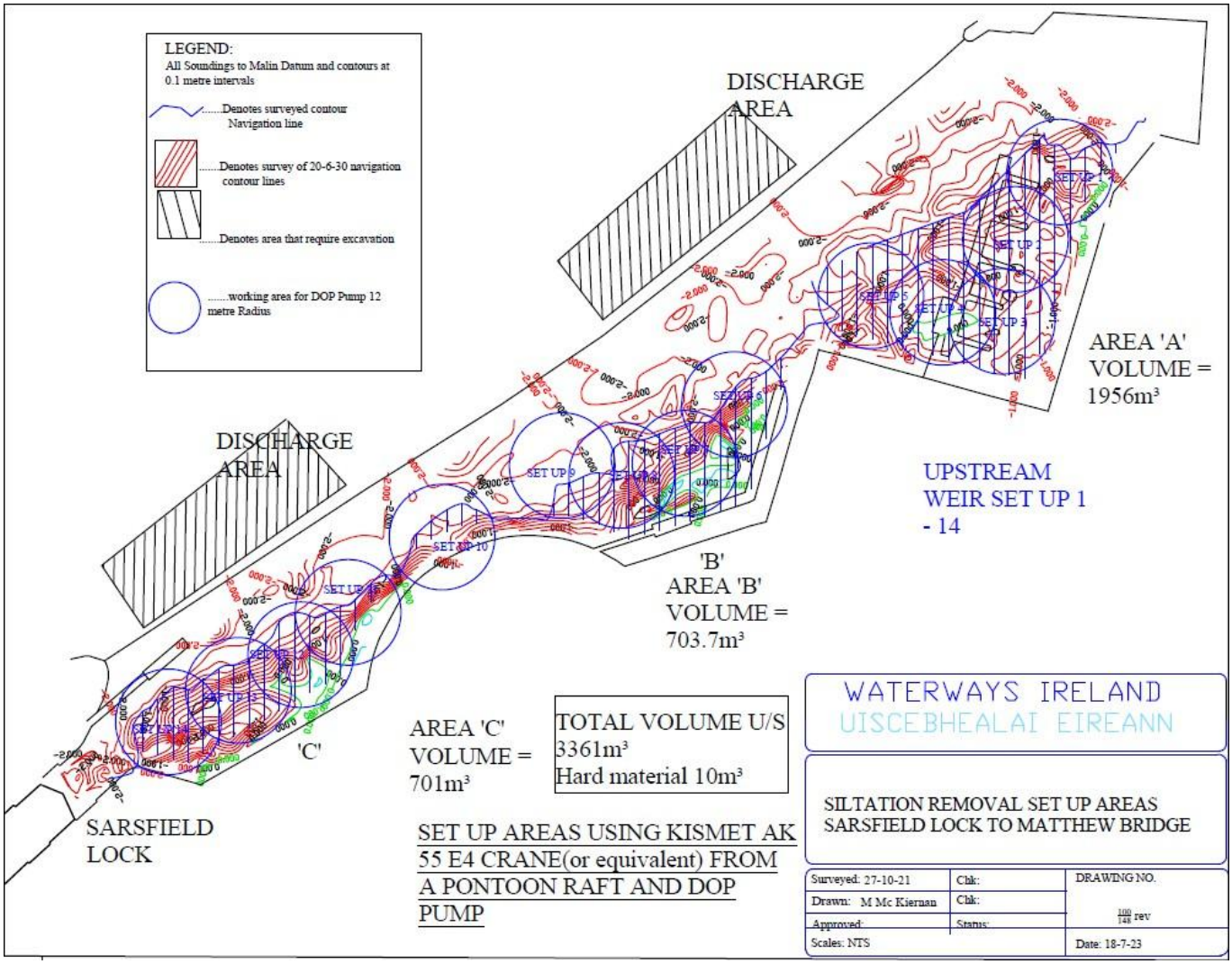
Figure 7 - Crane Reach details

APPENDIX 1



Set ups areas downstream of Sarsfield Lock

APPENDIX 2



Set up areas Upstream of Sarsfield Lock

Appendix 3

Lamprey assessment of the River Shannon at Limerick

Appendix 4

Marine Sediment Characterisation Report

Appendix 5

Numerical Modelling Study

Appendix 6

Environmental Commitments

1. Method Statements will be prepared by the appointed contractor. These will be submitted to Limerick County Council, Inland Fisheries Ireland and National Parks and Wildlife Service (NPWS) for approval in advance of works commencing. Method Statements will be used to translate the project requirements into planned systems of work instructions to the site staff and operatives involved. They will define the proposed method of working for an element or section of work taking into account the particular requirements of the project including site conditions, safety hazards, the contract drawings, specification or code of practice and ecological requirements (as outlined in migitation Section 8 and highlighted by site ecologist). They define the proposed use of plant, labour and materials, any hold points or permits and may be supplemented by drawings, sketches and produce data as necessary.
2. The contractor will employ technology to ensure there will be no dredging outside of dredge location boundaries.
3. The contractor will adhere to the following environmental commitments: working between October - February inclusive, hydrocarbon control emergency response plan, site training and environmental awareness, non-native and invasive species control and minimising noise.
4. Substances that can cause water quality problems will need to be controlled adequately at all times during the works. Refuelling of machinery will be in designated refuelling areas. Spill kits and personnel practised in their use will be required in case of an oil spillage.
5. The timing of construction in the intertidal area will be influenced by the tide as disposal can take place only during the ebb tide. There are tide timetables available online e.g. http://www.ukho.gov.uk/easytide/EasyTide/index.aspx.
6. A project ecologist (environmental clerk of works) will be appointed to monitor the works on a weekly basis for the full duration of the project. The contractor will work with the ecologist to deliver environmental compliance on site, as set out in the mitigation in the NIS. The ecologist will audit the construction works from an environmental viewpoint.

Appendix 7

2025 Sediment results