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Galway Harbour Extension Project: Assessment of Ecological Impacts on the Marine Environment

For

An Bord Pleanála

Project No.: I-ABP-101

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Summary

Galway Harbour Company Limited is applying for planning permission for an extension of Galway Harbour (Connaught, Ireland). This extension would be located approximately 500m south-east of the existing commercial Inner Harbour. The extension will be constructed on land to be reclaimed from the sea to the south of the existing Galway Harbour Enterprise Park, which was also partially built on land reclaimed from the sea.

The planning application for the Galway Harbour Extension is being made directly to An Bord Pleanála, in accordance with the provisions of Section 37 of the Planning and Development Acts 2000-2010. In this regard, the proposed development represents "Strategic Infrastructure Development" (SID) as defined in Schedule 7 of the Planning and Development Acts 2000-2010.

The application is supported by an Environmental Impact Statement (EIS), a Natura Impact Statement (NIS), Addenda and Errata to these documents and Appendices. These adequately describe the receiving environment.

The potential impacts on relevant sensitive receptors in the receiving environment during the construction and operation phases of the proposed harbour extension are generally adequately addressed in the EIS/NIS. The proposed mitigation measures to minimise and offset the likely potential impacts on the marine communities in the receiving environment are generally adequate, and consistent with current guidance and practice within the marine construction industry. Based on the review of information provided in the EIS/NIS and the responses to the representations presented during the Public Hearing on the 13th, 14th and 15th January 2015, my conclusions on the potential likely impacts of the proposed harbour extension are:

- During construction, the loss of intertidal habitats will cause an adverse and ecologically significant impact on the receiving environment.

- The impacts of rock drilling and blasting, percussive pile driving, capital dredging, subtidal habitat loss, disturbance caused by shipping and sediment resuspension have been predicted to be moderate adverse, and not ecologically significant.

- The impact of disturbance on marine mammals and birds is likely to be moderate adverse and not ecologically significant.

- The direct and permanent loss of fucoid-dominated reef habitat and mud and sand flat habitats in Galway Bay cSAC will result in the conservation objectives for these features not being met. This will result in an adverse effect on the integrity of this designated site. The potential loss of perennial vegetation on the south boundary of Renmore Lough would also result in an adverse effect on the integrity of the cSAC.

- Underwater noise and vibration during construction and disturbance caused by an increase in shipping traffic will have a moderate adverse impact on the Annex II species of the Lough Corrib cSAC.

- Loss of intertidal and subtidal habitat, underwater noise and vibration and disturbance during construction are likely to have a moderate adverse impact on many of the bird species that are qualifying features of the SPA.

- Disturbance caused by an increase in shipping traffic during operation are likely to have a moderate adverse impact on some of the bird species that are qualifying features of the SPA.

- The proposed development is unlikely to cause significant adverse environmental impacts on Lough Atalia and Renmore Lough.

- The cumulative impact of underwater sound and vibration due to rock blasting, pile driving, capital dredging and increase in shipping noise during construction is likely to be moderate adverse and not ecologically significant.

1. Introduction

Galway Harbour Company Limited is applying for planning permission for an extension of Galway Harbour (Connaught, Ireland). This extension would be adjacent to the Galway Harbour Enterprise Park (GHEP), approximately 500m south-east of the existing commercial Inner Harbour.

The proposed Galway Harbour Extension (GHE) will be constructed on land to be reclaimed from the sea to the south of the existing GHEP, which was also partially built on land reclaimed from the sea. The project includes the relocation of the majority of the existing harbour facilities, activities and businesses from the existing dock area to the new deep water harbour extension.

The proposed development will include:
(i) Construction of quay walls, breakwaters and wave walls to create commercial quays and a deep water docking facility, extending southwards into Galway Bay.
(ii) Dredging to create a new approach channel to the commercial quays and the deep water docking facility berths.
(iii) Reclamation of approximately 27ha of intertidal and subtidal substrata.
(iv) Development of the reclaimed land and redevelopment of part of the adjacent GHEP land for harbour-related business.
(v) Construction of a new marina on the western side of the development.
(vi) Construction of fishing quays, slipway for a lifeboat station and a nautical centre on the eastern side of the development.
(vii) Construction of a twin track freight rail link from the existing Galway to Dublin rail line to the commercial quays, including embankments, rail over-bridge to existing service road and noise abatement screening.
(viii) The construction of oil and bitumen transfer pipelines to the existing oil and bitumen tank farms on the GHEP and the provision of fire water storage facilities.
(ix) Harbour-related buildings, including Port Operations Office (4 storeys); Harbour Management Warehouse (single storey); Marina Office (single storey); Passenger Terminal (single storey); and ancillary car parking and site services, including 3 No. ESB sub-stations, demolition of 1 No. ESB sub-station, 3 No. Control Offices and Oil Terminal Water Pump House and a helicopter pad for search and rescue purposes.

(x) The construction and improvement of access roads including the horizontal and vertical realignment of the road under Lough Atalia Road Rail Bridge and realignment and improvements including traffic lights at Dock Road / Bóthar na Long / Galway Harbour Enterprise Park Access Road junction.

The planning application for the GHE is being made directly to An Bord Pleanála, in accordance with the provisions of Section 37 of the Planning and Development Acts 2000-2010. In this regard, the proposed development represents "Strategic Infrastructure Development" (SID) as defined in Schedule 7 of the Planning and Development Acts 2000-2010.

The application is supported by an Environmental Impact Statement (EIS) and a Natura Impact Statement (NIS), Addenda and Errata to these, and responses to Submissions from the Department of Arts, Heritage and the Gaeltacht (DAHG), which includes the National Parks and Wildlife Service (NPWS), the Inland Fisheries Ireland (IFI), An Taisce (AT) and the Cladonian Mariners Community Boat Club. Further submissions were made by these organisations during a Public Hearing which took place in Galway between the 13th and 15th January 2015, and responses to these submissions were given by the applicant (Galway Harbour Company Limited).

2. The Brief and Objectives

Thomson Unicomarine (TU) has been commissioned to prepare a report and present to the An Bord Pleanála reporting inspector, specifically addressing the following issues:

- The potential impact of the proposed development on marine ecology arising during both the construction and operational phases. The report should have regard to the sections in the EIS addressing the potential impacts of underwater noise propagation in Chapter 10.

- All potential impacts on marine ecology due to direct or indirect loss of habitat and disturbance from construction noise including blasting and pile driving, operational noise, changes in sedimentation and reduction on foraging areas.

The report should discuss the adequacy of Chapter 7 of the EIS and addendum to the EIS (submitted to the applicant on 16th October 2014) as it specifically relates to Marine Ecology. Specifically the report should discuss whether or not the EIS:

- Adequately describes the existing nature of the receiving environment.
- Adequately evaluates the direct, indirect and cumulative (where applicable) impacts on the marine environment.
- Adequately sets out mitigation measures to avoid, reduce and if possible offset the major adverse effects.
- Adequately identified adverse residual impacts post mitigation

The adequacy of the NIS and the addendum submitted to the NIS (submitted on the 16th of October 2014). Specific reference should be made to whether the applicant has:

- Adequately identified all designated sites in the vicinity (or wider area) of the proposed development that could potentially be impacted upon.
- Adequately identified of all qualifying interests associated with the designated sites. In this regard information contained in the NIS should be assessed in the context of the NPWS document entitled "Conservation objectives supporting document - Marine habitats and species"

The report should contain a specific section on the potential impact of the proposed development on the priority habitats of Lough Atalia and Renmore Lough.

The report should form a conclusion based on the analysis above, whether or not the proposed development will adversely affect the integrity of a European site, having particular regard to EU Commission guidance on 'Managing Natura 2000 Sites - The Provisions of Article 6 of the Habitats Directive' (see section 4.6.3).

TU was also requested to appraise the conclusions reached in the Appropriate Assessment prepared for the Shannon Foynes Master Plan 2041, particularly in relation

to whether the preliminary conclusions reached in the Appropriate Assessment (AA) are valid (P113).

3. Methodology

I reviewed the following documents to write the present report:

Galway Harbour Extension – Environmental Impact Statement (EIS). Volume 2A (Non Technical Summary).

Galway Harbour Extension – Environmental Impact Statement (EIS). Volume 1B (Chapters 1, 2, 3, 4 and 7).

Galway Harbour Extension – Environmental Impact Statement (EIS). Volume 2B (Chapters 8, 10 and 14).

Galway Harbour Extension – Environmental Impact Statement (EIS). Volume 2D (EIS Drawings).

Galway Harbour Extension – Environmental Impact Statement. Addenda / Errata to Chapters (October 2014).

Galway Harbour Extension – Environmental Impact Statement. Addenda / Errata to Chapters (January 2015).

Galway Harbour Extension – Environmental Impact Statement. Addendum / Errata Document II (January 2015).

Galway Harbour Extension – Natura Impact Statement. Volume 1C.

Galway Harbour Extension – Natura Impact Statement. Addendum / Errata (October 2014).

Galway Harbour Extension – Natura Impact Statement. Addendum / Errata (January 2015).

Galway Harbour Extension – Appendices to NIS Addendum / Errata (October 2014).

Galway Harbour Extension – Response for further information (October 2014).

Galway Harbour Extension – Appendices to Response for further information (October 2014).

Galway Harbour Extension - Environmental Impact Statement (EIS). Appendix 3.1 - Potential impacts and mitigation.

Galway Harbour Extension - Environmental Impact Statement (EIS). Appendix 3.2 – Chapter 8 from original EIS.

Galway Harbour Extension - Environmental Impact Statement (EIS). Appendix 10.2 – Underwater noise results.

Galway Harbour Extension - Environmental Impact Statement (EIS). Appendix 10.3 – Noise impact radii.

Galway Harbour Extension – Appendix 3.4 - Special Conservation Interests – Species assessments. (October 2014).

In addition to these documents, representations made to the An Bord Pleanála in relation to the proposed Galway Harbour Extension before the Public Hearing were considered in the preparation of this report. These representations were made by by:

- Department of Arts, Heritage and the Gaeltacht
- Inland Fisheries Ireland
- Department of Agriculture, Food and the Marine
- An Taisce – The National Trust for Ireland
- Galway Inshore Fishermen's Association
- Bird Watch Ireland

Further representations were made during the Public Hearing organised by An Bord Pleanála between the 13th and 15th January 2015 in the Connacht Hotel (Galway). These include formal submission from the Applicant: Introduction (E. Waldron), Hydrology (T. Cawley), Underwater Noise (E. Mc Keown), Renmore Lough (M. Sheehy Skeffington), Bird Counts (C. Peppiatt), Species Analysis (T. Gittings) and Ecology (Water and Marine) (B. O'Connor).

Submissions from Inland Fisheries Ireland, An Taisce, Cladonian Mariners Community Boat Club, Birdwatch Ireland and the National Parks and Wildlife Service (NPWS) were also presented during the Public Hearing.

These representations, and the response to them by the applicant were also considered for the preparation of this report. Guidance from the Irish Environment Protection Agency (EPA, 2012), the (Chartered) Institute of Ecology and Environmental Management (IEEM, 2010), The European Commission and Hill and Arnold (2012) were followed to review the assessments of potential impacts on marine ecology. Drivers of impacts include the direct or indirect loss of habitat, reduction of foraging areas, construction and operational noise, changes in hydrological and sedimentation patterns and contamination. These are discussed in Section 5 and when relevant, an alternative impact assessment based on the guidelines cited above has been undertaken.

The review of the assessments of potential effects of the proposed development on the conservation objectives and integrity of the European Sites was undertaken following guidance from the (Chartered) Institute of Ecology and Environmental Management (IEEM, 2012), the Department of Environment, Heritage and Local Government (2009), Hill and Arnold (2012) and the European Commission (EU, 2000, 2001, 2009 and 2011).

Following the 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2012) and the 'Guidelines for Ecological Impact Assessment in Britain and Ireland (CIEEM, 2010), an **ecologically significant impact** in the present report is an impact that has a negative, or positive effect on the **integrity** of a site or ecosystem and/or the conservation status or objectives for habitats or species populations within a given geographical area.

The review and assessment of the potential impacts of the proposed development on the marine environment and nature conservation were undertaken solely by the author of this report. The review undertaken by Thomson Ecology's Technical Director (Richard Arnold) involved only proof- reading the report.

4. The receiving environment

The current nature of the receiving environment is generally adequately described in the EIS. A substantial effort was made by the applicant and their consultants to gather, collate and summarise environmental data and information on the marine environment and biological communities in Galway Bay. This information was obtained from a number of sources, including published desk studies, peer-reviewed scientific literature, published and unpublished reports, and direct consultation with relevant authorities, historic independent data and results from site specific surveys over a number of years.

4.1 Galway Bay

Coastal processes in Galway Bay, including hydrological and sediment transport patterns are described in detail in Chapter 8 of the EIS, and adequately summarised in Chapter 7. Water and sediment quality are also described with sufficient level of detail in the EIS, together with the underlying geology.

Sensitive receptors in the receiving environment have been appropriately identified and described in Chapter 7 of the EIS. These include intertidal and subtidal habitats, water and sediment quality, and biota (marine fauna and flora). The receiving environment includes Galway Bay, Lough Atalia and Renmore Lough.

Sensitive biological receptors in Galway Bay include benthic (seabed) communities, marine and migratory fish, fish sensitive areas, shellfish, marine mammals and marine birds. Most of these are described with a good level of detail. However, ecologically-important habitats for mobile marine fish were not included in the EIS, despite that the presence of many of these species and fisheries are mentioned in Section 7.5.5.

4.1.1 Fish spawning and nursery areas

Ecologically important sites for mobile marine fish are (i) sites and habitats of importance to breeding, such as spawning beds and grounds, and (ii) sites and habitats of importance for recruitment and growth of early life-history stages such as nursery grounds are (ICES, 2003).

The proposed development is located within wider spawning grounds for sprat *Sprattus sprattus* and *Nephrops* (Coulson *et al.*, 1998). Sprat spawn between May and August, and *Nephrops* from January to December.

Galway Bay is part of wider nursery areas for juveniles of some species of marine fish. These include dab *Limanda limanda*, plaice *Pleuronectes platessa* (De Raedemaecker et al., 2012), saithe *Polachius virens*, *Nephrops spp*. (Coulson et al., 1998) spur dog *Squalus acanthias*, common skate *Dipturus batis*, herring *Clupea harengus*, whiting *Merlangius merlangus*, ling *Molva molva*, anglerfish *Lophius piscatorius* and mackerel *Scomber scombrus* (Ellis *et al.*, 2012).

Nursery grounds are where juvenile fish are found, and according to Beck *et al.* (2003), Heupel *et al.* (2007) and Ellis *et al.* (2012), those sites are where juveniles occur at higher densities, have reduced rates of predation and have faster growth rates than in other habitats. This in turn should result in nursery grounds providing a greater relative contribution to adult recruitment in comparison to non-nursery ground habitats. Nursery grounds for juvenile marine fish are usually found in coastal and estuarine waters such as Galway Bay. The areas in which viviparous fish are born or oviparous fish hatch are 'primary nursery grounds', and when juvenile fish grow they may extend and shift their range and habitats. In consequence, larger juvenile fish may occupy what is termed as a 'secondary nursery ground' (Ellis *et al.,* 2012, Bass *et al.,* 1973).

4.2 Lough Atalia and Renmore Lough

The proposed works are located in the proximity of two shallow coastal lagoons, Lough Atalia and Renmore Lough. Both lagoons are within the Galway Bay Special Area of Conservation (cSAC), and Lough Atalia is also within the Inner Galway Bay Special Protection Area (SPA). Additionally, coastal lagoons are listed as priority habitats in the EU Habitats Directive. Lough Atalia and Renmore Lough are also described with an

adequate level of detail in the EIS. Relevant sensitive environmental receptors in Lough Atalia and Renmore Lough such as bathymetry, salinity and biological populations are also adequately described in the EIS.

4.3 Nature conservation designations

The Natura Impact Statement (NIS) and the NIS Addenda – Errata (I and II) adequately identify the designated sites for nature conservation in the vicinity of the proposed development and the wider area, extending within a radius of 15km of the site. The relevant marine sites included in the NIS are Galway Bay Complex cSAC, Inner Galway Bay SPA and Lough Corrib cSAC. The conservation objectives and qualifying features of these sites and the potential impact of the proposed development on these are discussed in section 6 of this report (Impacts on Natura 2000 sites).

4.4 Summary

The existing nature of the receiving environment below Mean High Water Spring level (MHWS) in the zone of influence of the proposed development are adequately described in the EIS and the addendum to the EIS. With the exception of marine fish spawning and nursery areas, all relevant sensitive environmental receptors are described with an appropriate level of detail. Chapter 7 of the EIS provides an apparently accurate and adequate characterisation of the receiving environment below MHWS level.

The Natura 2000 sites that can potentially be affected by the proposed development have been correctly identified and described in the NIS, together with their conservation objectives and qualifying features.

However, and due to the diverse sources of data and information used, and the significant periods of time between the acquisition of the different data sets, the EIS cannot be considered as a valid baseline for the purpose of monitoring the impacts of the proposed development. A baseline study should provide qualitative and quantitative information on relevant sensitive environmental receptors immediately before impact, to compare with monitoring results to validate impact hypotheses formulated in the EIS (CIEEM 2010). The 'Additional monitoring' section in the EIS (7.7.9) gives assurance that qualitative and quantitative information to provide a valid baseline for the purpose of monitoring will be acquired pre-construction.

5. Impacts on the Marine Environment

The potential environmental impacts of the proposed port expansion during construction and operation are assessed in the EIS and addenda. An assessment of the implications of the project for the European Sites situated within a radius of 15km of the site (Galway Bay cSAC, Lough Corrib cSAC and the Inner Galway Bay SPA) was also undertaken with regard to the conservation objectives of the sites, and the results reported in the NIS and addenda.

All the relevant drivers of biophysical changes attributable to the project that are likely to affect valued ecological features, resources, conservation objectives and qualifying nature conservation features were considered in the EIS and NIS and their respective addenda. These include:

- Habitat loss
- Underwater sound and vibration
- Disturbance to biota due to shipping traffic
- Resuspension of seabed sediments
- Chemical contamination
- Modification of the existing shoreline
- Localised changes in salinity

A very large amount of environmental data and information was used to support the evaluation of the potential likely impacts of the proposed development on the relevant sensitive receptors in the marine environment. However, the EIS could have been considerably improved by a more focused, risk-based approach. Screening out some of the processes or activities that have very low likeliness of occurrence and relatively minor or moderate adverse potential impacts at earlier stages would have permitted a better resolution in the discussion of the likely impacts with significant or uncertain magnitude. Equally, it would have allowed for a more focused approach on the assessment of impacts for which there is lack of conclusive evidence. These points are discussed below, in relation to the different drivers and impacts, and in the summary (section 5.6). The outcome and results of the assessments of the impacts of the proposed development on marine ecology are discussed in sections 5.1 to 5.5. The assessment of impacts on the Natura 2000/European Sites are discussed in section 6.

5.1 Construction phase: Impacts on Marine Communities (EIS Section 7.7.4)

The drivers of potential impacts on marine communities in the receiving environment during the construction phase of the proposed harbour extension are habitat loss, underwater noise and vibration, increased shipping traffic, resuspension of seabed sediments and chemical contamination.

It is stated in section 7.7.1 that the 'Do nothing' Impact (scenario) would lead to a *'"Long term Slight Positive Impact" "from an ecological point of view".* Presumably, this means that not building the extension to the harbour would have a moderate positive impact on biological communities in the site. This is erroneous, as the 'do nothing' scenarios should only be considered when assessing impacts caused by developments which themselves are designed to alleviate environmental or infrastructural problems (IEEM 2012, EPA 2002). Since the proposed harbour extension has not been designed to alleviate environmental problems or structural problems affecting the receiving environment, **the 'do nothing' scenario will not cause an environmental impact** – positive or else.

5.1.1 Impacts of Habitat loss during construction

Intertidal Habitat Loss (EIS Section 7.7.4.1)

This section of the EIS refers to intertidal habitats only, which is not clearly indicated in the title and not entirely considered in the rationale beyond the impact hypothesis made. The proposed development will lead as stated in Section 7.7.4.1 to the "*direct and irreplaceable loss of 29.79 ha of habitat for marine plants and invertebrates of which 5.93 ha is represented by the fucoid-dominated reef community complex which is a qualifying interest habitat for the cSAC*". The EIS states that this represents approximately 0.16% of the marine habitat of the European Site. However, this figure is of much less relevance than the proportion of intertidal fucoid-dominated reef community that is a qualifying habitat for Galway Bay cSAC to be lost to the development. Additionally, it is stated in Section 7.4.1.1 that mudflats and sandflats not covered by seawater at low tide, which are also Annex I habitats are located within the footprint of the development, and that the area of these habitats to be lost to the development represents approximately 0.16% of the total Galway Bay cSAC. It is not clear in the EIS if this is 0.16% of the totality of the Annex I mudflats and sandflats not covered by seawater at low tide habitats or the totality of the habitats in the cSAC.

The area of fucoid-dominated reef community to be lost to the development (5.93 ha) would represents 0.48 % of the total extent of this habitat in the cSAC (1227 ha) if the totality of intertidal habitat was fucoid-dominated reef. However, it is apparent that part of these habitats are mudflats and sandflats not covered by sea water at low tide, though the total extent of these habitats within the footprint of the project is not provided in the EIS.

The intertidal habitats that would be lost to the development have been described as being of 'poor quality' in the EIS (Section 7.7.4.1, p. 7-121), due to the effects of organic enrichment, salinity fluctuations and sediment resuspension due to storms and maintenance dredging.

Organic enrichment could potentially affect the 'quality' of the biological communities in these habitats, if 'quality' means in this case no deviation from natural biological diversity against the background of natural biological and ecological processes. In relation to organic enrichment affecting the quality of these intertidal communities, this judgement does not appear to be supported by evidence. In section 8.2 of the EIS (Water Quality) it is stated that "*satisfactory results were obtained for nitrates, nitrites and phosphates*" and that "*ammonia levels were slightly over the EU Regulations for salmonid waters (0.025 mg/l NH3) in some occasions*". It is also stated in the Section 8.2 of the EIS that these data were obtained before diversion of sewage water to the Mutton Island sewage treatment works, and that these *"are higher than present day data".* This information does not support the claim that there are conditions of organic enrichment affecting the intertidal reef communities in the site.

In relation to the effects of current maintenance dredging works, it is stated in the EIS that these take place approximately every ten years, and in section 7.7.4.15 (Impacts on Marine Communities during Operation Phase due to Regular Maintenance Dredging) the EIS concludes that the predicted impacts of the proposed development on marine communities is likely to be *"Short-term Serial Localised Moderate Negative Impacts (similar to those that already occur)"*. Therefore, if these adverse impacts are short-term and moderate, and take place every ten years it is very unlikely that dredging would determine 'poor quality' in the intertidal and subtidal habitats of Galway Bay to be lost as a consequence of the port extension. The intertidal mudflat and reef communities in this location are adapted to wide natural fluctuations in salinity and dissolved suspended solids (turbidity), as coastal and estuarine communities usually are, even when they are

located in modified environments and in the proximity of sewage outfalls. The intertidal reef communities described in Section 7.4.1.1 of the EIS are typical of hard substrata in intertidal estuarine and coastal areas in the west of Ireland (Hill *et al*, 1998), and reflect the range of natural environmental stresses that they are subject to. They may have relatively low diversity values, but their biomass production can be and often is very high. The intertidal reef habitats to be lost to the development are indeed rich in biomass of *Fucus spp*. and associated macrofauna and epifauna, which together constitute an important food resource for juvenile marine fish and birds.

Despite the low value attributed to the intertidal communities to be lost as a consequence of the expansion of Galway Harbour, the EIS concluded that the permanent loss of intertidal habitats will cause a '***permanent significant negative impact'*** on the (intertidal) marine communities. This impact hypothesis is consistent with the current understanding of the structure and function of the intertidal habitats in the Inner Galway Bay and their value, as the loss of intertidal habitats will be permanent and it will affect the integrity of the site.

While the term 'significant' is used both in the EU Environment Impact Assessment (85/337/EEC) Directive and the EU Habitats Directive (92/43/EEC) and EU Birds Directive (79/409/EEC), there are substantial differences between its use in the context of the EIA and Habitats and Birds Directives (CIEEM, 2010). Significance in the context of the EIA Directive and Regulations should be used to describe the relative importance of impacts on any feature of importance, regardless of the application of the Habitats and Birds Directives and regulations. An ecologically significant impact is an impact that has a negative or positive, effect on the integrity of a site or ecosystem. The permanent and irreversible loss of intertidal habitats due to the proposed development will have a negative effect on the integrity of the ecosystem, and for this reason, the impact of this habitat loss will be an **ecologically significant adverse effect**. The significance of this impact on the conservation objectives of Galway Bay cSAC is discussed in more detail in Section 6.

Mitigation of the impact of intertidal habitat loss on marine communities

It is stated in the EIS that it is not possible to mitigate for the loss of subtidal habitat, and that the loss of intertidal habitats will be mitigated by the construction of a new quay wall and rock armouring. Mitigation measures are those capable of minimising or cancelling

the adverse impact of an activity or project during or after completion. The construction of intertidal artificial habitats (quay wall and rock armouring) is, according to European guidance, a compensatory measure, intended to compensate for the effects on habitats which have been already adversely affected – destroyed in this case -by the development. The introduction of new artificial substrata such as quay walls and rock armouring should not be considered as mitigation for the loss of natural reef, mudflat and sandflat habitats, rather it may be considered as a further adverse impact. This is discussed below.

Intertidal Habitat Creation (EIS Section 7.7.4.2).

The proposed development includes the construction of a quay wall and breakwaters, with a surface of approximately 76,000m^2. According to Section 7.7.4.2 of the EIS, the use of engineered textured surfaces in the intertidal and subtidal sections of the quay walls and breakwaters will greatly increase the rates of settlement of marine flora and fauna. It is stated in the EIS that this "*will more than compensate for the 550 m of current man-made rock wall coastline that will be covered*", concluding that this will lead to a *"Permanent Moderate Positive Impact"* (on marine communities).

In this case, the new artificial hard substrata will replace existing artificial substrata - the current man-made rock wall coastline that will be covered by the new harbour extension. While it is a well known fact that the introduction of new hard substrata (textured or not) in coastal areas will lead to rapid colonisation by epibiota (flora and fauna), this is clearly a deviation from the baseline conditions at the location of the proposed quay wall and breakwaters (presence of natural intertidal reef and subtidal mixed habitats, absence of man-made hard substrata), and as such, must be considered as an adverse impact.
Therefore, there is an adverse impact on both counts i.e. (i) loss of the existing sea wall and loss of natural habitats in the footprint of the harbour expansion and (ii) the creation of a new sea wall, with the first impact being somewhat compensated by the second. For this reason, the net impact of the loss of the original and the construction of the new quay wall and breakwaters on local intertidal and subtidal marine communities is likely to **be moderate and adverse, but may not be ecologically significant.**

Loss of subtidal habitat on the footprint of the dredge area (EIS Section 7.7.4.3 and 7.7.6.4)

Capital navigation dredging will be required for the approach channel and turning areas, and the proposed dredging area has an extension of 46.8ha. The dredging works will cause a direct impact on the existing biological communities, due to the loss of benthic infauna and epifauna within the footprint of the dredging works. However, as it is stated in the EIS, recolonisation will take place and the benthic communities will recover after a period of between two and six years (Hill *et al*, 2011, Boyd *et al*, 2004, 2005, Cooper *et al*, 2007a and 2007b). There is no possible mitigation for this impact, and the residual impact of the dredging works on the subtidal marine communities has been assessed as *'Short term moderate negative impact'.* Considering that the recovery time of the benthic community in the dredge area will be at least of two years, this may not be a short term impact, but it is reversible, and will affect a relatively small area of the seabed. There is no mitigation for the impact of dredging on biological communities, but it must be noted that the impact will caused by physical destruction of biota during the dredging works and to some extent to habitat modification, rather than habitat loss. The subtidal habitats may be modified in relation to their physical properties, such as particle size distribution and habitat type, but they will not be destroyed and in due time, they will be recolonised by benthic organisms.

For this reasons, the impact of the proposed dredging works on the subtidal benthic communities and marine fish in Galway Bay is likely to be **moderate adverse, and not ecologically significant**.

5.1.2 Impacts of underwater noise and vibration during construction

The potential impacts of the construction phase underwater noise and vibration caused by rock blasting, percussive pile-driving and dredging on biota in the receiving environment are addressed in Sections 7.7.4.4 to 7.4.4.6 and 7.7.6.5 to 7.7.6.7 of the EIS. The methodology used to undertake these assessments is described in Chapter 10 (Noise and Vibration) of the EIS and in Appendices 10.2 and 10.3.

The assessment of impacts of underwater noise and vibration on sensitive biological receptors in Galway Bay (marine mammals, birds and fish) are supported by a comprehensive review of the available literature on propagation of sound and vibration in the marine environment, including Schulkin and Mercer, 1985, Southall *et al*, 2007,

Nedwell *et al,* 1992, Nedwell *et al*, 2007a, Oestman *et al,* 2009, Ellison *et al,* 2011, de Jong *et al*, 2011, Department of Art, Heritage and the Gaeltacht, 2014, Finneran and Jenkins 2012, Halvorsen *et al,* 2012, Kastelein *et al*, 2012, Hawkins and Popper, 2012, NOAA, 2013, De Ruiter *et al,* 2013 and Thompson *et al.,* 2013. The review is adequately focused on the effects of noise and vibration in shallow and confined coastal areas such as Galway Bay, where the propagation of underwater noise and vibration is limited by interaction with the sea bed and the surface.

Site specific modelling work was undertaken to describe and predict propagation of sound in Galway Bay, and field measurements of underwater sound produced by moving vessels, seismic boomers and an underwater sound beacon (aTeledyne Benthos Model ALP-365 Flexi-Pinger) were undertaken to calibrate and validate the model results. The impacts of underwater sound and vibration are assessed for all the relevant sensitive receptors in their area of influence (marine mammals, migratory fish and marine birds). As explained in section 4.1, the potential impacts on marine fish in Galway Bay were not considered in the EIS.

The magnitude of the potential impacts of underwater sound and vibration on biota is based on a scale that includes "*non recoverable injury"* - lethal effects, "*recoverable injury"* - sub-lethal effects, which include permanent threshold shift (PTS) in hearing and temporary threshold shift (TTS) in hearing), "*disturbance*" and "*negligible*". This methodology is adequate, and follows established practice and guidance (Department of Art, Heritage and the Gaeltacht, 2014, 2014 and Robinson *et al,* 2011). The current uncertainties in relation to methods of measuring underwater noise and vibration, lack of standardisation and model calibration are acknowledged in the rationale supporting the impact assessments. These uncertainties are not always reflected in the impact hypotheses made, which rely heavily on the results of the modelling work.

Impacts of underwater drilling and blasting (EIS Section 7.7.4.4 and 7.7.6.5)

Drilling of hard substrata on the seabed, and the use of explosives during seabed rock-blasting will generate underwater noise and vibration, in the form of a percussive shock wave. The potential impacts of this on sensitive biological receptors in the receiving environment are adequately addressed in Chapter 10, and noise modelling results are shown in Appendix 10.2 and 10.3. These indicate that the range of temporary injury to the most sensitive marine species (Pinnipeds, common and grey seals) caused by

underwater blasting is up to 1km from the source, and that lethal effects would be expected at a distance of 10m from the source. This information is not included in Section 7.7.4.4, which attributes drilling and blasting a *"Temporary Potentially Moderate Negative Impact".* This is discussed below.

Mitigation of impacts of underwater blasting.

Section 7.7.4.4 states that mitigation is not possible. However, it is stated in Chapter 10 that *"Mitigation measures will be driven by the principle of reduction at source. In this regard trial blasting will be carried out prior to the commencement of production blasting to confirm the optimum blast ratio for the process, to test the effectiveness of the proposed mitigation measures and to provide initial monitoring data for the blasting events. The mitigation measures proposed are based on international best practice in particular that adopted by the Canadian authorities (Anon), and the American authorities (Anon 1991), (Anon 2006) and British Standard 5607 Code of practice for the safe use of explosives in the construction industry."* A comprehensive series of mitigation measures has been incorporated to the construction methodology (Section 7.7.6.5 and 7.7.8.1). These include limiting the explosive charges to a maximum of 10kg, blasting during low tide only, no blasting to take place between April to July (inclusive) to minimize impact on migrating fish and the seal pupping season (Chapter 10) and constant mammal watch by the deployment of qualified Marine Mammal Observers (MMOs). As it was mentioned in section 4, the proposed development is located within wider spawning grounds for sprat and *Nephrops* (Coulson *et al.*, 1998). Sprat spawn between May and August, and *Nephrops* from January to December, but with peak of spawning between April to June, so the proposed mitigation (no blasting between April to July) would also be appropriate to minimise the impact on these fish spawning grounds.

Additional mitigation includes monitoring of underwater noise levels prior to commencement of development, with particular emphasis on the presence of seals and during the smelt and eel migration period. A RIB will be used to ensure that diving bird species are not present during blasting activities, and to deter diving birds from approaching the area.

These mitigation measures are in line with the recommended available guidelines (Department of Art, Heritage and the Gaeltacht, 2014, Nedwell *et al*, 2007a, OSPAR, 2009) and they are also common practice in the construction of harbours and offshore

wind farms. Considering the levels of underwater noise and vibration described in the EIS, its temporary nature, the sensitivities of marine species in the receiving environment and the proposed mitigation measures, the potential impact of rock blasting on marine mammals, fish and birds in Galway Bay is likely to be **moderate adverse, and not likely to be ecologically significant.**

Impacts of percussive pile driving (EIS, Section 7.7.4.5, 7.7.6.6 and 7.7.8.2)

Percussive pile driving can also generate levels underwater noise and vibration that can be harmful for marine biota. With a diameter of 1.2m, the size of the steel tubular piles that would be used for the Galway Harbour is relatively small in comparison with those used in offshore wind farms, which are in the range of 9m to 14m of diameter. The levels of energy required to drive in piles with a diameter of 1.2 m are also minor in relation to those used to drive in larger piles.

The impacts of percussive pile driving on biota are addressed in different sections of the EIS. These include Chapter 7 of the EIS (Section 7.7.4.5, 7.7.6.6 and 7.7.8.2), Chapter 10 (Sections 10.5.2.2, 10.5.5 and 10.5.6.1). Further information has been presented in the briefs of evidence provided by Eugene McKeown and Chris Pepiatt during the Oral Hearing in January 2015.

Modelling results (in Annexes 10.2 and 10.3) suggest that an exclusion zone of 64m is required to avoid temporary injury to marine fauna (the limiting factor being the impact on Pinnipeds) for driving piles with a diameter of 1.2m. Based on the expected avoidance reaction from mobile biota, it is acknowledged in the EIS (Section 7.7.4.5) that percussive pile driving may have a localised adverse impact on fish at a distance of 2km. The modelled impact threshold distance for physical damage (presumably PTS) and the threshold distance for disturbance to seals and harbour porpoise are 4m and 64m respectively. The EIS concluded that the impact of underwater sound and vibration caused by percussive pile driving on the marine communities in the receiving environment will be "*Permanent/Moderate Negative*". Considering the temporary nature of the disturbance, the direct impact is likely to be temporary, rather than permanent. The magnitude of the residual impact after mitigation is discussed below.

Mitigation of impacts of percussive pile driving

The mitigation measures of the potential impacts of percussive pile driving are described in Sections 7.7.6.5 and 7.7.8.2. and in the 'Brief of Evidence, presentation to the Public Hearing, Chris Peppiatt, January 2015'. These include MMOs to monitor the pile driving operations, with pile driving not being permitted if cetaceans or seals are sighted within one km of the site. Chris Peppiatt also stated during the oral hearing that a 'soft-start method' in which the energy levels used for driving in piles is increased in a gradual, stepped manner, starting at levels unlikely to cause significant behavioural impact will be applied to give mobile fauna an opportunity to escape away from the noise source. These are standard mitigation measures for the potential impacts of underwater noise and vibration from pile driving on biota, they are in line with the guidance from the Department of Art, Heritage and the Gaeltacht (2014) and Robinson *et al* (2011) and are widely used in the construction of harbours and offshore wind farms.

Provided that these mitigation measures are implemented in an effective way, the impact of pile driving on the marine fauna in Galway Bay are likely to be **moderate adverse, and not likely to be ecologically significant.**

Impacts of capital dredging noise (EIS, Section 7.7.4.6 and 7.7.6.7)

In addition to rock drilling and blasting, the proposed harbour extension would require capital dredging using back-hoe, grab or clam-shell dredgers, and very likely a combination of all these. Dredging operations also generate underwater sound and vibration, but these are normally of less intensity than those produced by percussive piling.

The impact threshold distance for physical damage to fish caused by underwater sound from back-hoe dredging (worst case scenario) has been estimated to be of 128m. This is based on a period of exposure of 24 hours at this distance. For disturbance, the threshold distance has been estimated to be of 32m, based on an exposure time of 5 minutes at that distance.

Mitigation of impacts of capital dredging noise

The proposed mitigation of the impacts of underwater sound originated by the use of dredgers includes completing all dredging works between August and March to avoid critical periods for migratory fish. This period will also be appropriate to protect spawning grounds for marine fish in the area.

The proposed mitigation is appropriate, and provided that it is implemented in an effective way, the residual impact of capital dredging on marine mammals, fish and birds in Galway Bay are likely to be **moderate adverse, and not likely to be ecologically significant.**

5.1.3 Impacts of disturbance caused by shipping traffic (EIS Section 7.7.4.7 and 7.7.6.12)

The construction works associated to the construction of the harbour extension will involve an increase in shipping traffic. This increase will cause disturbance to marine mammals, fish and birds in the proximity of the site and access sea route. The EIS states that the only possible mitigation against disturbance from shipping is a reduction of speed on approach to the site, which would lead to a reduction of underwater and airborne noise levels at the construction site.

The impact of disturbance due to increased traffic during construction has been assessed by the applicant as *"Permanent Neutral or Imperceptible Negative Impact".* This definition or impact hypothesis is not in line with available guidance, and it is confusing. Considering that the impact would be adverse or negative, of low magnitude, over a limited area which represents a small fraction of the available habitats for marine species in Galway Bay, and temporary in nature, my assessment is that the impact of disturbance of biota during construction is likely to be **moderate adverse, and not ecologically significant.**

5.1.4 Impacts of sediment resuspension (EIS Section 7.7.4.8 and 7.7.6.12)

Construction and capital dredging operations will cause resuspension of sea bed sediments in the water column. This can lead to an increase of suspended solids in the proximity of the works and also to the formation of suspended solids plumes, which can potentially smother biological seabed communities after deposition or accretion on the

seabed. High concentration of suspended solids can also affect respiration in fish and marine mammals if the effects of shading are severe enough to limit primary production or clog their respiratory systems. Resuspension of contaminated seabed fine sediments can potentially release toxic substances associated to the sediment matrix to the water column, making these bioavailable and potentially leading to toxic effects on biota.

The predictions of the hydrodynamic modelling studies undertaken to support the EIS (Chapter 8) suggest that smothering will be localised to a distance of approximately 50m of the dredging operations. The model results also predict that at sites close to the mouth of Lough Atalia, sediments suspended by dredging could enter the lough during the flood tide. The impact of sediment resuspension on the marine communities in Galway Bay has been predicted to be *"Temporary Moderate Negative Impact"* in the EIS

Mitigation of impacts of sediment resuspension

It is stated in the EIS that dredging activity will be restricted to periods of ebb tide in the vicinity of the entrance to Lough Atalia, to prevent suspended sediments entering the lough. The sediments in the dredge area do not have contamination levels likely to lead to adverse biological effects on the local biological communities. Sediment resuspension will take place over a limited area, during a relatively short period of time, and for this reasons, it will have a **moderate adverse impact** on the local biological communities. This impact is **unlikely to be ecologically significant.**

5.1.5 Impacts of chemical contamination (EIS Section 7.7.4.9 and 7.7.2.10)

There is potential for accidental spills of fuel, oil and other chemicals from machinery and uncured concrete and concrete wash during the construction phase. These could potentially lead to significant adverse impacts on biota in the receiving environment, and the EIS concludes (Sections 7.7.4.9 and 7.7.4.10) that the impact of chemical contamination on the marine communities in Galway Bay can be *"Short-term Potentially Significant Negative Impact (localised)"*

Prevention of impacts of chemical contamination

Standard construction industry environmental management plans will be in place, such as the use of bunds and tanks to contain spills and prevent drainage water and liquids to enter the marine environment. Provided that these measures and plans are effectively implemented and adhered to, it is **unlikely** that chemical contamination caused by the proposed construction works will lead to **significant adverse impact** on biota in the receiving environment.

5.2 Operation phase: Impacts on Marine Communities (EIS Section 7.7.4)

The drivers of potential impacts on marine communities in the receiving environment during the operation phase of the proposed harbour expansion are increased shipping traffic and changes in river flow, sediment export and salinity caused by modifications to the hydrodynamic regime due to the modification of the existing shoreline, maintenance dredging and chemical contamination. The assessments of the potential impacts on the changes in the hydrodynamic regime rely on in the modelling work undertaken to support the EIS, and described in Chapter 8. The evaluation of the modelling results falls outside the scope of the present assessment.

5.2.1 Impacts of modified river flow and sediment export (EIS Section 7.7.4.11)

The construction of the proposed harbour extension will result in the narrowing of the mouth of the Corrib River, leading to an increase of flow rate of the river in this area. Hydrological modelling work results shows that the outflow of the river will be deflected southwards towards Mutton Island, resulting in a concentration of flow along the proposed dredged channel past the marina breakwater. As a consequence of this, modelling simulations indicate higher velocities in the flow, which in turn will cause short-term remobilisation of sediment from this area to the south, while the proposed development will restrict the erosive flow to the proposed dredge channel immediately to its west. The overall conclusion of the modelling results is that the proposed port configuration will confine the high flows and critical bed shear to the approach channels and will not result in any erosive impact elsewhere. The river plume on the ebbing tide will be extended to the south, beyond Mutton Island, while it will be much diluted during

the flood tide. The simulation results also indicate a reduction of between 40% and 60% in fine sediment loads east of the harbour extension.

The EIS concludes that the impact of these changes to the hydrodynamic regime and sediment transport patterns will have a *"Short-term Slightly Negative Impact (localised)"* on the marine communities in the receiving environment. This impact hypothesis is not supported by the information provided in the EIS, and the impact characterisation is not in line with available guidance (EPA, 2014, CIEEM 20101). This is discussed below.

Mitigation of impacts of modified river flow and sediment export

There is no possible mitigation for the impacts of modified river flow and sediment export in the marine biological communities in the affected area. Potential changes in particle size distribution in the seabed sediments as a consequence of the increase in flow and change in direction can potentially change the distribution and abundance of benthic infauna and epifauna. These changes will be limited to a confined area to the west of the proposed development and the access channel, and unlikely to change the ecological function of the subtidal habitats in a significant way. However, they will not be 'short term' but permanent, and irreversible. For these reasons, the impact of the modified river flow and sediment export on the biological communities in the receiving environment will be **moderate adverse, and may not ecologically significant.**

5.2.2 Impacts of changes in the salinity regime (EIS Section 7.7.4.12 and 7.7.6.14)

The presence of the harbour extension and its effect on the local hydrodynamic regime will also lead to an increase in salinity to the east of it. It will also lead to minor changes in salinity in Lough Atalia – the impact of the changes of salinity in Lough Atalia are discussed in Section 5.2.7 of this report. The impact of this change on the marine communities during operation phase due to changes in the salinity regime has been assessed to be *"Permanent Slight Positive"*. This impact hypothesis is based in the assumption that it will be easier for migrating salmon to find their way up the Corrib River due to an increase of freshwater flow during ebb conditions. While it may possible that this change in the salinity regime could potentially facilitate or direct the migration of salmon, no evidence has been presented to support this assumption. As discussed previously, the imposition of artificial conditions on more natural baseline conditions

should normally be considered to be an adverse impact on the receiving environment. Predicted changes in salinity to the east of the development will affect a relatively small area, and are very unlikely to cause a significant change in the community structure of the subtidal habitats in this area, since the benthic species present there are already adapted to wide variations in salinity. Fish and marine mammals in coastal and estuarine areas are also tolerant of fluctuations in salinity. For these reasons, the impact of changes in the salinity regime on the marine communities in the receiving environment is likely to be **negligible.**

5.2.3 Impacts of pollution with wastewater (EIS Section 7.7.4.13 and 7.7.6.14)

The sewage generated within the area of the proposed development will be directed to the existing pumping station then pumped into the Galway City main drainage network for treatment. As a result, the wastewater produced as a result of the proposed development **will not have a significant adverse impact** on the receiving environment.

5.2.4 Impacts of suspended solids from reclaimed land (EIS Section 7.7.4.14 and 7.7.6.14).

This refers to the risk of infill material being transported to the water by runoff, and the potential impact has been predicted to be "Potential Serial Short-term Moderate Negative Impact" in the EIS. Since the infill material will be contained by a geotextile membrane and hard sea defences, this potential impact is very unlikely to occur.

5.2.5 Impacts of maintenance dredging (EIS Section 7.7.4.15 and 7.7.6.19)

Maintenance dredging will take place approximately every ten years. The potential impacts associated with dredging are generally well understood, and the in-dredge material will be disposed of to an EPA permitted site outside the Natura 2000 sites in Galway Bay. The impacts on the marine communities in the receiving environment have been predicted in the EIS (Section 7.7.6.19) to be *"Short-term Serial Localised Moderate Negative Impacts (similar to those that already occur)*". A more accurate description of this impact would be **moderate adverse and not ecologically significant.**

5.2.6 Potential impacts of disturbance caused by increase in shipping.

The proposed development will lead to a significant increase in shipping traffic, which has been estimated to be 25% for commercial shipping and 600% for recreational vessels. The impact of this increase on fish has been discussed in Section 7.7.6.12 of the EIS, and the impact on birds in Section 7.7.7 of the EIS Addenda – Errata, which replaces the original assessment in the EIS. According to the original assessment in the EIS, the only possible mitigation for this impact is the reduction of speed of vessels on approach, and the residual impact have been predicted to be *'Permanent Neutral or Imperceptible Negative'* on fish and *'Imperceptible'* on birds. These impact definitions are unclear, and in the case of fish, contradictory. Clearly, an increase on maritime traffic like the one that is expected to take place during the operation phase of the proposed development is likely to cause an increase of disturbance. In the Response to Further Information document (RFI, October 2014) it is stated that "*given the more or less uniform very low densities at which these species (Red-breasted Merganser, Great Northern Diver and Cormorant) occur in Inner Galway Bay (2-5 birds per 100 ha), and the fact that highest intensity of recreational boat traffic will be in the summer, outside the main season of occurrence of these populations, it is unlikely that the increased recreational boat traffic will cause significant disturbance impacts."* The rationale beyond this impact hypothesis is not fully explained in this document, or in the EIS/NIS and subsequent responses to the representations. While the disturbance sensitivity of bird species to shipping traffic has been reviewed in the relevant species profile in the EIS Addenda, the significance and magnitude of the potential impacts associated with disturbance of marine birds has not been fully addressed in the EIS/NIS. For this reason, it is my opinion that the 'no likely impact' hypothesis has not been proved beyond reasonable scientific doubt in this case. Based on the precautionary principle, and considering the potentially significant increase of maritime traffic and the sensitivities of the different bird species, it is likely that the impact of disturbance on marine birds is likely to be **moderate adverse and may not be ecologically significant**.

5.2.7 Potential impacts on Lough Atalia and Renmore Lough (EIS Section 7.7.5).

The potential of impacts of the proposed development on Lough Atalia and Renmore Lough are addressed in the EIS (Section 7.7.5) and in Appendix 2.1 of the Appendices to the NIS Addendum/Errata. These are associated with an increase of suspended solids transported to the Loughs by either dredging works or tidal flow, and changes in the salinity regime caused by modifications of the hydrodynamic regime. As the dredging works will be undertaken during the ebb tide, no additional suspended sediments will enter Lough Atalia and Renmore Lough. For this reason, there is little likelihood of impact of sedimentation on bathymetry in the loughs.

The EIS states that according to the hydrodynamic model predictions, a decrease of salinity may take place in Lough Atalia. This would be a decrease of 1.8psu (practical salinity units) in the mean salinity value. As the measured range of salinity is from 1psu to 29psu, and the biological communities in the Lough are adapted to these variations, the EIS predicts that there will be no adverse impact on Lough Atalia due to the changes in the salinity regime. This impact hypothesis is correct, provided the predictions of the hydrodynamic modelling work are correct.

5.3 Cumulative impacts

The cumulative potential impacts of the proposed development in combination with other projects and developments in the region are assessed in the EIS (Section 7.7.10) and in the NIS Addendum/Errata II (January 2015). In relation to these assessments, the EIS concludes that having considered other plans and projects within the vicinity of the relevant Natura 2000 sites, the proposed project does not have the potential for further impacts arising in combination with any other plans or projects provided that the proposed mitigation measures to avoid impacts are implemented effectively. It is also stated in Section 7.7.10.3.6 that the proposed development will not result in significant negative impacts on the conservation objectives or integrity of the Natura 2000 sites.

However, and as it is explained in Section 5.1.1 of this report, the construction of the Galway Harbour extension will lead to the permanent loss of 5.93ha of intertidal habitat. The cumulative effects of this habitat loss should be considered in combination with the 8.58ha of intertidal habitat that was previously lost during the construction of the Galway Harbour Enterprise Park, and adjacent to the intertidal habitats that will be lost due to the

proposed development. As it was discussed in Section 5.1.1, the impact of this habitat loss will be an **ecologically significant adverse impact.**

As discussed in Section 5.1.2, the potential impacts of rock blasting, percussive pile driving, capital dredging and increase in shipping traffic during construction have been separately assessed to be moderate adverse and not likely to be ecologically significant. While there is potential for some overlapping of these activities during construction, it is unlikely that all of them will take place simultaneously over significant periods of time. Considering the scale and nature of these activities, and provided that the proposed mitigation measures are implemented effectively, the cumulative impact of underwater sound and vibration due to rock blasting, pile driving, capital dredging and increase in shipping noise during construction is likely to be moderate adverse and not ecologically significant.

The proposed works are located at a distance of approximately 1.5km of the outfall of the Mutton Island sewage treatment works (STWs). The potential environmental impacts of the expansion of Galway Harbour have not been assessed in combination with the impact of the effluent of STWs on water quality and the wider marine environment and sensitive biological receptors. Water quality in Galway Bay in the area of influence of the proposed development is addressed in Chapter 8 of the EIS (Section 8.3.3), but this refers to the period before diversion of sewage water to the Mutton Island STWs, so it is not relevant to assess the potential in-combination impacts of the proposed development with the impacts caused by the sewage effluent in Galway Bay. The EIS states in Section 7.7.10.1 that *"A number of wastewater treatment plants are currently discharging into the Natura 2000 sites subject to this assessment, or have proposed upgrades which will involve discharge to the relevant Natura 2000 sites. In the case of existing treatment plants which operate within the conditions of discharge licences, no potential for cumulative effects is anticipated, if plants work within their discharge licence conditions."* Presumably, even if these STWs are operating within their discharge conditions and meeting EU water quality standards under the Water Framework Directive, they will discharge nutrients and other chemical substances to the marine environment. While the potential cumulative impacts of the proposed development and the impact of effluent discharges from Mutton Island STWs and other STWs discharging to Galway Bay have not been addressed in the EIS, these are not likely to be of significant magnitude if the effluents of STWs are meeting their license conditions and relevant water quality standards are being met in Galway Bay.

5.4 Summary of impacts on the marine environment

The potential direct, indirect and cumulative impacts on marine communities in the receiving environment during the construction and operation phases of the proposed harbour extension are generally adequately addressed in the EIS/EIS Addenda. The proposed mitigation measures to minimise and offset the likely potential impacts of the harbour expansion on the marine communities in the receiving environment are generally adequate, and consistent with current guidance and practice within the marine construction industry. In consequence, the majority of the potential residual impacts will not be of significant magnitude, with the exception of the loss of intertidal habitats.

During construction, the loss of intertidal habitats will cause an adverse and ecologically significant impact on the receiving environment.

The impacts of rock drilling and blasting, percussive pile driving, capital dredging, subtidal habitat loss, disturbance caused by shipping and sediment resuspension are likely to be moderate adverse, and not ecologically significant.

The impacts of modified river flow and maintenance dredging during the operational phase of the project will lead to moderate adverse and not ecologically significant impacts on the receiving environment. However, the impacts of disturbance due to increased shipping traffic during operation on sensitive biological receptors in the site - especially marine birds – have not been fully assessed. The impact of disturbance on marine birds is likely to be moderate adverse and may not be ecologically significant.

The cumulative impact of underwater sound and vibration due to rock blasting, pile driving, capital dredging and increase in shipping noise during construction is likely to be moderate adverse and not ecologically significant.

6. Impacts on the Natura 2000 Sites

6.1 European Sites in the proximity of the proposed development

The Natura Impact Statement (NIS) and the NIS Addenda – Errata adequately identify the natural conservation designated sites in the vicinity of the proposed development and the wider area, extending within radium of 15km of the site. The relevant marine sites included in the NIS are Galway Bay Complex candidate Special Area of Conservation (cSAC), Inner Galway Bay Special Protection Area (SPA) and Lough Corrib Special Area of Conservation (cSAC).

The proposed development is within the boundaries of Galway Bay Complex cSAC and the Inner Galway Bay SPA.

Galway Bay is designated as a candidate SAC under the EU Habitats Directive and as SPA under the EU Birds Directive. The qualifying interests for the Galway Bay cSAC and the special conservation interest species for the Inner Galway Bay SPA are also described in Chapter 7 of the EIS and in the NIS and their Errata and Addenda.

The Galway Bay Complex cSAC is designated for the marine Annex I qualifying interests of Large shallow inlets and bays, mudflats and sandflats not covered by sea water at low tide and reefs and the Annex II species *Phoca vitulina* (harbour seal, also known as common seal). The Annex I habitat large shallow inlets and bays may wholly or partly incorporate other Annex I habitats, including mudflats, sandflats and reefs (NPWS, 2013). These habitats and the biology and ecological importance of Annex II species harbour seal are described in the EIS and the NIS and their addenda with an appropriate level of detail.

The Inner Galway Bay SPA supports wintering wetland birds, internationally important wintering populations of Great Northern Diver and Brent Goose, and nationally important populations of an additional sixteen species. The SPA is an important wintering site for populations of many bird species, some of them Special Conservation Interest (SCI)

species. These internationally and nationally important bird species, together with wintering species are described in the EIS and in the NIS and their addenda.

The proposed development is also situated at a distance of 4.5km of the Lough Corrib cSAC. This is a freshwater lough connected to Galway Bay by the Corrib River.

Lough Corrib cSAC is another important nature conservation and Natura 2000 site, which includes 14 habitats listed in Annex I of the EU Habitats Directive, with 6 of them being priority habitats. None of these habitats will be affected by the proposed development, due to the location of the cSAC, upstream of the River Corrib. However, sea lamprey *Petromyzon marinus,* Atlantic salmon *Salmo salar* (only in fresh water) and otter *Lutra lutra* are Annex II species which are qualifying features for the Lough Corrib cSAC, and these can be potentially affected by the proposed extension of Galway Harbour.

Lough Atalia and Renmore Lough are defined as “lagoons” within the EU Habitats Directive, and listed under the Directive as priority habitats. They are both within the boundaries of the Galway Bay cSAC, and Lough Atalia is also part of the Galway Bay SPA.

The Natura 2000 sites that can be potentially affected by the proposed development are adequately identified in the NIS. The potential impacts of the construction and operation phase of the Galway Harbour expansion are addressed in the NIS and the NIS Addenda – Errata and in Chapter 7 of the EIS and the EIS Addenda – Errata (I and II). All qualifying interests associated with the designated sites have been adequately identified in the NIS and the NIS Addenda – Errata.

The potential impacts on habitats and populations of species that are qualifying features of these Natura 2000 sites have been discussed in Section 5 of this report. A summary of these potential impacts in relation to the conservation objectives and qualifying features of the Natura 2000 sites is given below.

6.1.1 Impacts on Galway Bay Complex cSAC

The proposed development will cause the loss of 5.93ha of intertidal Annex I habitat. This will be a significant adverse impact. Underwater noise and vibration during construction

and disturbance caused by an increase in shipping traffic will have a moderate adverse impact on the Annex II species *Phoca vitulina* (harbour or common seal).

Potential impacts on the perennial vegetation on stony banks of Renmore Lough

The perennial vegetation on stony banks is a qualifying interest of the Galway Bay cSAC, and the conservation objective for this habitat is to maintain its favourable condition. As it is stated in the NIS Addenda (p. 143), 0.28ha of this habitat has been lost in the past, and the proposed harbour expansion will cause a further loss of 0.35ha. In addition to this, the presence of the new harbour will lead to changes in the hydrodynamic regime at local level, sheltering the stony bank that forms the south boundary of Renmore Lough. This in turn will prevent storm and wave surges from accessing the stony banks, leading to increased colonisation of terrestrial vegetation, such as heath grassland and grassland communities. This process is likely to lead to the loss of the perennial vegetation that benefits from the periodical disturbance of the shingle by the sea and, in consequence, it has been correctly assessed in the NIS Addenda to be a significant adverse impact.

6.1.2 Impacts on Lough Corrib cSAC

Three Annex II species which are qualifying features for the Lough Corrib cSAC can be potentially affected by the proposed extension of Galway Harbour. These are sea lamprey *Petromyzon marinus,* Atlantic salmon *Salmo salar* and otter *Lutra lutra*. Based on the information provided in the EIS/NIS, it is my opinion that underwater noise and vibration during construction and disturbance caused by an increase in shipping traffic during operation are likely to have a moderate adverse impact on these Annex II species.

6.1.3 Impacts on Inner Galway Bay SPA

Loss of intertidal and subtidal habitat, underwater noise and vibration and disturbance during construction are likely to have a moderate adverse impact on many of the bird species that are qualifying features of the SPA. Disturbance caused by an increase in shipping traffic during operation is likely to have a moderate adverse impact on some of the bird species that are qualifying features of the SPA.

6.2 Integrity of the European Sites

As discussed in Section 5, an extension of 5.93ha of fucoid-dominated reef (Annex I habitat) will be permanently lost as a result of the construction of the Galway Harbour Extension. This represents 0.48% of the extent of this habitat within the Galway Bay Complex cSAC (1127 ha). The loss of these intertidal habitats is identified in the EIS and NIS as a 'permanent significant negative impact'.

The NIS also states that an extension of mud flat and sand flat will also be lost through the construction of the harbour extension. 'Mudflats and sand flats not covered by seawater at low tide' is a feature of interest within the cSAC, however the area of this habitat that will be lost has not been adequately quantified.

Following EU Commission guidance for assessing the impact of plans and projects on a site (Article 6(3)), the benchmark for the assessment is the nature conservation objectives for the site. The test that must be satisfied, subject to the provisions of Article 6(4), is that consent for a plan or project can be given only having ascertained no adverse effect on the integrity of the site. The concept of site integrity is part of a wider consideration of the constituent elements and ecological characteristics of the site in so far as they affect the status of the qualifying features. The integrity of the site is defined by government policy, in the Commission's guidance and accepted by the courts as being:

"the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or levels of populations of the species for which it was classified."

This is consistent with the definitions of favourable conservation status in Article 1 of the Habitats Directive:

- Their range and area must be stable or increasing
- The species structure and functions necessary for long term maintenance exist and are likely to continue to exist for the foreseeable future, and
- The status of the typical species is considered to be favourable

There has to be a 'lasting preservation' of the characteristics of the site connected to the feature for which the site was designated.

The conservation objective for reef habitat within Galway Bay Complex cSAC is "*to maintain the favourable conservation status of Reefs*", which is defined by the following list of attributes and targets:

- The distribution of reefs is stable or increasing, subject to natural processes.
- The permanent habitat area is stable, subject to natural processes
- To conserve the following community types in a natural condition: Fucoid-dominated community complex; *Laminaria*-dominated community complex; and Shallow sponge-dominated community complex. (NPWS, 2013)

The conservation objective for mudflats and sand flats not covered by seawater at low tide is "to maintain the favourable conservation condition of the habitat in Galway Bay Complex cSAC, which is defined by the following list of attributes and targets:

- The permanent habitat area is stable or increasing, subject to natural processes
- Conserve the following community types in a natural condition: intertidal sandy mud community complex; and intertidal sand community complex. (NPWS 2013)

The NIS describes the reef habitat that would be permanently destroyed by the harbour extension as being of 'poor quality'. This could suggest that the target 'to conserve the community type in a natural condition' is not being met and may not allow the achievement of the habitat's conservation objective through natural conditions. However, the qualification of this habitat as being of 'poor quality' was not supported by the information provided in the EIS and NIS. Furthermore, a description or comparison of equivalent fucoid-dominated reef habitat in other areas of the SAC has not been made. As such it cannot be proved beyond reasonable scientific doubt that this habitat is of poor quality. It is also implicit in the conservation objectives for the site that the habitat should be restored if degraded i.e. if it is not in favourable condition currently, then the objective is to make it favourable and keep it that way.

The direct and permanent loss of fucoid-dominated reef habitat, and mud and sand flat habitat will result in the conservation objective for these features not being met. The

direct and permanent loss of a habitat, which is part of the conservation objective of the site, is in general **a significant adverse effect on the integrity of the site**.

As discussed in Section 6.1.1, the proposed development will also lead to the loss of 0.35ha of perennial vegetation of stony banks in the south boundary of Renmore Lough. The loss of this area of qualifying habitat will also have a **significant adverse effect on the integrity of the site.**

6.3 Shannon Foynes Port Appropriate Assessment

This is an Appropriate Assessment (AA) undertaken to support the Shannon Foynes Port Company Master Plan 2041, which is not at present time a specific project to develop the existing port structures and facilities in the Shannon Estuary (Port of Foynes and Limerick Docks), in the west coast of Ireland. The AA was undertaken considering the likely activities and drivers involved in the development of the port and the conservation objectives and qualifying habitats and species of the relevant local Natura 2000 sites, Lower River Shannon SAC, Barrigone SAC and River Shannon and River Fergus SPA. The AA concluded that following the implementation of the proposed mitigation measures, it is expected that the proposed vision (development of port facilities) "*will avoid significant negative impacts on key sensitive receptors and qualifying features of the SAC and SPA both along and in combination with the other elements identified in this report*".

To arrive at this conclusion, the AA examines all possible activities that can potentially cause significant negative impacts on the qualifying features of the Natura 2000 sites. An essential part of this process is the correct identification of the drivers or activities that can potentially affect these features in a negative way. These include direct habitat loss, direct physical damage of biota caused by blasting and percussive pile driving, direct physical damage to mobile species, indirect disturbance, changes to the hydrodynamic regime and toxic effects of contamination caused by accidental spills and sediment resuspension during dredging.

The conclusion of no likely significant effects on the integrity of the Natura 2000 sites and the sensitive receptors and qualifying features of these is valid, since all the potentially significant impacts have been either eliminated at project level through avoidance and removal of those elements more likely to cause significant effects or mitigated

adequately. Crucially, careful selection of sites for the development within the Natura 2000 sites would avoid sensitive features and habitats. This would avoid the loss or disturbance of sensitive habitats, Annex I habitats and species, thus preventing the development from affecting the integrity or conservation objectives of the Natura 2000 sites. The other mitigation measures proposed to minimise or avoid significant impacts on the Natura 2000 sites are also appropriate, and in consequence, the preliminary conclusions in the AA are valid as long as these mitigation measures are effectively implemented.

7. Conclusions

The existing nature of the receiving environment below Mean High Water Spring level (MHWS) in the zone of influence of the proposed development is adequately described in the EIS and the addendum to the EIS. Chapter 7 of the EIS provides an adequate characterisation of the receiving environment below MHWS level.

All the relevant drivers of biophysical changes attributable to the project that are likely to affect valued ecological features, resources, conservation objectives and qualifying nature conservation features have been adequately described.

Relevant sensitive environmental receptors are described with an appropriate level of detail.

The Natura 2000 sites that can be potentially affected by the proposed development have been correctly identified and described in the NIS, together with their conservation objectives and qualifying features.

The potential direct, indirect and cumulative impacts on marine communities in the receiving environment during the construction and operation phases of the proposed harbour extension are generally adequately addressed in the EIS/EIS Addenda.

The proposed mitigation measures to minimise and offset the likely potential impacts of the harbour expansion on the marine communities in the receiving environment are

generally adequate, and consistent with current guidance and practice within the marine construction industry.

During construction, the loss of intertidal habitats will cause an adverse and ecologically significant impact on the receiving environment.

The impacts of rock drilling and blasting, percussive pile driving, capital dredging, subtidal habitat loss, disturbance caused by shipping and sediment resuspension are likely to be moderate adverse, and not ecologically significant.

The impacts of modified river flow and maintenance dredging during the operational phase of the project will lead to moderate adverse and not ecologically significant impacts on the receiving environment.

The impacts of disturbance due to increased shipping traffic during operation on sensitive biological receptors in the site - especially marine birds – have not been fully assessed. The impact of disturbance on marine birds is likely to be moderate adverse and may not be ecologically significant.

The direct and permanent loss of fucoid-dominated reef habitat and mud and sand flat habitat in Galway Bay cSAC will result in the conservation objective for these features not being met. The direct and permanent loss of a habitat, which is part of the conservation objective of the site, is in general a significant adverse effect on the integrity of the site. The loss of perennial vegetation on stony banks due to the sheltering effect of the harbour extension will also have a significant adverse effect on the integrity of the cSAC.

Underwater noise and vibration during construction and disturbance caused by an increase in shipping traffic are likely to have a moderate adverse impact on the Annex II species of the Lough Corrib cSAC.

Loss of intertidal and subtidal habitat, underwater noise and vibration and disturbance during construction are likely to have a moderate adverse impact on many of the bird species that are qualifying features of the SPA.

Disturbance caused by an increase in shipping traffic during operation are likely to have a moderate adverse impact on some of the bird species that are qualifying features of the SPA.

The proposed development is unlikely to cause significant adverse environmental impacts on Lough Atalia and Renmore Lough.

The cumulative impact of underwater sound and vibration due to rock blasting, pile driving, capital dredging and increase in shipping noise during construction is likely to be moderate adverse and not ecologically significant.

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