MWP

Waste Licence Application For Howth Harbour Dredging and Reclamation Project

Environmental Liabilities Risk Assessment (ELRA)

Department of Agriculture, Food and the Marine

24/11/2023

Contents

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1 Introduction

A waste licence application is being made to the Environmental Protection Agency in relation to waste activities associated with the reclamation development on the West Pier of Howth Harbour.

The waste activities associated with these works relate to the management of dredge spoil material from the dredging works of the Inner Harbour. The dredge spoil will be solidified and stabilised prior to placement within the reclaimed area, negating the need to import virgin fill material and applying a recovery benefit to the material. The principal waste activity associated with the works is therefore:

R5 *Recycling/reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials.*

The applicant for this application is the Department of Agriculture, Food and the Marine (DAFM). This document forms an Environmental Liabilities Risk Assessment (ELRA) to inform the identification of the financial commitments required by the DAFM to cover potential 'incident' liabilities during the construction period associated with the works.

This document is submitted as part of the application submission and has been prepared in accordance with the following two EPA guidance documents:

- Guidance on assessing and costing environmental liabilities (2014)
- Guidance on assessing and costing environmental liabilities – Unit Cost rates (2014)
- Guidance on Financial Provision for Environmental Liabilities (2015)
- EPA Approach to Environmental Liabilities and Financial Provision (2019)

1.1 Environmental Liability Regulations

The Environmental Liability Directive (2004/35/EC) was transposed into Irish law through the European Communities (Environmental Liability) Regulations (S.I. 547 of 2008). The Directive identifies activities for which 'strict liabilities' apply, for which waste management operations are identified.

The Regulations place a number of responsibilities on operators, i.e. the entity that controls an activity, namely:

- Prevention of environmental damage including taking measures to prevent (environmental) damage occurring when there is an imminent threat of damage.
- Informing the EPA of the imminent threat of environmental damage where the preventative measures have not been successful in dispelling the threat.
- Informing the EPA when environmental damage has occurred complying with the EPA's direction in relation to imminent threat of damage, and
- Where damage has occurred, the operators shall take steps to control, contain, remove or manage the contaminants.

EPA guidance on environmental liabilities identifies proactive risk management as a core principle under which the EPA will implement the Regulations. EPA guidance identifies an ELRA as being a good example of a

methodology for environmental risk management. Therefore, the preparation of an ELRA is considered as an acceptable way of implementing these Regulations.

2 Facility Description and Operation

This section provides an overview of the site development, historic use, licensing history, nature of activity and operator performance.

This section broadly follows Table 3.1 of the Guidance through identifying the relevant information to inform the risk identification process undertaken in Section 3.3.1 following.

2.1 Site Location

Howth Harbour is situated on the north side of Howth Peninsula, to the north of Dublin Bay (**See Figure 1**). It is situated 15km east of central Dublin City and approximately 2.4km east of Sutton and 1km south of Ireland's eye.

Figure 1 Site Location

The application area relates to a 4.8ha sea area west of the West Pier (**See Figure 2**). To the east of the harbour are Howth Head and the Irish Sea; to the west a large sandy intertidal area towards Baldoyle/Portmarnock. Ireland's Eye, an uninhabited island, lies approximately 1km north of the harbour within the Irish Sea. Howth village lies adjacent to the harbour on its south side.

The proposed site is situated in proximity to several Special Protection Areas (SPA) and Special Areas of Conservation (SAC), the closest of which are Howth Head SAC, Baldoyle SAC, Ireland's Eye SPA and Howth Head Coast SPA. Howth Harbour and the proposed reclamation area did not lie within the boundary of any designated site at the time of lodging the proposal for Fingal County Council in July 2021.

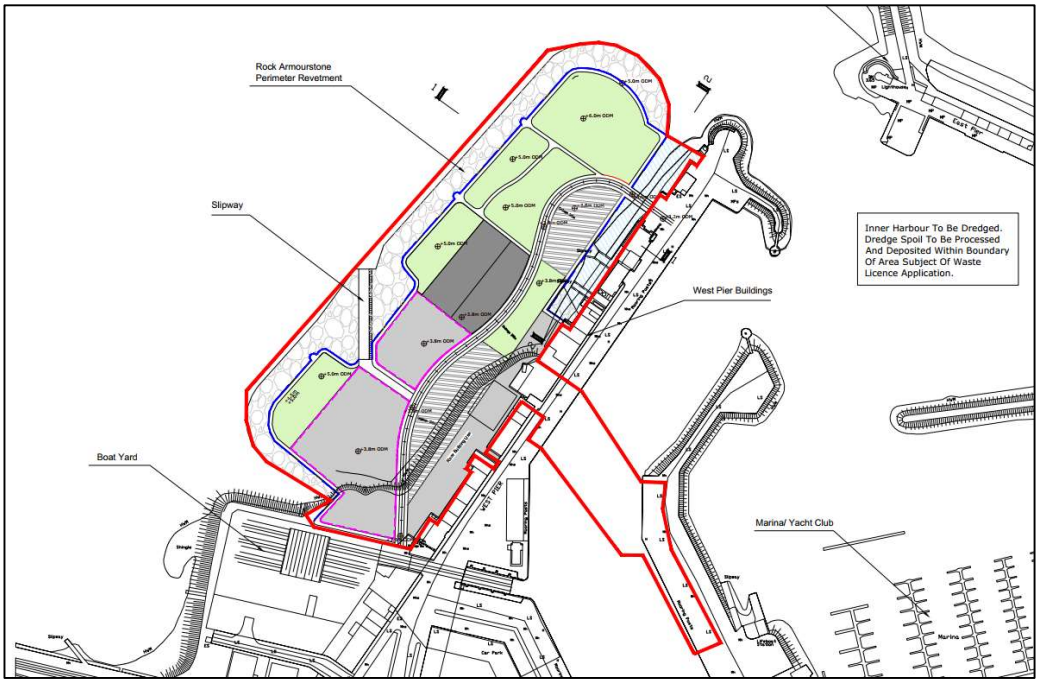

Figure 2. Red line boundary related to the application.

2.2 Description of the Existing Site

Howth Harbour operates as a Fishery Harbour Centre under the DAFM. The core fishing fleet is in the order of 50 vessels, and there is significant marine leisure activity including the Howth Yacht Club and the Howth Sailing and Boating Club. There are also a number of restaurants and shops along the West Pier. Fish processing and boat repair works are also undertaken on the harbour.

Howth Harbour itself comprises of three main areas; a trawler basin to the west a boat mooring area to the northeast and the yacht club marina to the southeast.

The current harbour layout was developed in the early 1980s with the construction of the Middle Pier and East Pier breakwater. These works provided segregated areas for fisheries and leisure users, i.e. western trawler basin, boat mooring area and marina area. Subsequently further works were undertaken to the Middle Pier in 2020 to 2022 and comprised the provision of 134m of berthage on the west side of this pier and the reclamation of 0.2ha on the east side by the processing and reuse of 6000m3 of dredge spoil. The dredge spoil was taken from the berthing area in front of the new berthing face.

2.3 Overview of the Proposed Development

The proposed development consists of the following main elements (See **Figure 2 Layout** above):

- Construction of an embankment and rock armour revetment around the perimeter of the reclaimed area – 520m.
- Construction of a 150m long channel between the reclamation area and the northern section of the West Pier.
- Dredging the harbour (as per above **Figure 3**) -240,000m^3
- Processing of the dredged marine material - 240,000m^3

- Reclaiming land (4.8 Ha) on the west side of the west pier using processed dredge material.
- Landscaping of the reclaimed area and provision of pavements, including footways, roadways and parking areas.
- Construction of a slipway access to the water.
- Construction of a bridge.
- Provision of storage areas for harbour activities; and
- Provision of services, including surface water drainage, mains water supply, lighting, and associated underground ducting.

2.4 Waste Activities

Stabilisation and solidification with cement (OPC)/ Ground Granulated Blast Furnace Slag (GGBS) is proposed in order to render the dredge material suitable as engineering fill and also to 'bind' potential contaminants that have been identified in varying concentrations within the 'fine' dredge material, in order to mitigate potential impacts resulting from the placement of this material. The use of the material as a fill material assigns a 'recovery' status to the waste activity where a 'useful purpose replacing other materials' results.

Waste activities associated with these works, in accordance with the Fourth Schedule of the European Communities (Waste Directive) Regulations 2011 (S.I. 126 of 2011) are as follows:

R5	*Recycling/reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials*
R11	*Use of waste obtained from any of the operations numbered R 1 to R 10*
R13	*Storage of waste pending any of the operations numbered R 1 to R12 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced)".*

2.5 Previous Waste Licences

There are no previous Waste Licences within Howth FHC.

A waste permit was granted by FCC for works to the Middle Pier. FCC Ref WFP-FG-18-0003-02.

2.6 Nature and Volumes of Waste

It is expected that dredging activities will produce c. 240,000m3 in total of dredge spoil material (EWC 17 05 06). This consideration is based on significant site investigation and testing carried out.

2.7 Site Operations

The methodology for the proposed dredging and processing works is included in the preliminary CEMP prepared for the planning application. A more detailed project construction methodology/ operation report has been included with this Waste Licence application.

Post completion of reclamation works, the surface will be landscaped with the provision of roads, footways, parking areas, storage areas and amenity areas. A new slipway with adjacent storage will provide access for leisure users.

Ongoing environmental monitoring, required as per the waste licence, should it be granted, will continue until such point as a licence may be surrendered.

2.8 Plant and Equipment

The infrastructure onsite during the dredging stage of the construction phase will include:

- Hoarding and herras fencing
- Site compound area on West Pier
- Site compound area on Middle Pier
- Site cabins – welfare, office, drying rooms
- Hardstanding areas
- Wheel washing area
- Hazardous chemical stores (small quantities of fuel)
- Waste quarantine & waste storage areas at site compound and on dump barges

The plant and equipment to be used during dredging and for the placement of the dredge spoil material will include:

- 2 no. 65ft long reach excavators for dredging
- Floating pontoon barges for supporting the excavators.
- Floating Dump barges for temporary storage of dredge spoil and transfer to quayside
- Dump Truck
- Work boat
- Safety boat
- Delivery trucks
- Binder storage silos – for cement and ground granulated blast furnace slag.
- Processing plant
- Pumps and piping for transfer of dredge spoil to processing plant and from the plant to the reclamation area.

Post placement of dredge spoil material and completion of the construction phase works, the following infrastructure will have been provided.:

2.9 Site Infrastructure

2.9.1 Drainage

Surface water controls will be put in place during the construction works as required, by the construction contractor. There will be no direct discharge of surface water to the adjacent waterbodies from the works. The methodology for the proposed drainage works is included in the Method Statements as part of the CEMP.

2.9.2 Tank, Pipeline and Bund Testing

Monitoring of processing equipment and pipelines will be undertaken to ensure the integrity of such equipment and pipelines against leakage of processed material into the sea. Such monitoring will include a daily visual inspection of the processing equipment and pipelines.

Bund testing will be carried out in accordance with licence requirements for any storage structures for any process materials used during the construction phase where applicable e.g. fuels, cement storage.

Bund testing will not be applicable to the areas where dredge spoil material will be placed, as the solidification process is proposed in order to bind potential contaminants. Potential leakage through the perimeter embankment and temporary bunds is only a risk for the processed material while in a fluid state which will only be for a short time (days) after placement in the reclamation area. There will be an impermeable liner placed within the perimeter bund to mitigate any such leakage. Daily visual inspections will be undertaken to ensure such leakage is not occurring.

2.10 Environmental Emissions

Environmental monitoring that will be carried out in accordance with the conditions and schedules of the waste licence are:

- Surface waters – daily (manual) for suspended solids, turbidity and heavy metals, including TBT & automatic (continuous – real time updating) for suspended solids and turbidity.
- Noise & Vibration– weekly
- Dust Deposition – monthly

<u>Monitoring of dredging and reclamation works</u>

Bathymetric surveys will be used to ensure the correct dredge depths are achieved and to identify high spots for further dredging. Bathymetric surveys will be undertaken prior to dredging to confirm the quantities of material to be dredged and during dredging to ensure that required dredge depths are achieved.

Monitoring of turbidity will be undertaken within the harbour and at sensitive locations outside the harbour to ensure that excess suspended sediment from the dredge plume do not impact on such areas. These monitoring points will also be used to monitor any excess suspended sediment when the seawater initially trapped within the perimeter embankment is drained to the sea.

Potential monitoring points are given in the application drawings.

Monitoring within the harbour will be on a continuous basis during the dredging operations.

Monitoring of turbidity outside the harbour will be undertaken on a discrete basis. Intermittently, monthly during the dredging process samples of water will be taken from the water column at a location off Charlemount Beach and tested for suspended sediment concentrations and water quality parameters.

<u>Quality control and monitoring of the infilling and reclamation process.</u>

The quality control and monitoring of the infilling and reclamation process will include:

- Location: the intermediate cell location, quantity and level of each week's infilling will be recorded.
- Samples taken every 3000m3 will be tested for
    - Strength of processed material, UCS, 5 concrete type cubes of the processed material would be taken for crushing at 7, 28, 56 and 112days with one spare.

- Strength of binder, UCS, 3 concrete type cubes of the binder taken for crushing at 7 and 28days with one spare.
- Contaminant concentrations: tested for total content of the following parameter values; Arsenic, Barium, Cadmium, Chromium, Copper, Mercury, Mickel, Lead, Antimony, Selenium, Zinc, Chloride, Flouride, Soluble Sulphate, Total Organic Carbon, BTEX, 7 PCBs, Mineral Oil C5 to C44, 17 PAHs, DBT and TBT. The results can be used if required to establish the material waste classification.
- WAC to be tested for leachate values using monolithic tank tests (as per "NEN 7375:2004 Leaching Characteristics of Moulded or Monolithic Building and Waste Materials"). The results are to be compared against the WAC limits. Two samples, one to be broken down prior to testing and the other to be tested as a monolith.
- Permeability of a cured (28day) cube of processed dredge spoil. Initially every 3000m3 for 4 weeks and then monthly.
- Consolidation characteristic of a cured (28day) cube of processed spoil. Initially every 3000m3 for 4 weeks then monthly.

Following construction – approximately 28days following the filling of each cell the following engineering tests will be undertaken. They relate to strength characteristic.

- Plate load tests to establish CBR values. 12 locations.
- SPT tests undertaken in 8 cable percussive boreholes.
- Dynamic probing at 32 locations.
- Settlement monitoring at 8 locations.
- Monitoring of placed material temperature (4 locations).

2.11 Nuisance control

Nuisance control will be managed in accordance with the requirements of the facility licence and will follow the specifics of the Construction Environmental Management Plan.:

2.12 Environmental Management Systems

It is not proposed to develop a specific environmental management system for the facility, given the relatively short duration of the 'operational life' i.e. construction phase of the facility.

A Construction Environmental Management Plan (CEMP) has been prepared and is included with this application.

2.13 Incidents and Compliance History

No incidents or non-compliances relate to the facility given that it is not operational. Any incident and/or complaints occurring during the lifetime of the facility licence will be notified to the Agency and rectified under the procedures identified with the site-specific Construction Environmental Management Plan.

3 Environmental Sensitivity

3.1 General

The works area spans the interior of Howth harbour and the 4.8ha sea area west of the West Pier (See Figure 2). To the east of the harbour are Howth Head and the Irish Sea; to the west a large sandy intertidal area towards Baldoyle/Portmarnock. Ireland's Eye, an uninhabited island, lies approximately 1km north of the harbour within the Irish Sea. Howth village lies adjacent to the harbour on its south side.

3.2 Protected Habitats

The proposed site is situated in proximity to several Special Protection Areas (SPA) and Special Areas of Conservation (SAC), the closest of which are Howth Head SAC, Baldoyle SAC, Ireland's Eye SPA and Howth Head Coast SPA. Howth Harbour and the proposed reclamation area did not lie within the boundary of any designated site at the time of lodging the proposed development to Fingal County Council for planning approval in July 2021.

In August 2023 DAFM were consulted in relation to a proposed candidate Marine Protection Area that covers much of the northeast Irish Sea. The boundary of the proposed cMPA is within the boundary of the Fishery Harbour Centre at Howth. DAFM have requested that the boundary of the cMPA be kept outside that of the FHC. The proposed reclamation is within the FHC limits.

3.3 Geology/Hydrology

The bedrock immediately to the south of the site at Howth and extending west towards Dublin city are mostly sedimentary in nature, dominated by limestone and shale. The Howth peninsula itself is dominated by Cambrian greywacke, slate and quartzite, which forms to the east of a north-west diagonal fault line **(Figure 4).** There is an igneous intrusion to the north at Donabate and Lambay Island. (GSI).

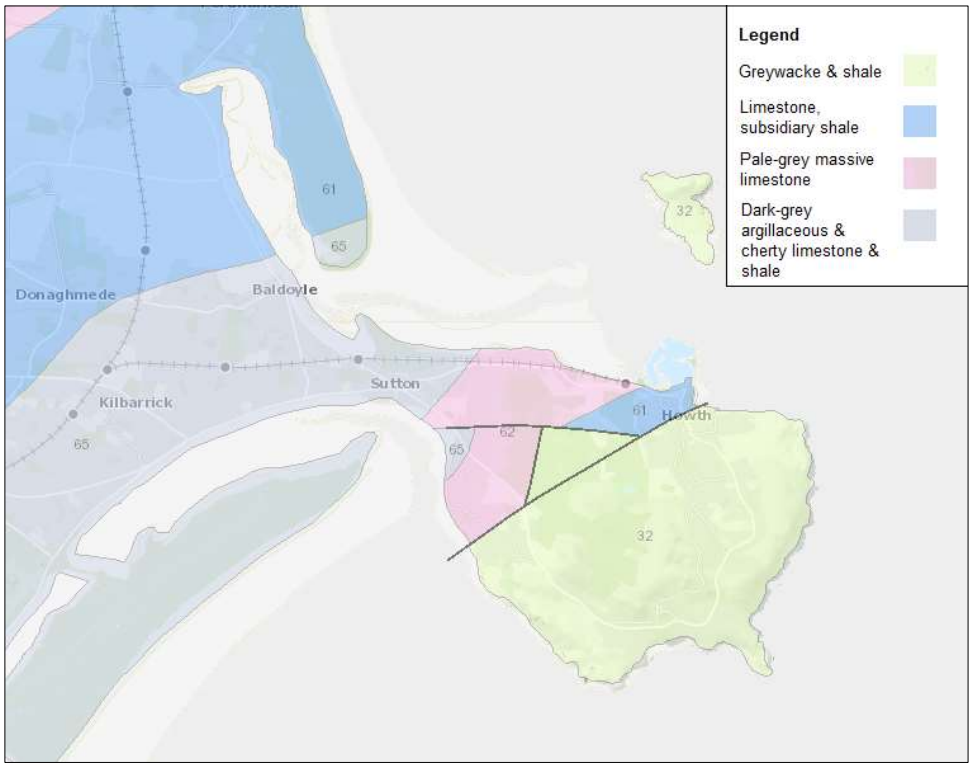

Figure 4 Local and Regional Geology

There is one Irish Geological Heritage site located about 60 meters from the site, namely Balscaddan Bay (DF013), which extends from the south end of the eastern pier along the coast to the east. The area is described in the Fingal County Geological Report as Coastal Cliffs within a small bay area. Other nearby Irish Geological Heritage sites include Claremont Strand (DF014), Hill of Howth (DF010) and Ireland's Eye (DF011), Bottle Quay (DF009) and North Bull Island (DC007). All are outside the footprint of the proposed reclamation area.

Three rotary core holes sunk within the proposed reclamation area indicate that the underlying ground comprises 1 to 3m of sand, overlying 1.5 to 2m of clay overlying limestone rock. Large bulk samples taken at the same locations indicated that the top 0.5m layer of seabed material consists of soft silt.

3.4 Human Receptors

The waste activity location is within Howth FHC. Howth FHC is an active fishery harbour with fishery vessels, storage areas, associated maintenance areas, retail and commercial units.

Howth FHC is located adjacent to the town of Howth.

4 Approach to Environmental Liabilities

4.1 Environmental Liability Assessment

ELRAs assess the risk of incidents that could result in a liability to the operator of a licenced facility. As per the Guidance, incidents are considered as "a change of circumstances from the norm with actual or potential negative consequences".

The purpose of the ELRA is to:

- Identify and quantify environmental liabilities focusing on unplanned, but possible and plausible events occurring during the operational phase.
- Provide a mechanism to encourage continuous environmental improvement through the management of potential environmental risks.
- Cost the worst-case scenario for the purposes of informing the level of financial provision.

The ELRA procedure is as follows:

1. Scoping to determine the type of environmental liabilities to be covered.
2. Risk assessment.
3. Risk identification i.e. the systematic identification of plausible risks, the sensitivity of the receiving environmental (receptor) and the potential pathway for the activity to impact on the environment.
4. Risk analysis consists of determining the likelihood and consequences for identified risk events.
5. Risk evaluation is the ranking and presentation of risks to allow for prioritisation of the risk treatment program.
6. Risk treatment is a process to mitigate risks e.g. by removing the risk or minimising the likelihood or consequences.
7. Identification, quantification and costing worst case scenario for financial provision (FP).

4.2 Step 1 - Scoping

The Guidance states that the purpose of an ELRA is to identify and cost risks to the environment (surface water, groundwater, atmosphere, land, flora, fauna and human health). It should not include health and safety type risks, e.g. direct injury or death resulting from vehicular collisions. In addition, the analysis and costing should cover the environmental aspects of an event, i.e. stopping it, preventing further contamination, clean-up of missions/pollution caused. It should not include other associated costs that are non-environmental.

To this end, the scope of the ELRA is considered to include activities associated with the management of dredge spoil from the point of placement on the dredging barge, through to its processing and final placement in the reclamation area.

4.3 Step 2 – Risk Assessment

The assessment of risk comprises three sub-stages:

- Risk identification

- Risk analysis
- Risk evaluation

4.3.1 Step 3.1 - Risk Identification

The Guidance document identifies that risk identification must focus on plausible incidents and, in doing so, must take account of the controls and mitigating measures in place but with regard to the capacity of the controls to contain incidents and the potential for failure of these controls.

Table 3.1 of the Guidance presents the key information required for the risk identification process and this data has been summarised in Section 2 of this document. Based on this process, **Table 4.1**, hereunder, presents a list of plausible risks applicable to the proposed works.

Table 4.1: Plausible Risks Identified

Risk ID No.	Process	Potential Risks	Environmental Effect
1	Dredging and transport to the reclamation area i.e. works over water.	Uncontrolled release of dredge spoil during off-loading from the dump barges.	Release of fine dredge material with elevated levels of contaminants into the water column.
2		Sinking of the dump barges with the uncontrolled release of large quantities of dredge spoil.	Release of large quantities of fine dredge spoil material with elevated level of contaminants into the water column.
3	Dredge spoil treatment stage.	Uncontrolled release of cementitious/ Ground Granulated Blast Furnace Slag (GGBS) binder material associated with treating of material. Due to leakage in the feed line to the mixing plant.	Release of binder material to surface water resulting in surface water quality deterioration.
4		Uncontrolled release of dredge material immediately prior to, during or immediately following treatment. Due to leakage from the pipeline or mixing plant.	Release of fine dredge material with elevated level of contaminants to surface water resulting in surface water quality deterioration.
5		Failure of the treatment of material resulting in the release of contaminants from the dredge spoil.	Release of contaminants to surface water resulting in surface water quality deterioration.
6		Collapse of a section of the perimeter embankment and the uncontrolled release of treated dredge spoil prior to solidification.	Release of fine sediments, binder material and contaminants to surface water resulting in surface water quality deterioration.
7	Fuel Storage/Refuelling	Spillage of fuel from storage or during refuelling of plant and equipment.	Release of hydrocarbons to surface water resulting in surface water quality deterioration.

8	General Operations	Excessive noise and/or vibration generation due to dredging, transfer of unprocessed material, processing and placement and associated construction operations	Nuisance generation for local receptors.
9		Dust generation associated with materials placement or stabilisation/solidification activities during periods of dry weather.	Low level of uncontrolled dust emissions to air. Potential nuisance in the localised area.

4.3.2 Step 3.2 - Risk Analysis

The plausible risks identified in the above table are assessed against the likelihood and consequence as per the Guidance. The below tables (4.2 and 4.3) are used to calculate (using the formula Likelihood x Consequence = Risk Score) a risk score for each risk identified and the results of the analysis are presented in Table 4.2 below.

Table 4.2: Risk Classification Table – Likelihood (EPA, 2014)

Rating	Likelihood	
	Category	Description
1	Very Low	Very low chance of hazard occurring.
2	Low	Low chance of hazard occurring.
3	Medium	Medium chance of hazard occurring.
4	High	High chance of hazard occurring.
5	Very High	Very high chance of hazard occurring.

Table 4.3: Risk Classification Table – Consequence (EPA, 2014)

Rating	Consequence	
	Category	Description
1	Trivial	No damage or negligible change to the environment.
2	Minor	Minor impact/localised or nuisance.
3	Moderate	Moderate damage to environment.
4	Major	Severe damage to local environment.
5	Massive	Massive damage to a large area, irreversible in medium term.

Table 4.4 Risk Analysis

Risk ID No.	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
1	Dredging and transport to the reclamation area i.e. works over water.	Uncontrolled release of dredge spoil during off-loading from the dump barges.	Release of fine dredge material with elevated levels of contaminants into the water column.	1	During transfer from the dredge barge there isa potential for small spillages onto the pier deck and the water adjacent to the of loading point. The greater spillage volume is likely at the dredging point. The impacts of such losses have been assessed as part of the EIAR and are not considered to be significant at sensitive locations outside the harbour. The potential losses at the transfer point from the barge to the mixing unit will be less. In the case of the dredging losses will be mitigated through use of an environmental dredging bucket, a silt curtain and dilution with the tidal waters entering and exiting the harbour. At the transfer point dilution will mitigate any potential impacts. Therefore, any uncontrolled release would be of small quantities with minor impacts and localised to the Inner Harbour area.	2	The use of sealed lids on mechanical dredging buckets and the use of a pumped sealed pipeline system to transfer the material from the dredge barge to the processing plant will minimise the potential for release.	2
2		Sinking of the dump barges with the uncontrolled release of large quantities of dredge spoil.	Release of large quantities of fine dredge spoil material with elevated level of contaminants into the water column.	2	Sinking (or similar) of the dredge barge could release up to approx. 300 m3 of dredge spoil material resulting in mobilisation of sediment which may contain contaminants, with potential to impact on water quality. However, the presence of silt curtains and dilution factor act as mitigating measures.	1	Very low likelihood due to: • Maintenance procedures and ship-worthiness inspections of barge vessel as barge design.	2

Risk ID No.	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					In addition, the dump barges will have been certified as seaworthy prior to undertaking the works and the main contractor will have demonstrated their competence and suitability for undertaking the works. The harbour area is sheltered lowering the risk of accidental sinking. The tidal currents within the harbour are low – mitigating the risk of the material in the barge exiting the harbour.		• Protected nature of Inner Harbour • Procedures addressing appropriate working weather conditions. • Mitigation measures employed i.e. silt curtain	
3	Dredge spoil processing stage.	Uncontrolled release of binder material associated with processing of material.	Release of binder material to surface water resulting in surface water quality deterioration.	2	The processing of dredge spoil with the proposed cement/GGBS binder will be carried out on land in a controlled processing facility. The process can be brought to a halt in the event binder material is being lost reducing the consequence.	1	The processing area will be bunded to mitigate against the risk of cement loss. The potential losses are likely to be small.	2
4		Uncontrolled release of dredge material immediately prior to, during or immediately following treatment. Due to leakage from the pipeline or mixing plant.	Release of fine dredge material with elevated level of contaminants to surface water resulting in surface water quality deterioration.	2	Leakage of dredge material from the vicinity of the mixing plant could result in some treated and or untreated fine material with contaminants and binder to escape into surface waters. However, such a leakage is on dry land in a bunded area. The volumes of material release are likely to be small.	2	The pipelines through which the dredge spoil is to be pumped will be sealed and of sufficient strength to take the required pressures. However, there is a low possibility of their being some leakage at joints.	4

Risk ID No.	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
5		Failure of the processing of material resulting in the release of contaminants from the dredge spoil.	Release of contaminants to surface water resulting in surface water quality deterioration.	2	Non-performance of the material processing could result in an ongoing flushing of the fine dredge material, resulting in ongoing release of sediment with contaminants. The volume involved will be small because of ongoing monitoring of the treatment operation, and any such material will be encased in solidified treated material.	1	The processing of dredge spoil is an established method. Ongoing lab testing during placement will verify performance. An impermeable clay liner will be constructed within the revetment embankment. This will further mitigate against the risk of non-performance. There will also be a permeable liner on the outside of the perimeter embankment reducing the migration of fine material from the embankment itself into the protective rock armour layer and into the sea.	2
6		Collapse of a section pf the perimeter embankment or temporary bund and the uncontrolled release of dredge spoil prior to solidification.	Release of sediment, binder material and contaminants to surface water resulting in surface water quality deterioration.	3	A collapse of a section of the perimeter embankment or temporary bund could result in the release of dredge spoil. It will not be possible during construction to fully protect against such an eventuality because the core of the embankment consisting of smaller material must be put in place first prior to placing the protective layer. Such embankments are usually constructed in sections with the core advancing seawards ahead of the protective layer. In addition, the processed material should be in place prior to the full completion of the protective layer and seawall. Finer material would enter the water column and coarser	2	The perimeter embankment and its protective layers will be suitably designed by a competent engineer. It will be constructed by a competent contractor under the inspection of the engineer. The protective layer will be inspected for damage following storms during the treatment stage. Any damage identified can be addressed early. The possibility of the collapse of a section of perimeter embankment during construction is very low. However, the partial collapse of a temporary bund is a	6

Risk ID No.	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
					material would deposit on the beach locally. The volume of material would be limited due to the ongoing solidification of material shortly after being placed.		greater probability as it will not be protected to the same degree as the perimeter. However, temporary bunds and the perimeter embankment can be constructed in parallel so that temporary bunds are given a degree of protection from a partly constructed perimeter embankment.	
7	Fuel Storage/Refuelling	Fuel loss due to rupture of mobile bunds maintained onsite; bund failure; spillage during filling, worst case release of 1500L.	Release of hydrocarbons to surface water resulting in surface water quality deterioration.	2	Persistent and hazardous pollutant with potential impact within the harbour. Volumes limited and procedures to manage spills/releases.	1	Unlikely but possible due to human error.	2
8	General Operations	Excessive noise and/or vibration generation due to dredge movement, placement and processing activities.	Nuisance generation for local receptors.	1	Localised and non-persistent but of a nuisance nature. There will be restrictions in place regarding allowable noise levels. If these are exceeded action will be taken and therefore such nuisance is likely to be of short duration.	2	Because of restrictions on noise levels such nuisance is unlikely but possible due to human error.	2
9		Dust generation associated with materials placement or stabilisation/solidification activities during periods of dry weather when the processed material reaches the design level and prior	Low level of uncontrolled dust emissions to air. Potential nuisance in the localised area.	1	The dredge material to be processed will be wet, the binder will be mixed with water prior to the processing and the mix being placed in the reclamation area will be wet. There will be a continual importation of wet processed material into the	2	Because of the wet nature of the process, it is unlikely until the processed material is at its design level. While finishings are applied dry weather could result in dust for short time periods.	2

Risk ID No.	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
		to the application of finishes.			reclamation area. When the processed material has been placed to its design level and before it is covered in the finishings it may dry out and some dust can be generated. It is likely to be a localised and non-persistent nuisance as it can be mitigated against by water spray.			

4.4 Step 3 - Risk Treatment

Risk treatment is the process of mitigating risks, e.g. by removing the risk or minimising the likelihood or consequences.

The output from this process is the preparation of a Statement of Measures to be taken in relation to the prevention of impact on the environment, which is presented in Table 4.5.

Responsibility for the carrying out of such measures is assigned in Table 4.5 to the relevant persons at the facility. A cornerstone of risk management at the facility is the onsite presence of experienced staff with a detailed knowledge and understanding of site operations. This Statement of Measures will be updated on an annual basis to include new risks or remove existing risks, based on the status of at the facility.

Table 4.5 Risk Treatment Measures

Risk ID No.	Process	Potential Risks	Environmental Effect	Risk Score (Consequence x Likelihood)	Mitigation Measures to be Taken	Outcome	Action	Completion Date	Relevant Individual
1	Dredging and transport to the reclamation area i.e. works over water.	Uncontrolled release of dredge spoil during dredging operations and off-loading from the dump barges.	Release of fine dredge material with elevated levels of contaminants into the water column.	2	• Operator training • Procedures and experience in dredging, processing and placement of dredge spoil material • Certification of equipment • Environmental bucket. • Silt curtain installation	Risk of uncontrolled releases is reduced.	• Full training for operators. • Certified equipment only. • Method statements to ensure correct procedures are being followed. • Environmental buckets. • Silt curtains.	Prior to and ongoing from construction commencement.	Contractors Construction Environmental Manager
2		Sinking of the dump barges with the uncontrolled release of large quantities of dredge spoil.	Release of large quantities of fine dredge spoil material with elevated level of XYZ contaminants into the water column.	2	• Maintenance schedule / certification for dredge barge prior to works commencing. • Procedures for appropriate weather working. • Sheltered location within Harbour • Silt curtain installation	Risk of catastrophic failure and uncontrolled releases is reduced.	• Maintenance schedule for dredge barge • Certification of barge. • Full training for operators. • Silt curtains.	Prior to and ongoing from construction commencement.	Contractors Construction Environmental Manager

3	Dredge spoil processing stage.	Uncontrolled release of binder material associated with processing of material.	Release of binder material to surface water resulting in surface water quality deterioration.	2	• Operator training • Procedures and experience in dredging, processing and placement of dredge spoil material • CEMP with procedures for uncontrolled discharge clean-up • Maintenance schedule and procedures for processing activities. • Regular environmental site checks and audits. • Reporting system.	Risk of uncontrolled releases is reduced.	• Maintaining maintenance schedule and relevant CEMP procedures.	Prior to and ongoing from construction commencement.	Contractors Construction Environmental Manager
4		Uncontrolled release of dredge material immediately prior to, during or immediately following treatment. Due to leakage from the pipeline or mixing plant.	Release of fine dredge material with elevated level of contaminants to surface water resulting in surface water quality deterioration.	4	• Monitor condition of seals on pipeline and treatment equipment. • Ensure the treatment area is bunded to prevent any accidental leakages entering the surface water.	Risk of uncontrolled release is reduced.	• Maintain maintenance schedule and relevant CEMP procedures	Prior to commencement of treatment and ongoing during treatment	Contractor'5s Construction Environmental Manager

					• Regular environmental site checks and audits. • Reporting system. 5				
5		Failure of the processing of material resulting in the release of contaminants from the dredge spoil.	Release of contaminants to surface water resulting in surface water quality deterioration.	2	• Use of established process. • Ongoing verification through testing. • Ongoing sampling of processed material. • Ongoing monitoring of potential impacts. • Regular environmental site checks and audits. • Reporting system. •	Risk of uncontrolled releases is reduced.	• Implementation of testing verification, sampling and monitoring procedures in accordance with CEMP.	Prior to and In place & ongoing from construction commencement.	Contractors Construction Environmental Manager
6		Collapse of a section pf the perimeter embankment or temporary bund and uncontrolled release of dredge spoil prior to solidification.	Release of sediments, binder material and contaminants to surface water resulting in surface water quality deterioration.	6	• Design checks. • Sequencing of construction works. • Inspection of construction works. • CEMP with procedures for collapse emergency re-construction.	Risk of uncontrolled releases is reduced.	• Regular inspections. • Method statements for the emergency reconstruction of the revetment. • Assess weather conditions. • Stand-by material	Prior to and In place & ongoing from construction commencement.	Contractors Construction Environmental Manager Designer. Resident Engineer.

							available for reconstruction works.		
7	Fuel Storage/Refuelling	Fuel loss due to rupture of mobile bunds maintained onsite; bund failure; spillage during filling, worst case release of 1500L.	Release of hydrocarbons to surface water resulting in surface water quality deterioration.	2	• Relevant bund failure integrity testing in adherence with licence & CEMP • Spillage management procedures in place • Regular environmental site checks and audits. • Reporting system.	Risk of uncontrolled releases is reduced.	• Implementing relevant CEMP procedures.	From construction commencement.	Contractors Construction Environmental Manager
8	General Operations	Excessive noise and/or vibration generation due to dredge movement, placement and processing activities.	Nuisance generation for local receptors.	2	• Noise mitigation measures in accordance with CEMP and specification • Regular environmental site checks and audits. Reporting system.	Reduced impacts on receptors from noise.	• Implementing relevant CEMP procedures	From construction commencement.	Contractors Construction Environmental Manager

9		Dust generation associated with materials placement or stabilisation/solidification activities during periods of dry weather.	Low level of uncontrolled dust emissions to air. Potential nuisance in the localised area.	2	• Dust monitoring in adherence with licence requirements and CEMP procedures. • Regular environmental site checks and audits. • Reporting system.	Reduced impacts on receptors from dust.	• Implementing relevant CEMP procedures	From construction commencement.	Contractors Construction Environmental Manager

4.5 Step 4 - Identification, Quantification & Costing of Worst-Case Scenario

4.5.1 Risk Identification

The Guidance requires that the costing of the required ELRA financial provision be based on the "worst case scenario" and that the worst-case scenario refers to the event that "poses the maximum environmental liability i.e. consequence." In this context, the worst case can be represented by the risk with the highest consequence rating, with the likelihood not being considered in the analysis.

The plausible risk identified with the highest consequence is:

- Risk ID 5 – Collapse of the revetment and uncontrolled release of dredge spoil prior to solidification.

4.5.2 Risk Quantification

As per the Guidance, a detailed description of the actions required to mitigate the worst-case plausible risk event given that it has occurred is required to inform the costing process.

Actions to be taken in the event of a failure/collapse of a section of the perimeter embankment or temporary bund are outlined as follows:

- Daily monitoring of the perimeter embankment and any temporary bunds is to be carried out during the construction works. In particular during storm events. Such embankments are to be constructed in accordance with the design specification and temporary works design.
- A failure of the perimeter embankment will be more costly to repair than a temporary bund. For cost estimation purposes it is assumed that 5m in height of the perimeter embankment is lost over a 20m length.
- If a failure to the perimeter embankment or temporary bund has occurred and has been identified all processing and infilling works to the reclamation area is to be halted until the section of embankment has been fully repaired. This would have considerable cost implications in terms of added delay costs to the project.
- If conditions allow, the contractor will install silt curtains around the failure point.
- In addition, the contractor would block outflows of material from the collapsed section using rock and geotextiles until such time as the fill material has set and or the repair to the embankment is in place.
- The Designer is to assess the collapse and determine the reason for the collapse.
- The Contractor is to re-construct the embankment or temporary bund as an immediate priority.
- If necessary, strengthening works will be carried out to the embankment/ bund to make it stronger in the partially constructed condition.
- If the failure results in material being deposited onto the adjacent beach, that material is to be removed and re-processed. Given that the fluidised processed dredged material consists for the most part of fine sediment, any of this material that flows out of the reclamation area will be dispersed over a wide area by tidal currents, considerably reducing the concentrations of suspended sediment in the

water column as it moves away from the reclamation area. This material is more likely to settle in more quiescent areas than the immediately adjacent beach areas.

4.5.3 Risk Costing

The following table 4.6 presents the cost estimate for the Worst-Case Scenario plausible risk as described above.

Table 4.6 Risk Costing

Activity	Quantity	Unit	Rate (€)	Cost (€)
Suspension of works.	10	Day	€30,000/day Daily Rate for Delays.	300,000
Installation of Silt Curtains				
Silt curtain	50	m	100	5,000
Installation	8	hrs	500	4,000
Temporary Blocking of Failure Point – emergency works				
Geotextile	500	m2	10	5,000
Rock Fill	600	m3	75	45,000
Reconstruction of the Perimeter Embankment				
Geotextile – geotextile and clay liner	300	m2	10	3,000
Embankment Core	700	m3	50	35,000
Primary Armour Armourstone	400	m3	100	40,000
Secondary Armour	150	m3	50	7500
Clean-Up				
Beach Material	1,000	m3	50	50,000
Sub-Total				494,500
Contingencies @10%				49,450
Total				**€543,950**

4.5.4 Summary

The financial provision to cover the environmental liability for the proposed development is based on a plausible worst-case scenario. This is the maximum liability that may be incurred and is estimated at €543,950.

5 Financial Provision

Financial provision ensures that an available source of funding is maintained for:

- Known environmental liabilities that will arise at the time of facility closure.
- Known environmental liabilities that are associated with the aftercare and maintenance of the facility until such a time as the facility is considered to no longer pose a risk to the environment.
- Unknown environmental liabilities that may occur during the operating life of the facility
  The EPA has prepared guidance on the matter of financial provision in 2015, entitled "Guidance on Financial Provision for Environmental Liabilities". The steps in the agreement of the financial provision assessment process are as follows:

1. Licensee's environmental liability costings approved.
2. Licensee submits financial provision proposal (including supporting documentation) to the EPA via EDEN.
3. Financial provision proposal reviewed.
4. Licensee executes final document.
5. Confirmation that financial provision requirement is satisfied.
6. Licensee maintains and periodically update the financial provision.

Section 4 of the Guidance suggests the following measures as appropriate financial provision instruments for ELRA:

- Secured fund.
- On-demand performance bond.
- Parent Company guarantee.
- Insurance.
- Charge on Property.

It is proposed that the DAFM offer a guarantee.

This document presents the likely costs to be associated with the environmental liabilities of the worst case risk events to be associated with site operations. Agreement of the environmental liability costings with the EPA is required prior to identification of the appropriate financial provision instrument. This ELRA document is submitted for agreement to facilitate the further stages in the financial provision assessment process.