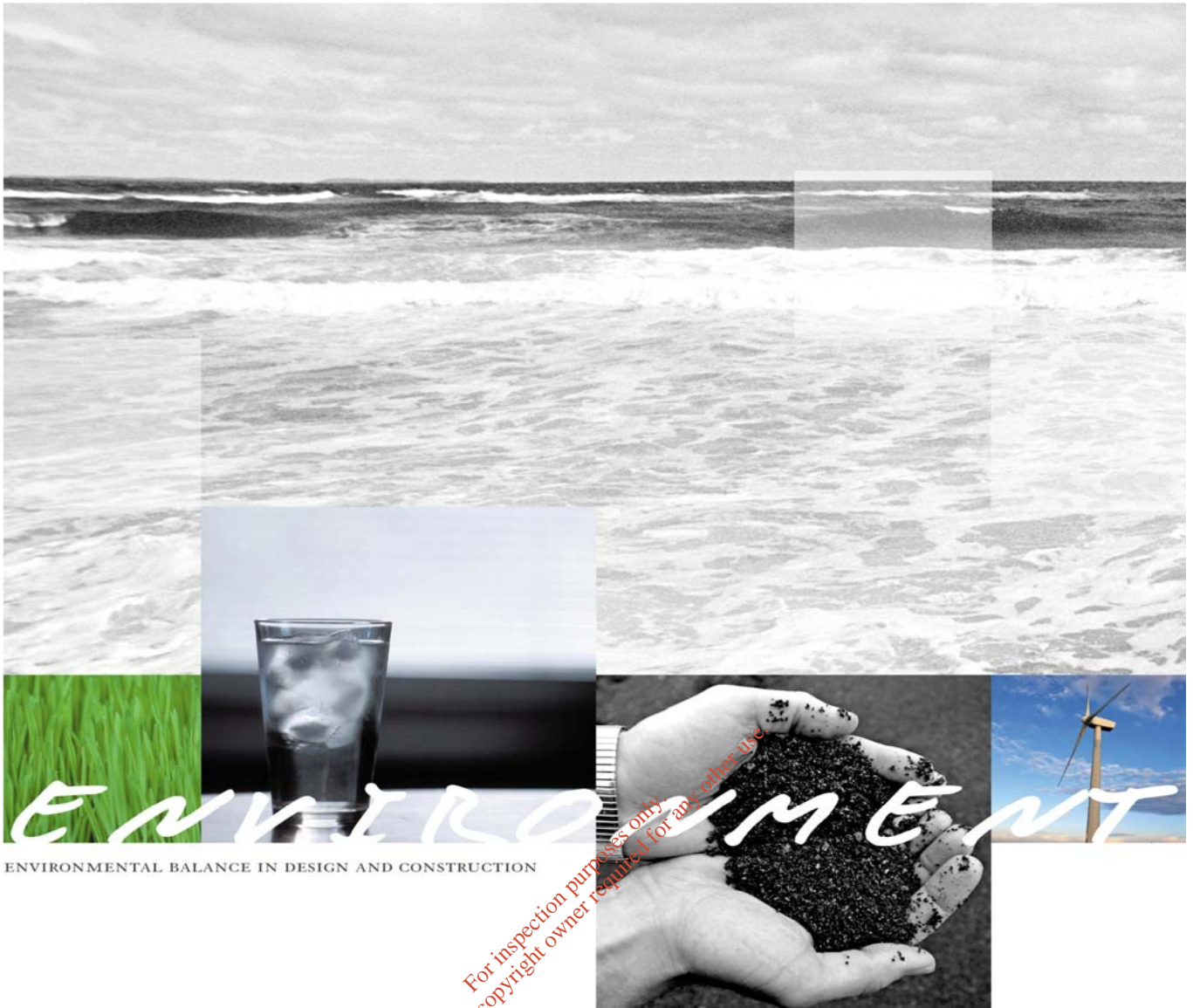


Appendix 9 - Attachment J

*For inspection purposes only.
Consent of copyright owner required for any other use.*



ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

OUTLINE ENVIRONMENTAL LIABILITIES RISK ASSESSMENT (ELRA) FOR WASTE ACTIVITIES AS PART OF BANTRY INNER HARBOUR - PHASE 1 WORKS

PORT OF CORK COMPANY

MARCH 2016



OUTLINE ENVIRONMENTAL LIABILITIES RISK ASSESSMENT (ELRA) FOR WASTE ACTIVITIES AS PART OF BANTRY INNER HARBOUR - PHASE 1 WORKS

PORT OF CORK COMPANY

User is Responsible for Checking the Revision Status of This Document

Rev. Nr.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
0	Issue to Client	DFM/MW	DFM	BG	23.03.2016

Client: Port of Cork Company

Keywords: Environmental Liabilities Risk Assessment, Unforeseen, Incident Liabilities

Abstract: This document presents a draft, outline environmental liabilities risk assessment (ELRA) to accompany a waste licence application for the Bantry Inner Harbour Phase 1 works and to inform further discussion in relation to financial provision for same.

TABLE OF CONTENTS

PAGE

1 INTRODUCTION	1
1.1 ENVIRONMENTAL LIABILITY REGULATIONS	1
1.2 STATUS OF DOCUMENT	2
2 FACILITY DESCRIPTION AND OPERATION	3
2.1 SITE OPERATION	3
2.1.1 Site Development	3
2.2 SIZE AND NATURE OF THE ACTIVITY	4
2.3 DETAILS OF WASTE LICENCE	5
2.4 NATURE & VOLUMES OF WASTE	5
2.5 SITE OPERATION	5
2.6 SITE INFRASTRUCTURE	5
2.6.1 Drainage	6
2.6.2 Tank, Pipeline and Bund Testing	6
2.6.3 Environmental Emissions	6
2.6.4 Nuisance Control	7
2.7 OPERATOR PERFORMANCE	7
2.7.1 Environmental Management Systems	7
2.7.2 Incidents & Compliance History	7
2.8 ENVIRONMENTAL SENSITIVITY	7
2.8.1 Geology/Hydrogeology	7
2.8.2 Human Receptors	8
2.8.3 Natural Habitats	8
3 APPROACH TO ENVIRONMENTAL LIABILITIES	9
3.1 ENVIRONMENTAL LIABILITY ASSESSMENT	9
3.2 STEP 1 - SCOPING	10
3.3 STEP 2 – RISK ASSESSMENT	10
3.3.1 Step 3.1 - Risk identification	11
3.3.2 Step 3.2 - Risk Analysis	12
3.4 STEP 3 – RISK TREATMENT	14
3.5 STEP 4 – IDENTIFICATION, QUANTIFICATION & COSTING OF WORST CASE SCENARIO	16
3.5.1 Risk Identification	16
3.5.2 Risk Quantification	16
3.5.3 Risk Costing	17
3.6 SUMMARY	18
4 FINANCIAL PROVISION	19

LIST OF TABLES & FIGURES

PAGE

TABLE 3.1: PLAUSIBLE RISKS IDENTIFIED FOR THE BANTRY INNER HARBOUR WORKS.....	11
TABLE 3.2: RISK CLASSIFICATION TABLE – LIKELIHOOD (EPA, 2014)	12
TABLE 3.3: RISK CLASSIFICATION TABLE –CONSEQUENCE (EPA, 2014)	12
TABLE 3.4: RISK ANALYSIS	13
TABLE 3.5: RISK MATRIX	14
TABLE 3.6: STATEMENT OF MEASURES	15
TABLE 3.7: QUANTIFICATION AND COSTING OF RISK ID 1	18
FIGURE 2-1: SITE LOCATION MAP	3
FIGURE 2-2: AERIAL VIEW OF SITE.....	4
FIGURE 2-3: PROPOSED DEVELOPMENT	4
FIGURE 3-1: ASSESSING AND COSTING ENVIRONMENTAL LIABILITIES	9
FIGURE 3-2: ENVIRONMENTAL LIABILITY RISK ASSESSMENT PROCESS	10
FIGURE 4-1: STEPS IN FINANCIAL PROVISION ASSESSMENT PROCESS	19

APPENDICES

Appendix 1: Method Statement MS02-3

Appendix 2: EP10 Surfacewater Controls

Appendix 3: Construction Environmental Management Plan

Appendix 4: QRA related to the Proposed Development

Appendix 5: EP15 Containing and Cleaning Up Spills

1 INTRODUCTION

A waste licence application is being made to the Environmental Protection Agency in Q1 2016 in relation to waste activities associated with the development of Phase 1 of the Bantry Inner Harbour Development works.

The waste activities associated with these works relate to the management of dredge spoil material from the dredging works in Bantry Inner Harbour. A portion of the dredge spoil will be solidified and stabilised prior to placement in specific locations within the works 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 Port of Cork.

This document forms an outline environmental liabilities risk assessment (ELRA) to inform the identification of the financial commitments required by the Port of Cork 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 two no. EPA guidance documents entitled:

- Guidance on assessing and costing environmental liabilities (2014)¹, hereafter referred to as the "Guidance" and
- Guidance on Financial Provision for Environmental Liabilities (2015)²

1.1 Environmental Liability Regulations

The Environmental Liability Directive³ (2004/35/EC) was transposed into Irish law through the European Communities (Environmental Liability) Regulations (S.I. 547 of 2008⁴). 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.

Section 4.1 of the document '*Environmental Liabilities Regulations – Guidance Document*⁵, EPA 2011' identifies proactive risk management as a core principle under which the EPA will implement these Regulations. Section 4.3 of the document 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

¹ as well as its accompanying document "Guidance on assessing and costing environmental liabilities – Unit cost rates for verification"

² Available online at <http://www.epa.ie/pubs/advice/licensee/financiaprovisionsreport.pdf>

³ Available online at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:143:0056:0075:en:PDF>

⁴ Available online at <http://www.irishstatutebook.ie/pdf/2008/en.si.2008.0547.pdf>

⁵ Available online at http://www.epa.ie/pubs/advice/general/Liability_Regulations%20Final%20August%202011.pdf

1.2 Status of Document

As part of the pre-application process for the waste licence application being made for the development of Phase 1 of the Bantry Inner Harbour Development works, some discussion has been undertaken with the Agency as a pre-cursor to the identification of ELRA requirements and financial provision for same. A meeting was held on Tuesday 23rd February 2016 at the EPA offices at Inniscarra.

It was confirmed based on these discussion that an outline ELRA would be submitted to accompany the waste licence application, and further discussions would be held, based on the information contained herein, as part of the overall waste licence application process.

Thus, this outline document aims to identify known and unknown liabilities as best as possible based on the current understanding of the development proposal and is submitted on the basis of further review of same potentially being required as the application process progresses.

DRAFT
For inspection purposes only.
Consent of copyright owner required for any other use.

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 Operation

2.1.1 Site Development

Bantry Inner Harbour is located in the heart of Bantry Town, which is located at the head of Bantry Bay, one of the deepest harbours in Europe and the longest Bay in Ireland. It is a major tourist attraction in Ireland in its own right and attracts large numbers of Irish and overseas visitors on an annual basis. The harbour itself makes up a substantial portion of the town and is a significant backdrop and focal point for the town.

Bantry Harbour is approximately 100 metres wide and 500 metres from its mouth to its head. Mean high water levels are approximately 3.4 metres above Chart Datum while the seabed is often exposed at low tide. Bantry Harbour is enclosed by steep slopes that provide natural shelter and a dramatic and attractive landscape setting for both the harbour and town.

The Harbour is currently constrained by the available water depths. At low water parts of the harbour dry out leaving exposed areas of mudflats and at present, it is not suitable for use by vessels at all states of the tide.

Figure 2-1: Site Location Map



Figure 2-2: Aerial View of Site



2.2 Size and Nature of the Activity

It is proposed to carry out, as part of the Phase 1 works at Bantry Inner Harbour, and shown in Figure 2-3, development of:

- a 20 berth marina (quayside pontoons)
- dredging to -4m CD and -3m CD to maximise water depth at all tides
- remedial works to Town pier (widening and extending)
- 7,000 m² of reclaimed landscaped amenity area
- 2,300 m² pier side Quayside reclamation for use as car parking

Figure 2-3: Proposed Development



Dredging will produce approximately 45,000 m³ of dredge spoil, comprising 25,000 m³ of ‘fine’ dredge material and 20,000 m³ of granular material, to be managed. This material will be stabilised using specialist

plant and injected with cement, in order to solidify the material, and placed within the proposed amenity area and within the remedial works area as a fill material.

Solidification with cement is proposed in order to render 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)".

2.3 Details of Waste Licence

No waste licence relates to the Bantry Inner Harbour Phase 1 Development Works. This document forms part of the application submission for same.

2.4 Nature & volumes of waste

As identified, it is expected that dredging activities will produce c. 45,000 m³ in total of dredge spoil material (EWC 17 05 06), a portion of which is considered contaminated. This consideration is based on significant site investigation and testing carried out as part of the overall project EIS development and pre-construction works.

It is considered that potential contamination is confined to the top 0.5 m of 'fine' material on the seabed that will be dredged. At a depth of c 1.m below the seabed, material encountered will be a coarse, granular material that is considered clean and uncontaminated.

2.5 Site Operation

The methodology for the proposed dredging and solidification/stabilisation works is included in Method Statement MS02-3, included in Appendix 1.

Post completion of the dredging and stabilisation works, the Town Pier and Railway Pier areas will remain as amenity infrastructure for the locality, supporting sailing and other recreational activities.

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

2.6 Site Infrastructure

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

- hoarding and herras fencing, gated

- hardstanding area at Railway Pier (on revetment)
- hardstanding area at Town Pier
- wheel washing area
- hazardous chemical stores (small quantities of fuel)
- waste quarantine & waste storage areas at site compound and on dump barges
- site compound area
- site cabins – welfare, office, drying rooms

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 excavator with GPS system
- Aoibheen spudleg Dredger barge
- 2 no. dump barges
- 1 no. 35 ton excavator with clap shell grab
- 1 no. A25 dumper
- 1 no. work boat
- 1 no. safety boat
- 1 no. Allu PMX500 power mixer
- 1 no. Allu PF7 +7 power feeder
- 1 no. landing craft
- Cement storage silos of c 100 tonnes capacity

Post placement of dredge spoil material and completion of the construction phase works, the following amenity related infrastructure will have been provided as part of the Bantry Inner Harbour Phase 1 works:

- Landscaped amenity area of 7000 m² behind revetment structure at Railway Pier
- Widened pier area and Quayside Reclamation of 2,300 m² at Town Pier

Permanent monitoring bouys will remain in place, at locations agreed with the Agency, for the monitoring of potential impacts to surfacewaters at the frequency to be specified in the waste licence, should it be granted.

2.6.1 Drainage

Surfacewater controls will be put in place during the construction works as required, by the construction contractor. There will be no direct discharge of surfacewater to the adjacent waterbodies from the works. The Contractors environmental procedure EP-10 Surfacewater Controls is included in Appendix 2.

2.6.2 Tank, Pipeline and Bund Testing

Testing of tanks and pipelines is not considered to be relevant to the proposed activity given that there is no storage or movement of process waters, other waters or any other materials proposed as part of the development works.

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, as described, and the structures behind which the material will be placed are not designed as impermeable structures.

2.6.3 Environmental Emissions

Environmental monitoring that will be related to the site will be carried out in accordance with the conditions and schedules of the waste licence.

The environmental media monitored and the frequencies of monitoring proposed as part of the waste licence application process are:

- Surfacewaters – 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

2.6.4 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, which addresses, in addition to noise, vibration and dust:

- Air quality
- Litter control

2.7 Operator Performance

2.7.1 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.

The appointed contractor for the works, BAM, is accredited under ISO 140001 and has developed a site specific Construction Environmental Management Plan (CEMP) in accordance with the principles and procedures of their company EMS. A copy of this CEMP is included in Appendix 3.

In addition, the proposed licensee, the Port of Cork, is ISO 14001 accredited and, as part of the auditing and review procedures and requirement of this accreditation, will review the CEMP prepared by BAM at the beginning of the overall Bantry Inner Harbour Phase 1 works and again at the commencement of the dredge spoil placement element of the works.

2.7.2 Incidents & 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.

2.8 Environmental Sensitivity

The environmental sensitivities in relation to the facility are presented under respective headings.

2.8.1 Geology/Hydrogeology

The site is located within Bantry Harbour, which comprises a large portion of Bantry Town

The geology of the area is characterised by the Reenagough Member, which is described as sandstone, which is composed of massive and flaser-bedding. The most recent published geological map identifies the bedrock occurring beneath the site as being of late Devonian sandstone.

The dominant sandstone rock types around Bantry are classified as aquifers but are have poor productivity. This means that where groundwater is present it will be present in low volumes with slow recharge if removed. The groundwater table was encountered during borehole drilling at the site during site investigation works, at a level of 7m bgl.

The overburden soils in the Bantry area comprise predominately “dry” soil types: typically well drained deep mineral soils (AminDW) and well drained shallow soils (AminSW), both acidic chemical derived from mainly acidic parent materials. There is also a significant area of “made ground” associated with Bantry village and Harbour.

2.8.2 Human Receptors

The waste activity location is within the confines of Bantry Inner Harbour and its two piers, the Railway Pier and Town Pier. The harbour is surrounded to the south by the N71 road (“The Quay”); to the east by a public carpark and to the north by the local Harbour View road. West of the site is the wider harbour area.

The nearest residential and commercial receptors are located within 20 - 50 m of the site boundaries, in the form of shops, a hotel, restaurants and private residences, while members of the public utilise the piers for launching vessels and recreation.

2.8.3 Natural Habitats

The development site is concrete paved pier and open harbour area and is classified in accordance with Fossitt 2000, ‘A Guide to Habitats in Ireland’, as:

- Buildings and Artificial surfaces (BL3)
- Estuaries (MW4)

Three Natura 2000 sites lies within an approximate 10 km radius of the development site:

- Glengarriff Harbour and Woodland cSAC (000090) – 7km north west
- Caha Mountains cSAC (000093) – 8.5 km north west
- Derryclogher (Knockboy) Bog cSAC (001873) – 9 km north

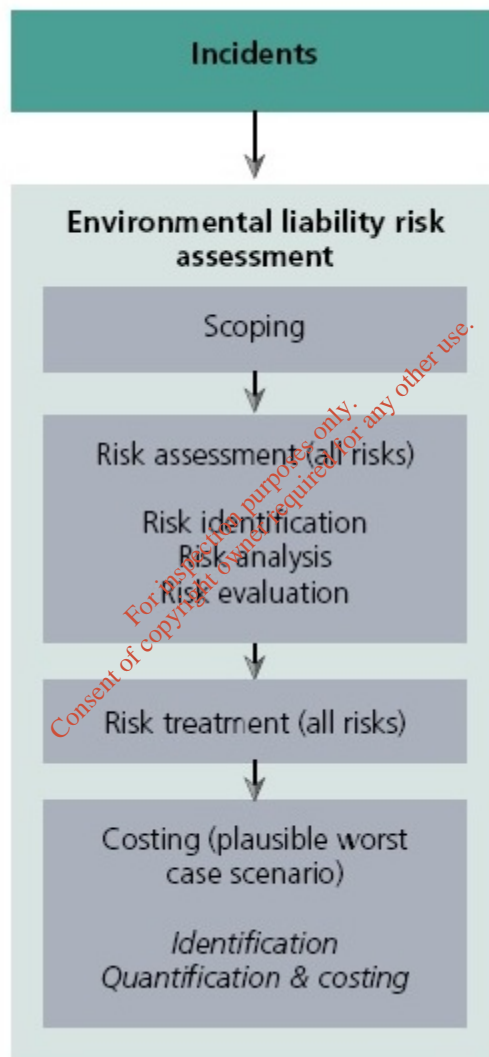
3 APPROACH TO ENVIRONMENTAL LIABILITIES

3.1 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 approach for assessing and costing environmental liabilities is illustrated in Figure 3-1.

Figure 3-1: Assessing and costing environmental liabilities

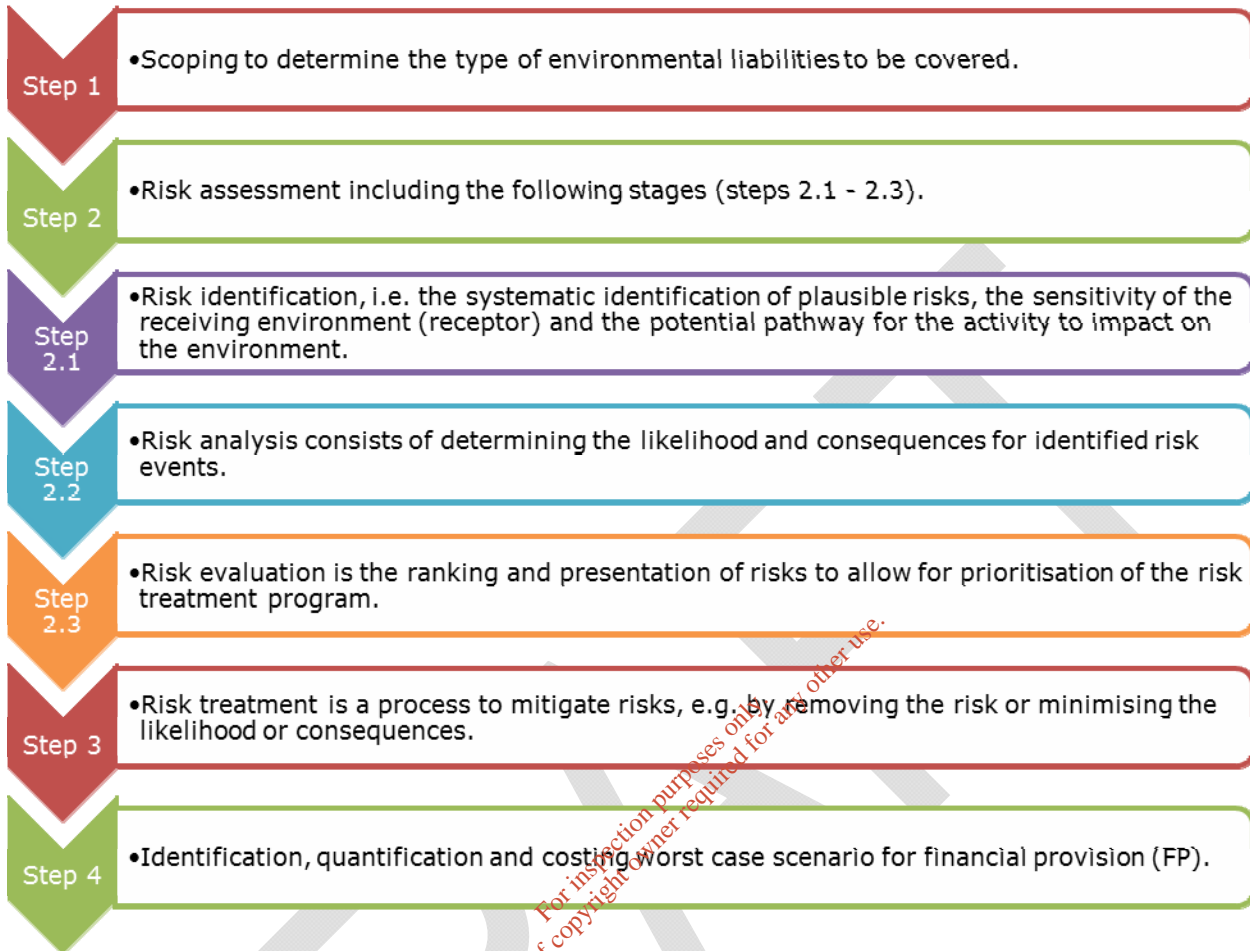


The purpose of the ELRA is to:

- 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 set out in Figure 3-2.

Figure 3-2: Environmental Liability Risk Assessment Process



3.2 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 emissions/pollution caused. It should not include other associated costs that are non-environmental.

To this end, the scope of the ELRA related to the Bantry Inner Harbour Phase 1 works is considered as:

- activities associated with the management and placement of dredge spoil material from the point of placement on the dredging barge, through placement and temporary storage at the Town Pier site and Railway Pier site prior to stabilisation/solidification of the material in-situ until completion of the dredge material placement works

3.3 Step 2 – Risk Assessment

The assessment of risk comprises three sub-stages:

- Risk identification
- Risk analysis
- Risk evaluation

3.3.1 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 3.1, hereunder, presents a list of plausible risks applicable to the Town Pier site and the Railway Pier site at Bantry Harbour.

This list has been informed through discussion with the appointed construction contractors and based on their experiences in carrying out similar dredging works.

Table 3.1: Plausible Risks Identified for the Bantry Inner Harbour works

Risk ID	Process	Potential Risks	Environmental Effect
1	Dredge spoil movement & placement	Uncontrolled release of non-treated fine dredge spoil material during off loading from the dump barges and/or placement within processing locations	Release of fine dredge spoil material with elevated concentrations of heavy metal contaminants resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour
2		Catastrophic failure of the dump barges (i.e. sinking) during dredging with uncontrolled release of large quantities of non-treated fine dredge spoil material	Release of significant quantities of fine dredge spoil material with elevated concentrations of heavy metal contaminants resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour
3	Dredge spoil stabilisation/solidification	Uncontrolled release of cementitious material associated with the stabilisation/solidification activities	Release of cementitious material to surfacewater resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour
4		Failure of stabilisation/solidification process resulting in potential release of heavy metal contaminants from treated fines dredge spoil	Release of heavy metal contaminants resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour
5	Fuel Storage/ Refilling	Fuel loss due to rupture of mobile bunds maintained onsite; bund failure; spillage during filling	Release of hydrocarbons to surfacewater resulting in surfacewater quality deterioration through presence of an oil slick, impacting on surfacewater quality and aquaculture throughout Bantry Harbour
6	General Operations	Excessive noise and/or vibration generation due to dredge movement, placement and treatment activities	Nuisance generation for local receptors
7		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.

3.3.2 Step 3.2 - Risk Analysis

The plausible risks identified in Table 3.1 are assessed against the likelihood and consequence as per Table 3.2 and Table 3.3, as per the Guidance. These tables 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 3.4.

Table 3.2: 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 3.3: 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 3.4: Risk Analysis

Risk ID	Process	Potential Risks	Environmental Effect	Consequence Rating	Basis of Consequence	Likelihood Rating	Basis of Likelihood	Risk Score (Consequence x Likelihood)
1		Uncontrolled release of non-treated fine dredge spoil material during off loading from the dump barges and/or placement within processing locations	Release of fine dredge spoil material with elevated concentrations of heavy metal contaminants resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour	1	Material will be off-loaded and placed in relatively small quantities per each offloading/placement event using the bucket of mechanical plant. Therefore, any uncontrolled release would be of small quantities with minor impacts and localised to the Inner Harbour area, with dilution factor and presence of silt curtain mitigating impacts	2	The use of sealed lids on mechanical plant buckets will minimise the potential for release – however, the fine dredge material will be quite liquid in nature	2
2	Dredge spoil movement & placement	Catastrophic failure of the dump barge (i.e. sinking) during dredging with uncontrolled release of large quantities of non-treated fine dredge spoil material	Release of significant quantities of fine dredge spoil material with elevated concentrations of heavy metal contaminants resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour	2	Sinking (or similar) of the dredge barge could release up to approx. 300 m ³ of dredge spoil material resulting in mobilisation of sediment which may contain elevated heavy metal concentrations, with potential to impact on water quality and aquaculture sites. However, presence of silt curtain and dilution factor act as mitigating measures.	1	Very low likelihood due to: <ul style="list-style-type: none"> Maintenance procedures and ship-worthiness inspections of barge vessel as barge design Protected nature of Inner Harbour Procedures addressing appropriate working weather conditions Mitigation measures employed i.e. silt curtain 	2
3		Uncontrolled release of cementitious material associated with the stabilisation/solidification activities	Release of cementitious material, running to surfacewaters resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour	2	Solidification/stabilisation process will occur on a batch basis therefore potential release would be limited to the batch rather than continuous; in addition, a dilution factor would mitigate deterioration	1	Stabilisation/solidification activities will occur behind sheet piles (Town Pier) and rock revetment (Railway Pier) removed from direct contact with surfacewater; uncontrolled releases to be managed through spillage response procedures	2
4	Dredge spoil stabilisation/solidification	Failure of stabilisation/solidification process resulting in potential release of heavy metal contaminants from treated fines dredge spoil	Potential release of sediment with elevated heavy metal concentrations resulting in surfacewater quality deterioration impacting on surfacewater quality and aquaculture in Bantry Harbour	2	Non-performance of the stabilisation/solidification process could result in an ongoing flushing of the fine dredge material, particularly at the Railway Pier location, resulting in ongoing release of sediment with potentially elevated heavy metal concentrations	1	Stabilisation/solidification process is a proven demonstrated technology; ongoing lab testing during placement to verify performance; findings of QRA assessment provided in Appendix 4 identifying negligible potential impacts	2
5	Fuel Storage/ Refilling	Fuel loss due to rupture of mobile bunds maintained onsite; bund failure; spillage during filling, worst case release of 1500L	Release of hydrocarbons to surfacewater resulting in surfacewater quality deterioration through presence of an oil slick, impacting on surfacewater quality and aquaculture throughout Bantry Harbour	3	Persistent and hazardous pollutant with impact potential in a relatively wider area, volumes limited and procedures to manage spills/releases	2	Unlikely but possible given proximity of plant to surfacewaters and potential for human error	6
6		Excessive noise and/or vibration generation due to dredge movement, placement and treatment activities	Nuisance generation for local receptors	1	Localised and non-persistent but of a nuisance nature; short works duration	2	Unlikely but possible, given construction nature of works	2
7	General Operations	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.	1	Localised and non-persistent but of a nuisance nature; short works duration	2	Can occur in dry weather periods, where dust levels rise in general environment.	2

Table 3.5: Risk Matrix

Likelihood	V. High	5					
	High	4					
	Medium	3					
	Low	2	1, 6, 7		5		
	V. Low	1		2, 3, 4			
			Trivial	Minor	Moderate	Major	Massive
			1	2	3	4	5
			Consequence				

3.4 Step 3 – Risk Treatment

Risk treatment is the process to mitigate 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 3.6.

Responsibility for the carrying out of such measures is assigned in Table 3.6 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 3.6: Statement of Measures

Risk ID	Process	Potential Risks	Risk Score (Consequence x Likelihood)	Mitigation Measures to be taken	Outcome	Action	Completion Date	Relevant Individual
1	Dredge spoil movement & placement	Uncontrolled release of non-treated fine dredge spoil material during off loading from the dump barges and/or placement within processing locations	2	<ul style="list-style-type: none"> Operator training, procedures and experience in placement of dredge spoil material Silt curtain installation 	Risk of uncontrolled releases is reduced	<ul style="list-style-type: none"> Full training for operators 	In place & ongoing from construction commencement	Contractors Construction Environmental Manager
2		Catastrophic failure of the dump barge (i.e. sinking) during dredging with uncontrolled release of large quantities of non-treated fine dredge spoil material	2	<ul style="list-style-type: none"> Maintenance schedule for dredge barge prior to works commencing Procedures for appropriate weather working Shelter location within Inner Harbour Silt curtain installation 	Risk of catastrophic failure is reduced	<ul style="list-style-type: none"> Maintaining maintenance schedule and relevant procedures 	In place & ongoing from construction commencement	Contractors Construction Environmental Manager
3	Dredge spoil stabilisation/ solidification	Uncontrolled release of cementitious material associated with the stabilisation/solidification activities	2	<ul style="list-style-type: none"> CEMP with procedures for uncontrolled discharge clean up Maintenance schedule and procedures for stabilisation/solidification activities 	Reduced risk of uncontrolled releases	<ul style="list-style-type: none"> Maintaining maintenance schedule and relevant CEMP procedures 	In place & ongoing from construction commencement	Contractors Construction Environmental Manager
4		Failure of stabilisation/solidification process resulting in potential release of heavy metal contaminants from treated fines dredge spoil	2	<ul style="list-style-type: none"> Demonstrated process Ongoing verification through testing Ongoing sampling of input material Ongoing monitoring of potential impacts Silt curtain installation 	Potential for release of heavy metals is reduced	<ul style="list-style-type: none"> Implementation of testing verification, sampling and monitoring procedures in accordance with CEMP 	In place & ongoing from construction commencement	Contractors Construction Environmental Manager
5	Fuel Storage/ Refilling	Fuel loss due to rupture of mobile bunds maintained onsite; bund failure; spillage during filling, worst case release of 1500L	6	<ul style="list-style-type: none"> Relevant bund failure integrity testing in adherence with licence & CEMP Spillage management procedures in place 	Reduced risk of leakages and spillages	<ul style="list-style-type: none"> Implementing relevant CEMP procedures 	From construction commencement	Contractors Construction Environmental Manager
6	General Operations	Excessive noise and/or vibration generation due to dredge movement, placement and treatment activities	2	<ul style="list-style-type: none"> Noise mitigation measures in accordance with CEMP 	Reduced impacts on receptors from noise	<ul style="list-style-type: none"> Implementing relevant CEMP procedures 	From construction commencement	Contractors Construction Environmental Manager
7		Dust generation associated with materials placement or stabilisation/solidification activities during periods of dry weather	2	<ul style="list-style-type: none"> Dust monitoring in adherence with licence requirements & CEMP procedures 	Reduced impacts on receptor from dust	<ul style="list-style-type: none"> Implementing relevant CEMP procedures 	From construction commencement	Contractors Construction Environmental Manager

3.5 Step 4 – Identification, Quantification & Costing of Worst Case Scenario

3.5.1 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 taken into account in the analysis.

The plausible risk identified with the highest consequence is:

- Risk ID 5 – Fuel loss due to rupture of mobile bunds maintained onsite; bund failure; spillage during filling (worst case release of 1500L)

3.5.2 Risk Quantification

As per the Guidance, a detailed description of the plausible risks is required to inform the costing process.

The construction Contractor has developed environmental procedures relating to the clean-up process for spills that forms the basis of quantifying this risk. EP-15 'Containing and Cleaning up Spills' is included in Appendix 5 to this document.

Actions to be taken in the event of a spillage of materials are outlined in the Emergency Spill Response Plan in EP-15 and are outlined as follows:

1. Try to identify the source of the pollutant and, if possible and safe to do so, stop the flow.
2. Get a spill kit(s) and apply absorbent materials appropriate to the spill type. Ensure that waste containers are available in which to place used absorbents.
3. Prevent the spill from spreading and contain it in as small an area as possible, using absorbent sausages, sand, earth or polythene to dam the flow. Divert any flow away from drains, sewers or watercourses or prevent pollutants from entering drains by placing sausages and/or polythene around or over the opening. **Never wash spillage into the drainage system and never use detergents.**
4. If any pollutant has entered a watercourse absorbent booms must be positioned to prevent the spread of the pollutant. Ensure that the booms are anchored to the shore and that water cannot flow around the edges of the boom. If there is not enough flow in the water to push the pollutant into the boom you may need to apply absorbent pads to the surface to soak up the pollutant.
5. If a large volume of liquid has been contained and is not soaking into the ground (e.g. if the spill occurs on concrete) it may be more appropriate to have a waste contractor remove the liquid by drawing it directly into a tanker for disposal, or pumping it into an IBC, which can be collected for disposal.
6. Alternatively if an oil interceptor is located nearby, any oil or oil/water mixture may be pumped into this, as long as the capacity of the interceptor is not exceeded.
7. Place used absorbent pads and shovel contaminated sand/earth/absorbent granules into sacks or containers. Store large volumes of contaminated soil/material in a contained impervious area, such as a plastic-lined bund.
8. Used absorbent pads / sausages / booms that are not fully laden with pollutant (i.e. not dripping when they are held up) may be stored in appropriate containers for reuse. Any such containers must be sealed and clearly labelled as to their contents and stored in a bunded area.
9. The HSE Officer or Emergency Coordinator shall notify the relevant authority, the Health & Safety Authority and neighbours, and complete an Environmental Incident Report, if required.

This procedure identifies the use of absorbent booms as the means by which spillages to watercourses are managed. In the event of such an incident occurring, the Contractors own personnel will implement the procedures identified to manage the incident.

However, for the purposes of costing the response to this risk, it has been assumed that the risk is being managed by a 3rd party, in a worst case scenario where the contractor was not present onsite. While it is impossible for such a scenario to occur given the nature of the works and contractual arrangements, it is considered prudent to provide costs on that basis.

The costs identified below are identified from a number of sources, including directly from the Contractor and the consultants own professional judgement. The costs are indicative, insofar as can be identified at this juncture, for the activities involved in responding to a fuel spill.. No consideration is given to health and safety (except that associated with clean-up) or to other non-environmental costs such as programme interruption or liquidated damages.

3.5.3 Risk Costing

Table 3.7 presents the quantification and costing of the plausible risk ID 5 as described above.

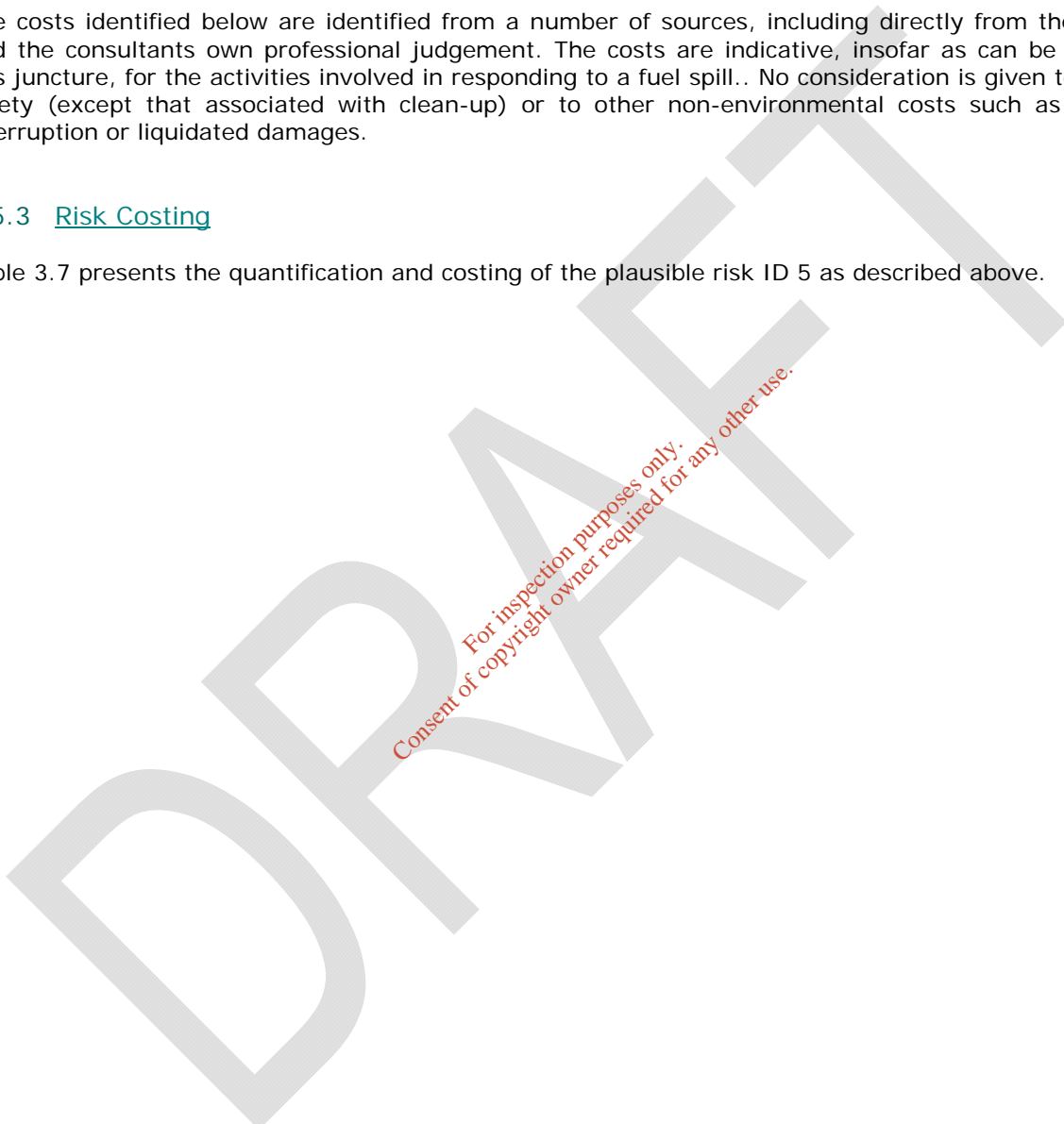


Table 3.7: Quantification and Costing of Risk ID 5

Activity Description	Quantity	Unit	Rate (€)	Cost (€)	Source of Unit Rates
<i>Absorbent Boom Installation</i>					
Absorbent boom	150	m	80	12,000	Note 1
Spill kits	4	unit	4	1,600	Note 2
Installation – labour	24	hr	35	840	Note 3
<i>Clean up process</i>					
Labour	80	hr	35	2,800	Note 4
Boat Hire	1	sum	1,500	1,500	Note 5
<i>Absorbent product disposal</i>					
Disposal, inc transportation	1	sum	1,500	1,500	Note 6
<i>Monitoring</i>					
Labour & extra parameters	60	days	150	9,000	Note 7
<i>Reporting</i>					
Incident reporting to EPA	20	hr	75	1,500	Note 8
Subtotal				30,740	
Plus contingency @ 10%				3,074	Note 9
Total				33,814	
Note 1	Contractor provided price				
Note 2	Contractor provided price				
Note 3	Labour rate – 3 operatives x 1 day				
Note 4	Labour rate – 2 operatives x 1 week				
Note 5	PC sum, for sampling, boom installation				
Note 6	Contractor provided price				
Note 7	Extra hydrocarbon related parameters (in addition to ongoing daily sampling), sampling increased to twice daily				
Note 8	Consultant time				
Note 9	Contingency assumed at 10%				

3.6 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 calculated at **€33,814**.

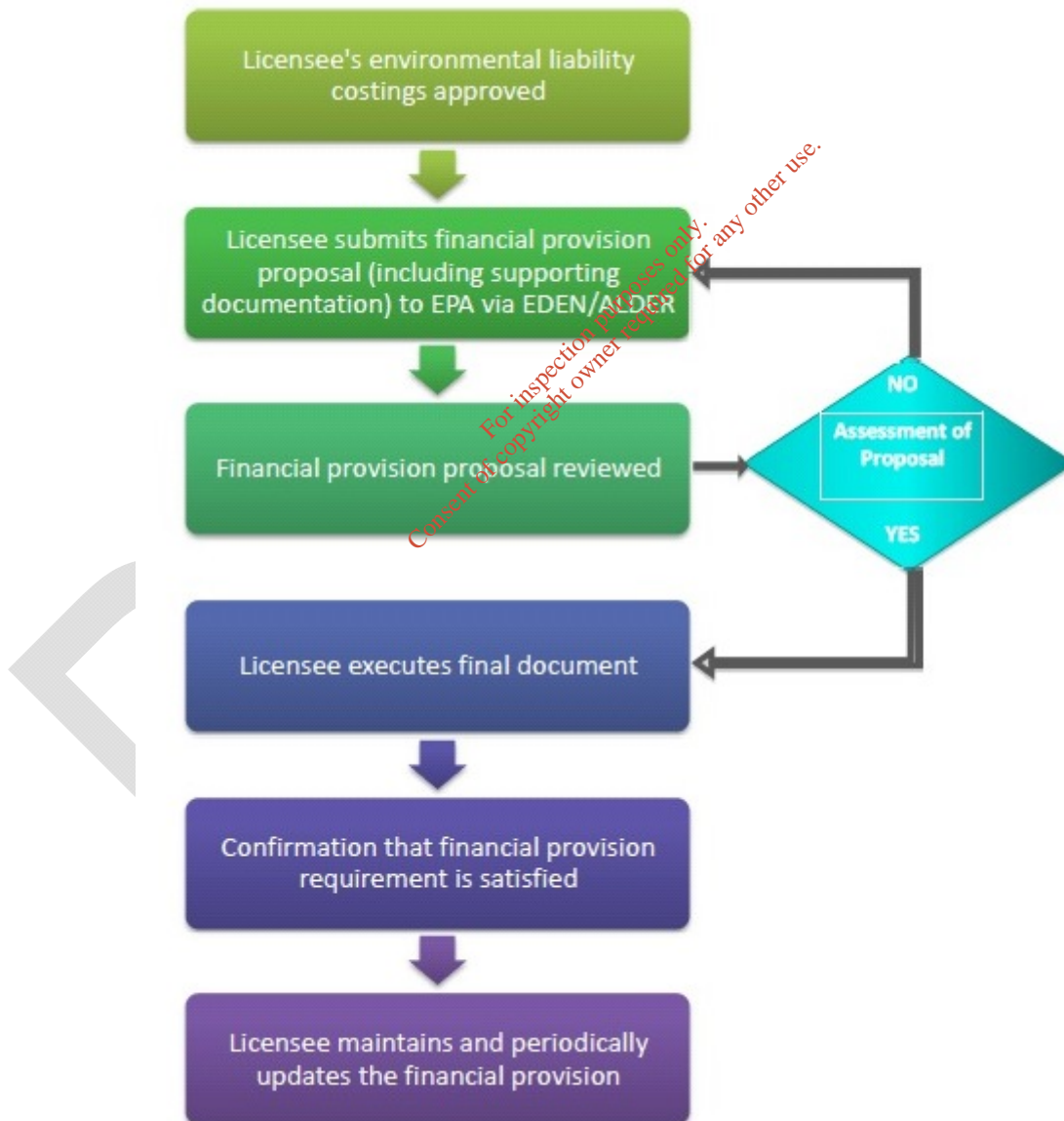
4 FINANCIAL PROVISION

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 shown in Figure 4-1.

Figure 4-1: Steps in Financial Provision assessment process



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

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

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. As per the first step shown in Figure 4-1, agreement of the environmental liability costings with the EPA is required prior to identification of the appropriate financial provision instrument.

To this end, this ELRA document is submitted for agreement to facilitate the further stages in the financial provision assessment process.

DRAFT
For inspection purposes only.
Consent of copyright owner required for any other use.

*For inspection purposes only.
Consent of copyright owner required for any other use.*



ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

Appendix 1

Method Statement MS02-3

Works Proposals – Option 3

Part 1 Site Specific Method Statements – MS02-3

Dredging Works

Introduction

Prior to any works commencing on site Site Specific Method Statements will be prepared for all the major elements of the work. These method statements will outline precisely how Bam will approach and carry out the works associated with the Bantry Inner Harbour Development – Phase 1 Contract. These method statements will be submitted to the Employers Representative for approval, work will not commence prior to the relevant method statements being approved.

The method statements will be prepared by the Project Manager Collins Connolly and the Site Agent Seamus O’Sullivan, however the various other members of the site management team will be asked to contribute to the relevant sections of the method statements as required. The method statements will be prepared in line with the Works Requirements, Specifications, Guidance Documents and Consultations meetings with various other stakeholders.

While the more specific in-depth method statements will be prepared once we get to site, below are the overall method statements which will outline our general approach and methodology to the Bantry Inner Harbour Development – Phase 1 Contract.

Dredging Works

Introduction

This method statement incorporates Bam overall approach for the Dredging Works, option 3-variant. Prior to any works commencing on site more comprehensive and detailed, task specific method statements will be prepared by Bam for each element of the works.

Scope of Works

The works will consist of the following:

- **Proposed Plant**
- **Dredging Methodology**
- **Transport of Spoil**
- **Processing of Spoil**
- **Deposition of Spoil**
- **Surveying**

Location of the Works



Figure 1: Site Location Map

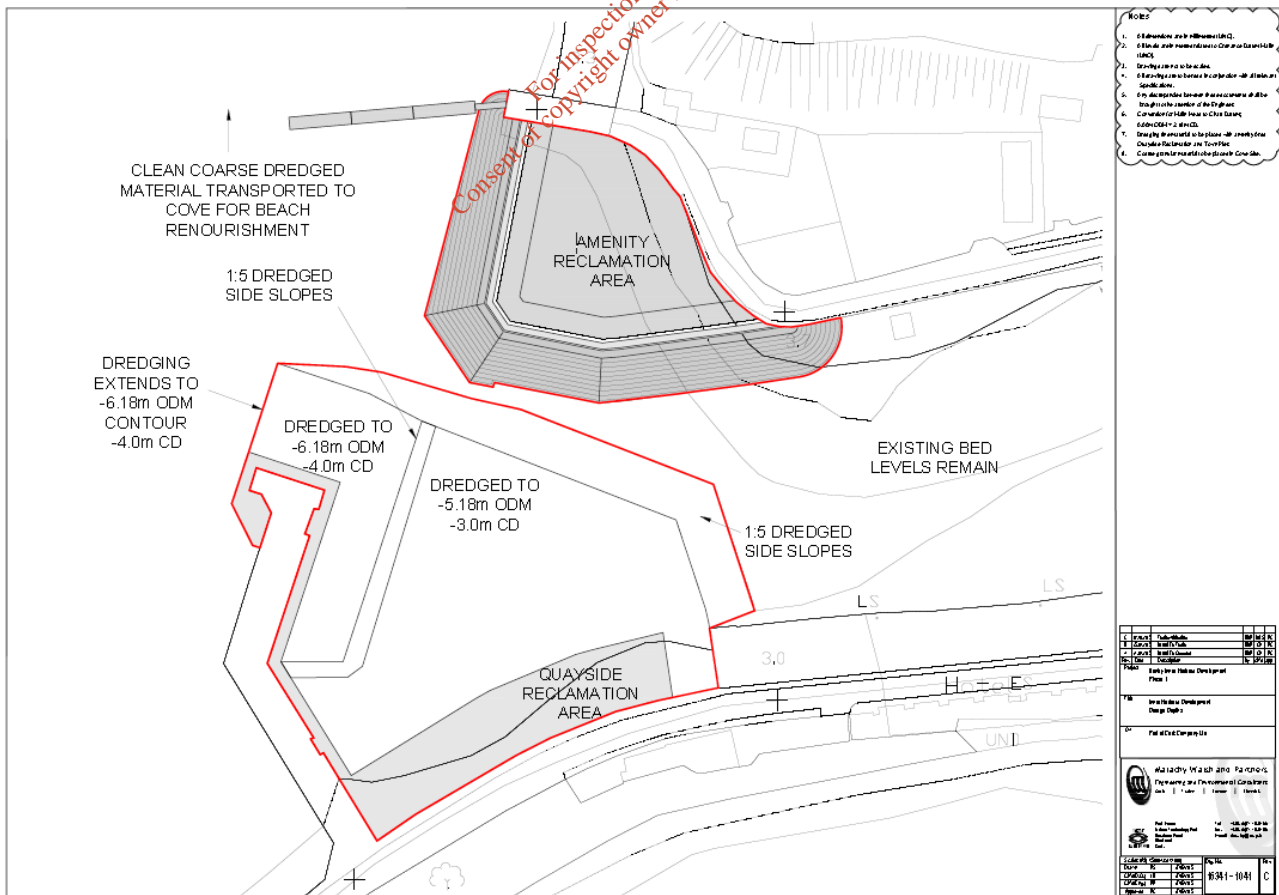


Figure 2: Dredging layout drawing

Proposed Plant

Details are listed below of plant and equipment to be utilized in the Inner Harbour Dredging works, including access and egress support to be used in the works.

The details provided are specific to the project. All floating plant, dredging equipment, transportation plant and equipment relating to dredging, treatment, transportation and disposal are detailed.

Most of the equipment is BAM owned or will otherwise be hired/ subcontracted.

Item	Activity/ Roles	Quantity [nos.]
65t long reach excavator with GPS system & 4t breaker	Dredging of silts from causeway	1
Aoibheen spudleg Dredger barge	Dredging inner harbour	1
2 no dump barges	Dredging inner harbour	2
35 ton excavator with clamp shell grab	Managing dredge materials	1
A25 Dumper	Managing dredge materials	2
Work boat	Managing dump barge	1
Safety boat	Managing safety in the harbour	1
Allu PMX500 Power mixer	Dredge stabilisation	1
Allu PF7+7 power feeder	Dredge stabilisation	1
Landing craft	Transport machinery	1

Further equipment is also available from our subcontractors and sister companies in the BAM group.

All mechanical plant will be in good working order and subject to a regular maintenance regime. Only suitably qualified and experienced personnel will be allowed to operate plant and equipment.

All Vehicles will be fitted with reversing beacons and a flashing light and will be directed by a banksman. All plant certification will be checked by the BAM Civil Safety Officer prior to commencing works on site. A register of all plant and equipment checks will be kept on site for the duration of the project.



Figure 4: Bam Plant dredging in Dublin Port

Dredging Methodology

It is the intention of BAM to carry out the dredging of the material using a combination our own long reach excavator (CAT 365) which will work from the shore and the Aoibheann Dredger mounted on floating barge (ACN 5) as per the photograph below. It has been identified that the dredged materials will be used on site as fill in the following locations.

- Quayside Reclamation area
- Amenity Area
- Town Pier Widening



Figure 5: The Aoibheann Dredger which will be utilized for the dredging works

In order to dredge the material the following steps will be followed:

Note: Prior to dredging operations commencing, a marine mammal survey will be carried out, a silt curtain will be put in place in liaison with the Harbour Master on marine traffic.

- The dredging design will be input into a monitor control box in the excavator as described in the surveying section below.
- The dredged area will be plotted out and broken into grids so as to allow a controlled methodical approach to the dredging operations.
- The Aoibheann will be moved into position over the first grid section to be excavated.
- A dump barge will be tied alongside the Aoibheann, the dredged material will be deposited into this dump barge which will then transport it to the temporary offloading quay in the Amenity area and the Quayside Reclamation area.
- The excavator will dredge the top 0.85 to 1.8m of the silt material, the GPS dig system will be used to verify the depths. The material will also be visually monitored during the excavation to ensure the silty materials and gravels are segregated.

- All excavators carrying out the dredging works will be fitted with environmental dredging buckets which will minimise the loss of any dredge spoil into the harbour.
- Additionally a silt curtain will be erected across the mouth of the harbour during dredging operations.



Figure 6: Environmental Dredging Buckets & Silt Curtains will be used for the dredging operations

- Once the material has been loaded into the dump barge it will be transferred to the Amenity area or the Quayside Reclamation area where it will be off loaded and treated. Treatment will be covered further in the Processing section below.
- The silt material will be stabilised by adding cement using the Allu Stabilisation System which will be attached to the end of a long reach excavator and will ensure that the material is stable enough to be incorporated into the permanent works. See Processing of Spoil section.
- The material will be sampled and tested in accordance with the Works Requirements continuously throughout the dredging operation. Furthermore daily water samples will be taken and tested to ensure that the dredging operations are not having an adverse effect on the environment.
- At all times communication will be maintained with the Marine Mammal Observe, if in the event of marine mammals being observed within the influence zone then the dredging works will be suspended immediately and will only recommence once the Marine Mammal Observer gives the go ahead.
- As the top layer of silt is excavated, the underlying inert gravels will be available for excavation. The material will be dredged in the same manner outlined above and will also be stabilised if required in the manner outlined above. The material will also be tested to ensure that it is inert. These gravels will be used in the permanent works as engineered fill.
- Dredging tolerances shall be that as outlined in appendix 6/71.

- Working hour restrictions as per Appendix 1/9 and it is understood that the dredging window is November to March inclusive.
- Note: materials will also be dredged from land, this is covered in the Quayside reclamation works and the Town pier construction work.

Transport of Spoil

- All material will be handled in such a way as to minimise the impacts on water quality, the environment and other harbour users. Material handling and storage areas will be monitored to ensure that there is no surface water run off which could cause damage to the environment.



Figure 7.a: Environmental Silt Cutains used for the dredging operations

- All dredged materials will be moved to its permanent deposition/treatment area over water, as per appendix 6/71. If during the works hazardous materials are identified this will have to be transported off site by land transport to an appropriately licenced facility.
- As covered above the excavated dredged material will be transported to a temporary loading quay at the Amenity area or the Quayside Reclamation area by a dump barge here it will be excavated from the barge by a 30 ton tracked excavator using a clamp shell grab into a 25ton dump truck where it will be in a holding cell for treatment. All transport of dredge material is local within the site boundary and will not be transported outside the site boundary on land.
- All dredge material will have quantities, times etc recorded and made available for inspection to the Engineer.

Processing of Spoil

- As mentioned above once the material is excavated from the dump barge it will be placed in cells behind the Amenity area revetment where the water collected during the dredging operation can drain prior to the material being stabilised. The water draining from the dredge material will naturally filter through the geotextile and rock revetment of the Amenity area.
- As per appendix 6/71 it is estimated that the ratio required for treatment and stabilisation is between 10 to 12%, the actual ratio will be determined on site by trial mixes. The stabilisation design mix will be offered to the engineer for approval prior to the full scale dredging programme proceeding. Bam have engaged the services of AGL consulting to review all geotechnical matters.

- Once the material has dewatered it will be treated using cement stabilisation. Stabilisation is required so that the material can be incorporated into the permanent works as engineered fill. All treated materials will be tested as per Appendix 1/73 and dredging, treatment and disposal records maintained as per Appendix 6/71.
- To mix the cement through the wet dredge material, Bam will mount an Allu PMX500 power mixer to a 35 ton excavator. This is a rotating agitator mixing which will feed and mix the cement from Allu PF7+7 power feeder with Allu DAC system into the dredge material, the attachment is powered by the hydraulics of the excavator. The agitator will be lowered into the cell of dredge material and the cement added through the agitator. The agitator then mixes the cement through the dredge material ensuring the mix is homogeneous throughout. The material is then for a sufficient period for the chemical reaction between the water and cement to take place. Once the moisture content of the material is reduced to the required levels it will be placed and compacted into the permanent works.



Figure 8: Dredge material being treated using the Allu treatment system

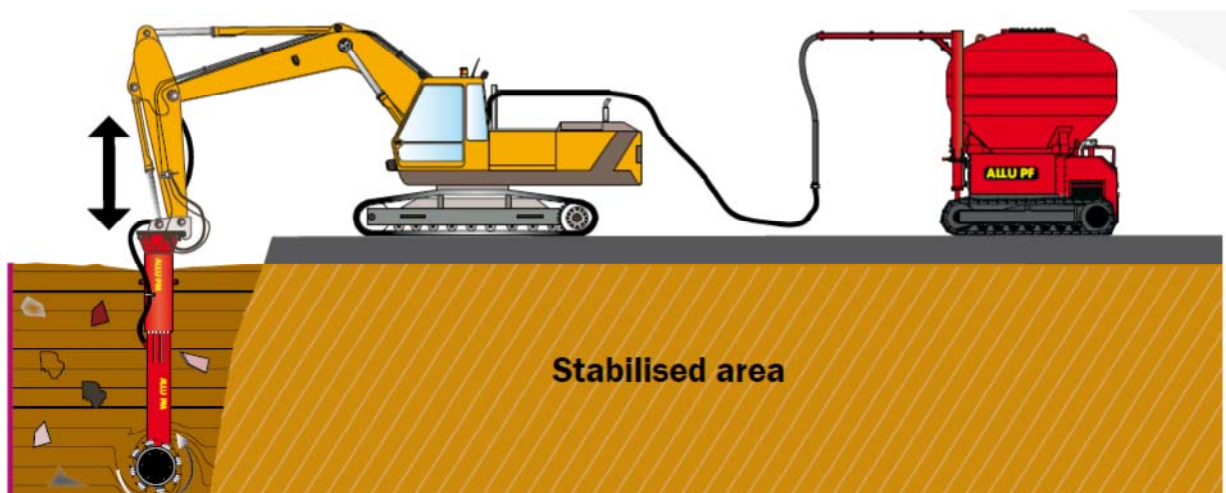


Figure 9: Allu Stabilisation System

Deposition of Spoil

- As mentioned above it is the intention of Bam to incorporate all the dredge materials into the permanent works in the Harbour works.
- The material will be deposited into its permanent location and treated in-situ. All run off will be filtered through the revetment of the Amenity area which will have a geotextile screen to ensure no sediments are displaced into the watercourse. Additionally this will be the case at the Quayside reclamation area.

Surveying

- Prior to dredging works commencing, an “in bathometric” survey will be carried out in order to determine the most up to date existing bed profile. The surveying will be carried out in accordance with the specification as outlined in Appendix 1/12 of the Works Requirements. The information from the survey will be made available to the Employer. The information will also be used to determine the total quantity of material to be dredged. Throughout the dredging works, numerous interim surveys will be carried out on a grid basis for checking purposes and interim measurements. Finally, once the dredging works are complete, an “out” survey will be carried. All information will again be made available and requested drawings, survey reports etc. will be submitted for final acceptance and approval by the Employers Representative.
- Notification will be given for the “in” and “out” survey and the Employer and or the Employers Representative will be invited to witness. During interim surveys, this invitation is also there should the ER wish to attend.
- In order to dredge to the requirements of the Contract drawings, the Works will need to be set out. It is the intention of BAM to utilise a long reach excavator on a floating barge to carry out the excavation. The excavator will be fitted with a “Dig Master” system. The system is run from a global positioning system, from this operator is aware of the location x,y & z respectively and also the orientation of the bucket of the machine. The system is set up by taking the dredge design information and creating a surface model of the design. This is then inputted into the machine control box. The required design is then visible on a monitor in the cab in both plan and section view relevant to the XYZ position of the excavator bucket.

Safety

- Risk assessments have been carried out and are included in the Health and Safety Plan. The Health and Safety Plan is included in section 3 of the submission.
- All work will be carried out in accordance with the Health and Safety Plan for the site.
- The site operates an induction procedure for personnel prior to commencing work on site.
- P.P.E. will be worn by everyone involved on this project at all times to include a minimum of high visibility vest, hard hat, safety glasses and safety boots.
- All plant will be in good working order and equipped with yellow flashing beacons

Programme of Works

Refer to construction program as included in section 2 of this submission

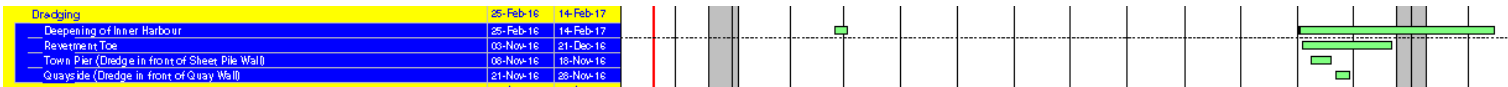


Figure 10: Screenshot of dredging programme from main programme

Quality and Environmental management

The project Quality Plan will be implemented after being approved by the ER and the inspection and test plan will be adhered to rigidly. A copy of the Quality Management Plan will be kept on site. Seamus O'Sullivan will be the person with responsibility for quality control. Site audits will be carried out to ensure compliance with the Quality Plan. Periodic company audits will be carried out to ensure QA standards are being maintained on the project.

All works will be undertaken in accordance with the Site Specific Environmental Management Plan and the Waste Management Plan. These plans have been included in section 5 of the submission. The main environmental impacts and considerations associated with the works are as follows:

- Waste Management: Waste management will be as specified in the site WMP
- Water Pollution: No contaminated water to be discharged into the harbour.
- Noise: All plant and machinery used on site will be serviced regularly to avoid excessive noise. Noise levels on site are not expected to exceed the legal but where necessary, mandatory warnings signs shall be erected informing all when ear protection is required to be worn.
- Protection of Watercourse: The water course shall be protected from pollution, by ensuring that generators, pumps etc are placed in drip trays. Spill kits shall be located adjacent to the watercourse and clearly identified. Spill kits shall also be placed in all machines. Details of procedure for dealing with oil spillages and procedure for protecting water courses are contained in BAM Environmental Management Plan
- Hazardous Substances: All hazardous substance will be stored in the hazardous store and all generators will be placed on a drip tray at all times.



*For inspection purposes only.
Consent of copyright owner required for any other use.*


*For inspection purposes only.
Consent of copyright owner required for any other use.*



ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

Appendix 2

EP10 Surfacewater Controls

EP-10	Surface Water Control			
Note: Always print or copy to double-sided pages	PROC. NO: EP-10	REV: 04	DATE: 10.03.2016	PAGE: 1/6

Purpose:	To provide guidance on control measures to minimise the adverse impacts on watercourses caused by sediment release during construction activities.
Scope:	Control of surface water on all sites
Responsibility:	Contract/Project Manager, Foreman, HSE Officer, All site personnel
<p>Regulatory Requirements:</p> <ul style="list-style-type: none"> • Inland Fisheries Ireland Acts, 1959 - 1980 and Fisheries (Amendment) Acts 1983 - 2003 • Local Government (Water Pollution) Acts, 1977 – 1990 • Planning and Development Act, 2000 and Amendment Act, 2002 • Local Government (Water Pollution) Regulations, 1978 – 2001 • European Communities (Quality of Salmonid Waters) Regulations 1998 • European Communities (Quality of Shellfish Waters) Regulations 2006 • European Communities (Water Policy) Regulations 2003 • Environmental Protection Acts 1992-2003 • Bathing Water Quality Regulations 2008 • Inland Fisheries Ireland Act 2010 <p>Under the Water Pollution And Fisheries Acts allowing polluting matter to enter any waters is an offence. Under the Local Government (Water Pollution) Act, 1977, a licence is required for the discharge of trade effluent or sewage effluent (see definitions below) to waters or for the discharge of trade effluent or other matter to a sewer. Such a license would specify the quality of the water that may be discharged.</p>	
<p>Definitions – from Local Government (Water Pollution) Act, 1977</p> <p>"polluting matter" includes any poisonous or noxious matter and any substance (including any explosive, liquid or gas) the entry or discharge of which into any waters is liable to render those or any other waters poisonous or injurious to fish, spawning grounds or the food of any fish, or to injure fish in their value as human food, or to impair the usefulness of the bed and soil of any waters as spawning grounds or their capacity to produce the food of fish or to render such waters harmful or detrimental to public health or to domestic, commercial, industrial, agricultural or recreational uses;</p> <p>"trade effluent" means effluent from any works, apparatus, plant or drainage pipe used for the disposal to waters or to a sewer of any liquid (whether treated or untreated), either with or without particles of matter in suspension therein, which is discharged from premises used for carrying on any trade or industry (including mining), but does not include domestic sewage or storm water;</p> <p>"waters" includes—</p> <p>(a) any (or any part of any) river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial,</p> <p>(b) any tidal waters, and</p> <p>(c) where the context permits, any beach, river bank and salt marsh or other area which is contiguous to anything mentioned in paragraph (a) or (b), and the channel or bed of anything mentioned in paragraph (a) which is for the time being dry,</p> <p>but does not include a sewer.</p>	
<p>Trade effluent can include:</p> <ul style="list-style-type: none"> • Water from dewatering operations, which may or may not contain sediment; • Water from cutting or blasting operations; • Waste chemicals, including oils and fuels; • Plant wash down water, including wheel washes; • Concrete washout water; • Cleaning water, which may contain detergents and/or other chemicals; • Liquid wastes discharged from sinks, basins and toilets. <p>The only effluents that is not classed as trade effluent is clean, uncontaminated surface water (i.e. that has not been contaminated when running over or through the site).</p>	

Common pollutants from construction sites and their effects on aquatic life are given below.

Pollutant	Affect on Aquatic Life
Silt or sediment	Reduces water quality, clogs fish gills causing suffocation, covers aquatic plants stunting their growth and reducing fish shelter, destroys riverbed insect habitat and thus fish food source.
Coarse sediments	Can physically injure fish through abrasive action.
Cement or concrete wash water	Are highly alkaline and change the pH and chemical balance of the water.
Oil, diesel & other hydrocarbons	Form a film on the water surface that reduces oxygen and can suffocate aquatic life.
Detergents	Remove dissolved oxygen from the water
Heavy metals & metalloids	May be present in contaminated ground and can be toxic to aquatic life such as tadpoles, frogs, minnows and trout at low concentrations.

Protection of Watercourses and Bodies

A river, stream, estuary or lake may be afforded additional protection in national legislation by being designated:

- A Natural Heritage Area (NHA) under the Wildlife (Amendment) Act, 2000
- A Special Area Of Conservation (SAC) under the European Communities (Natural Habitats) Regulations 1997/8:
- Salmonid Waters under the European Communities (Quality of Salmonid Waters) Regulations 1998
- Shellfish Waters under the European Communities (Quality of Shellfish Waters) Regulations 2006-2009
- Inland Fisheries Ireland Act 2010

A watercourse may be protected by more than one, or all, of these statutory instruments. For further information on NHAs and SACs refer to EP-12.

Management Requirements:

Water pollution as a result of construction activities usually occurs as result of the release of silt / sediment or spillage of hazardous substances. To prevent such impacts control measures must be implemented from the commencement of site activities and will be required for the duration of construction. The procedure outlined below is for surface water control (often referred to as erosion and sediment control) to minimise the release of sediment to waterways. For control measures to minimise fuel and hazardous substance releases refer to EP-13 Bulk Fuel & Oil Storage, EP-14 Storage & Handling of Hazardous Substances and EP-15 Containing & Cleaning Up Spills.


Sediment control measures are designed to minimise the transport of sediment and other pollutants into watercourses, either by providing a physical barrier (filtering) or by slowing the flow rate of water so that suspended pollutants 'drop out' (settling). Filtering measures include sediment fences and inlet filters, whilst settling measures include sediment ponds and check dams.

The type and capacity of control measure required is dependent on a number of factors, including the volume and duration of flow, and the particle size of the sediment. Fine sediments (clay & silt) are harder to remove as they will take longer to settle than coarse sediments (sand & gravel). Methods for calculating the capacity of the sediment control can be found in the CIRIA publication *C648 Control of water pollution from linear construction projects – technical guidance*. The different types of control measures are described below.

For any activities that have the potential to impact on fisheries habitat the Inland Fisheries Ireland documents *Guidelines on the protection of fisheries during construction in and adjacent to waters* and/or document *Maintenance and Protection of the Inland Fisheries Resource During Road Construction and Improvement Works* must be consulted.

For all NRA contracts the NRA *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes* must be consulted.


All guidance documents are available from the HSE Department.

EP-10	Surface Water Control			
Note: Always print or copy to double-sided pages	PROC. NO: EP-10	REV: 04	DATE: 10.03.2016	PAGE: 3/6

Surface Water Management Procedure:

This procedure and the associated control measures may be attached to or included in method statements.

1. Prior to any work that may affect a watercourse the environmental sensitivity and level of protection of the waterways must be established by **consulting the appropriate authority** – either Inland Fisheries Ireland, Irish Water, the Local Authority, NRA, Waterways Ireland (for any canals), National Parks and Wildlife Service (NPWS).
2. The relevant authority(ies) may specify requirements for design or construction and must be kept informed through regular liaison during the works.
3. Wherever possible surface water flowing onto the site should be diverted around, over or under the construction area to prevent clean water entering excavations and becoming contaminated and avoid the movement of vehicles through watercourses. Water should be diverted using pipes or temporary **culvert / stream diversions** (lined with clean stone or geotextile material) and discharged downstream of the work area. All affected watercourses should be diverted prior to the commencement of earthworks.
4. Where possible it is preferable to direct sediment-laden water to a vegetated area, particularly grass, which will provide a physical barrier to improve filtration and also slow water flow, thus increasing infiltration. This is often more effective than other built control measures. Areas of vegetation that may be used for this purpose should be identified prior to site stripping and retained. In particular, maintaining stream bank vegetation will provide an effective filter strip for surface water containing sediment.
5. Any sediment-laden water that accumulates within the work area either through surface water runoff or groundwater ingress must be channelled and intercepted at regular intervals, or mechanically pumped, to appropriate **surface water controls** prior to discharge to any watercourse. Details of different control measures are given below.
6. It is better to install control measures nearest to the source of sediment and as far as possible from the discharge point (i.e. where the water enters the waterway). This allows more opportunities to install additional measures should further treatment of the water be required.
7. **Drainage** must be designed or altered so that all contaminated or sediment laden water from the construction site, including any water pumped out of excavations, flows to the control measures and not directly to any watercourse or stormwater inlet.
8. Where site water is being pumped into catchment areas such as v-ditches or sediment ponds, ensure the capacity of the structure can contain the volume of water being pumped
9. Ensure that the discharge from sediment traps, tanks or ponds outflows to a vegetated filter strip or through clean stone and not directly into a waterway. Overflow will usually occur when the capacity of the control measure has been exceeded so the additional filtering will assist to minimise pollution.
10. Where work is being conducted in, over, or directly adjacent to sensitive or protected watercourses surface water control measures may need to be specifically designed by a specialist consultant. Such measures may include in-stream controls such as floating sediment curtains, and drainage and sediment pond systems designed to particular flow capacities.
11. The type of surface water controls to be used and their location, including drainage changes, must be specified in the **activity specific method statement** for the work to be undertaken.
12. **Regular inspection** and maintenance of any surface water control measures is required to ensure they remain effective. For example sediment must be removed from sediment tanks to ensure they continue to operate effectively and filtering measures checked to ensure no breaks.
13. **Routine water quality monitoring** may be specified as a requirement by the client and/or regulatory authority, to ensure water pollution does not result from site activities. In such cases, waters which encroach or run through the site would be checked on a regular basis for signs of pollution – if anything is noticed photos must be taken and areas and sign recorded. Additional monitoring would be undertaken up and downstream of the discharge point to determine what impact the discharge is having on the watercourse. Water samples must be analysed by an accredited laboratory. A specialist consultant can assist in setting up the sampling regime and may also undertake

EP-10	Surface Water Control			
Note: Always print or copy to double-sided pages	PROC. NO: EP-10	REV: 04	DATE: 10.03.2016	PAGE: 4/6

ongoing sampling.

For any further advice contact the Company Environmental Coordinator, HSE Department.

Surface Water Control Measures:

When designing and constructing sediment controls always ensure they are of a sufficient capacity to effectively treat the volume of water expected and identify additional overflow areas.

References given are for further information, including design drawings, cases studies and example photographs

Diversion Drain (CIRIA 648 - 18.6.8)

Diversion drains are simple linear ditches used to channel water to a desired location, such as a sediment pond or discharge point. They may be used to divert runoff around disturbed areas, away from slopes or to a slope drain. If there is a risk that the diversion drain itself will erode it should be lined with geotextile fabric and/or clean stone and check dams may be installed.

Slope drain (CIRIA 648 - 18.6.10)

A slope drain is a pipe or lined channel used to drain runoff from the top of a slope to the bottom without causing erosion. It is used in conjunction with other controls, such as diversion drains, to confine flow to the designated slope drain.

Filter strip / buffer (CIRIA 648 - 18.6.1 & MDOT 4)

A filter strip or buffer is an existing vegetated area. When overland sheet flow is carried across the vegetation suspended solids are removed and water infiltrates into the ground. Filter strips are suitable for smaller volumes of water with small suspended solid loads. They can become smothered by high sediment loads and eroded by high flows of water and are normally used in conjunction with other control measures.

Grass swale

Swales are open grassed or vegetated channels that slow water flow, increasing infiltration and filtering out pollutants. They depend on well established vegetation and can be eroded by large volumes of water. Treatment performance can be increased by the construction of weirs and check dams to slow the flow of water.

Filter ("French") drain

A filter drain is a narrow linear drain containing granular material such as stone or gravel that filters out sediment prior to discharge. The drain may also contain a perforated pipe and is best suited to small sites or limited runoff areas where sediment loads and water volume are small. May also be installed adjacent haul roads.

Sediment / silt trap or sump (CIRIA 648 - 18.6.11 & MDOT 8)

Small excavation for low flows of diverted or pumped water, usually allowing infiltration into the ground. May be lined with geotextile material or clean stone to prevent scouring. Such traps are often placed near watercourses and it is important to ensure that any overflow is directed over a vegetated filter strip or through clean stone prior to entering the watercourse.

Sediment / silt tank


A prefabricated tank, usually containing a number of separate chambers, allowing sediment to settle out of the water. These are most effective when treating low flows and coarser sediments, although a flocculant may be used to assist the settlement of finer material. A number of tanks may be used together to increase capacity. Must be regularly inspected and sediment will have to be removed to remain effective.

Sediment Pond / Basin

A sediment pond is used when high volumes of water and sediment loads are expected, typically on large projects where there is a large disturbed area. Sediment ponds may be part of the permanent works on such projects. A number of ponds may be used, allowing flow between them, thus increasing capacity and retention time.

Check dams (CIRIA 648 - 18.6.11 & MDOT 14)

A check dam is usually constructed from clean stone placed in a grass swale or existing drainage line to slow the flow of water and increase infiltration. When using check dams always ensure that they are level across the channel so that water does not scour the banks on one or both sides of the check dam. Geotextile fabric may be placed on banks to

EP-10	Surface Water Control			
Note: Always print or copy to double-sided pages	PROC. NO: EP-10	REV: 04	DATE: 10.03.2016	PAGE: 5/6

prevent scour and over check dams to further reduce flow, if required.

Surface Water Control Measures (cont.):

Sediment fence & Straw Bale filter (CIRIA 648, 18.6.12, MDOT 9)

Sediment fences and straw bale filters are permeable barriers used to remove the sediment from, and break the flow of, sheet flow runoff. They should be placed as close as practical to the work area and can also be used in filter strips to reduce water flows. They can also be placed around stockpiles to prevent loss of material. Geotextile fabric is usually used to construct sediment fences and can also be wrapped around straw bales to increase their effectiveness.

Riprap (MDOT 5)

Riprap is a layer of stone laid over an exposed surface to provide a non-erodible cover, dissipate flow and prevent erosion. A geotextile liner is usually installed under the stone. May also be installed in stream beds and culverts.

For assistance in implementing any control measures or further information contact the Environmental Coordinator.

Other Measures

Additional measures that assist surface water controls and should also be considered include:

- vegetation and topsoil retention – by reducing the area of exposed surfaces, the potential for erosion is minimised. This also assists dust control (refer to Procedure EP-08);
- stabilised site access – either using aggregate, tarmac or concrete, providing an area to wash vehicle wheels before leaving site and minimise sediment loads on public roads;
- truck wash and wheel wash facilities – as above;
- Control of potentially polluting substances such as fuels and oils by providing storage areas that are bunded and isolated from the drainage system (refer to Procedure EP-14 and EP-15).
- Providing drip trays for all water pumps and other static equipment and ensuring the use of drip trays when refuelling mobile equipments, which should be undertaken in a designated area away from watercourses.

For further advice or information contact the Environmental Coordinator, on 045 886557

References:

CIRIA C532 (2001) Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors

CIRIA C648 & C649 (2006) Control of water pollution from linear construction projects – technical guidance & site guide

CIRIA C650 (2005) Environmental Good Practice on Site

Inland Fisheries Ireland (2016) Guidelines on the protection of fisheries during construction in and adjacent to waters

MDOT (Michigan Department of Transportation) - Construction Site Soil Erosion and Pollution Prevention Pocket Guide

NRA (2006) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.

Inland Fisheries Board (2007) Maintenance and Protection of the Inland Fisheries Resource During Road Construction and Improvement Works – Requirements of the Inland Fisheries Board.

Irish Statute Book – www.irishstatutebook.ie

*For inspection purposes only.
Consent of copyright owner required for any other use.*



ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

Appendix 3

Construction Environmental Management Plan



Environmental Management Plan

Bantry Inner Harbour Development Phase 1

Document Revision No: 02			
Reason For Issue: For client approval			Client Approval (if required)
Originator	Reviewer	Approver	
Brian Abbott	Seamus O'Sullivan	Seamus O'Sullivan	Port of Cork

Copy	Circulation:	Name	Company	Location
1	Contract Manager	Liam Collins	BAM	Site
2	Project Manager	Seamus O'Sullivan	BAM	Site
3	General Foreman	Jack Tuohy	BAM	Site
4	Site Health, Safety & Environmental Officer	Alan Mullins	BAM	Site
5	Co. Environmental Coordinator	Brian Abbott	BAM	Head Office, Kill

Contents

1. General Project Details	3
1.1 Introduction	3
1.2 Description of the Works	3
2. Environmental Management System	4
2.1 Organisation Chart	4
2.2 Communication	4
2.3 Responsibilities	5
3. Environmental Management Arrangements	6
3.1 Environmental Management	6
3.2 Communications	7
3.3 Suppliers and Subcontractors	8
4. Summary of Emergency Procedures	10
5. Environmental Planning, Aspects and Controls	10
5.1 Environmental Risk Assessment	10
5.2 Environmental Risk Assessment Report	10
5.3 Environmental Assessment and Management Controls	10
5.4 Method Statements	10
6. Environmental Compliance Requirements	11
6.1 Consultation with Relevant Authorities	11
6.2 Site Restrictions & Hold Points	11
6.3 Table of Environmental Licences, Permits and Permissions	12
6.4 Company Policy & Procedures	12
6.5 Relevant Statutory Provisions	13
6.6 Design Requirements	13
6.7 Control of Documents	13
7.0. Environmental Objectives & Targets	14
7.1 Environmental Management Targets	14
7.2 Initiatives to ensure compliance with BAM Targets	16
8.0. Environmental Control Measures	17
8.1 Water Pollution Control	18
8.2 Noise & Vibration Control	19
8.3 Air Pollution Control	24
8.4 Habitat (Flora & Fauna) Protection	24
8.5 Waste Management (incl. Hazardous Waste)	25
8.6 Hazardous Materials Handling & Storage	26
8.7 Vermin Control	27
8.8 Landscape	27
8.9 Archaeology	27
9. Management Review	27
10. Training & Competence	28
10.1 Recommended Toolbox Talks	28
Appendix 1: Table of Requirements for ISO14001	30
Appendix 2: Table of Contractual Requirements for Environmental Management	32
Appendix 3: Environmental Risk Assessment Report	34
Appendix 4: Site Maps	35
Appendix 5: Environmental Policy	38

1. General Project Details

Project Name	Bantry Inner Harbour Development Phase 1		
Project Location	Bantry , Co. Cork		
Client	Port of Cork (PoC)		
Contract Manager	Liam Collins		
Start Date	8 Feb 2016	Duration (Months)	16 months
Completion Date (Expected)	30 June 2017		
Primary Project Type	Marine project		

Project Description:

1.1 Introduction

This environmental Plan has been written in accordance with BAM Contractors Environmental Procedures. The controlled copy of all environmental procedures is hosted on Sharepoint.

This Plan is a working document, clearly stating the arrangements in place to manage the significant environmental aspects and legal requirements of this project. This Plan covers BAM Civil activities and that of its Subcontractors.

This Plan has been approved by the HSE Department at Kill and has the commitment of the Project Manager and Engineers to fulfil the requirements of the plan.

1.2 Description of the Works

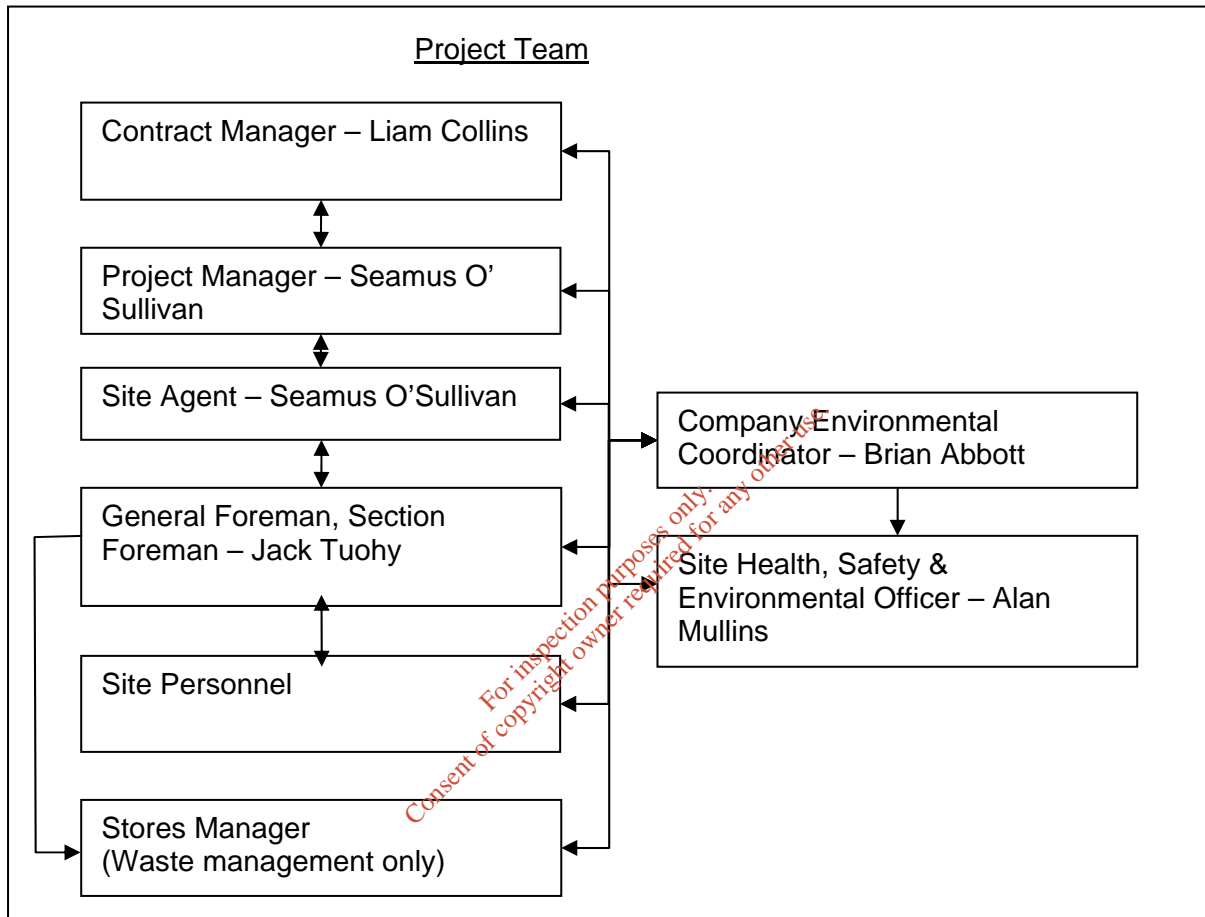
The purpose of the scheme is to provide a sheltered harbour environment and marina with increased water depth and improved pier facilities to promote fishing and tourism activities in the Bantry area. This will also provide additional and improved recreational and amenity areas at the inner harbour. As a means of making use of the dredged sediments it is intended to make beneficial re-use of clean dredged material at adjacent, and connected, locations for land reclamation. The main components of the proposed development at Bantry are as follows:

1. Dredging of Harbour Basin;
2. Fishing Docks and Quay Wall Improvements;
3. Revetment construction;
4. Fishing Pier Refurbishment;
5. Land Reclamation within Bantry Harbour;
6. Breakwater and Open Pile Quay Construction;
7. Installation of pontoons and Marina Services;

2. Environmental Management System

Project Roles and Responsibilities

2.1 Organisation Chart



2.2 Communication

The principal lines of internal communication in relation to the EMP are shown above. Environmental issues are communicated to staff through the site induction, toolbox talks and monthly safety meeting.

Communication with other external parties will be in accordance with the consultation requirements (section 6) and in response to complaints (section 3).

2.3 Responsibilities

Company	Role (Job title)	Environmental Management Responsibilities
BAM Civil	Company Environmental Coordinator	Conducts Environmental Risk Assessment, advises on environmental issues and controls, and conducts internal environmental audits.
BAM Civil	Contract Manager	Approves and implements EMP
BAM Civil	Site / Project Manager	Monitors implementation of control measures, ensures that activities, including subcontractor activities, comply with the requirements of the relevant performance requirements.
BAM Civil	Site Safety, Health Environmental Officer	Conducts weekly environmental inspections; carries out toolbox talks on environmental issues. Coordinates emergency response, including spills. Checks spill kits and orders spill control materials when required
BAM Civil	Site Engineer	Ensures that works are carried out in accordance with the EMP and with the approved works method statement. Includes Environmental matters in weekly site inspections.
BAM Civil	Section Engineers / Foreman	Carry out toolbox talks; coordinates water/noise/dust monitoring and remedial actions; ensures that works are carried out in accordance with the EMP and with the approved works method statement. Performs environmental inspections.
BAM Civil	Quantity Surveyors	Tracks the costs associated with the implementation of environmental matters and forwards to the Company Environmental Coordinator as required.

3. Environmental Management Arrangements

3.1 Environmental Management

The environmental management system (EMS) complies with the ISO 14001:2004 standard. Those aspects of the EMS relevant to this project are outlined in this document which also contains references to specific procedures.

3.1.1 Planning

The environmental planning for the project is based on information from:-

- The clients project information and tender documentation
- Planning Permission register number 12/00735
- Bantry Inner Harbour Development Environmental Impact Statement; RPS 2012
- EPA waste licence for waste management activities at Bantry harbour (pending)

Such information has been used in the environmental assessment of the activities for this project.

3.1.2 Monitoring and checking

The significant environmental aspects of the project are monitored regularly by carrying out the following at the frequency stated below:-

Monitoring and Checking	Frequency
Environmental Inspections by Site Managers	Monthly
Environmental Inspection by Foremen	Weekly
Environmental Inspections by HSE Officer	Weekly
Environmental Audits by Env Co-ordinator	Quarterly
Surface Water Inspections (recorded)	Continuous & Daily
Surface water inspection (visual)	Daily
Noise and Vibration Monitoring	Weekly
Dust Monitoring (visual)	Daily
Dust deposition monitoring	Monthly
Marine Mammal Observer	Daily
Dredge material (WAC analysis)	1 sample per 1000m ³ of dredging
Slump testing on stabilised dredge material	5 sample per treated cell
Mussels in Inner Bay for Mercury and heavy metals	Immediately before, (ii) 2 weeks after and (iii) 3 months after dredging

3.1.3 Action Register

A record of environmental management actions is to be kept on site. The progress for all actions is reported regularly to the appropriate member of the Management Team and as per the EPA waste licence conditions. Such actions will include information taken from:-

- Environmental inspections
- Audit actions: non-conformances and observations
- Progress of actions following environmental incidents
- Significant communications with stakeholders
- Project issues requiring management action
- Complaints

These actions will be closed out, signed and dated by the appropriate person in the appropriate timeframe.

3.1.4 Performance

Environmental Performance of the project is monitored by:-

- Environmental review meetings as a part of the Monthly Safety Meetings
- Site inspections
- Audits conducted by the BAM HSE Department
- Audits conducted by the Port of Cork
- EPA inspections for compliance of the waste licence
- A review of the quantities of waste created
- External communications and feedback
- Review of objectives and targets (targets table section 7)
- Corporate Social Responsibility (CSR) reporting

3.2 Communications

3.2.1 Environmental Complaints

All environmental complaints will be recorded in the project Complaints Register. The Register is maintained on site by a nominated member of the Management Team who also allocates responsibility for resolving any issues and follows up complaints to ensure they are resolved. Any issues that are deemed to be significant will be reported to the Site Management Team and the relevant authorities as appropriate. Complaints are reviewed during internal audits by the Environmental Coordinator, where any additional measures to improve performance are discussed. Complaints are reported to Head Office also. See EP-24 Complaints and Incident Procedure for more details.

All complaints received from external sources and incidents must be reported to the Project Manager, the EPA (for waste management activities) and a representative of the Port of Cork.

All notifications, records and reports will be submitted to the EPA as per the sites waste licence.

3.2.2 Environmental Incidents

Environmental incidents related to activities controlled under the site's EPA waste licence, will be reported to the EPA as per waste licence conditions and the EPA's "Guidance to Licensees/COA holders on the Notification, Management and Communication of Environmental Incidents".

Under this reporting system the environmental impact assessment criteria is as follows:

Ranking	Classification	Impact on the environment
1	Minor	<p>No contamination, localised effects</p> <p>Minor effect on air quality as evidenced by dust or odour complaint(s) ELV breaches</p> <p>An emission which does not comply with the requirement of the licence/COA (A pattern of repeated minor incidents should be taken into account when considering the level of response)</p>
2	Limited	<p>Simple contamination, localised effects of short duration</p> <p>Local limited impact to water, land and air</p> <p>Notification to and short term closure of potable water extractors required</p>

3	Serious	Simple contamination, widespread effects of extended duration Significant effects on water quality Major damage to an ecosystem (e.g. significant impact on fish population) Longer term closure of potable water extractors Significant reduction in amenity value Significant Damage to agriculture or commerce Significant Impact on man
4	Very Serious	Heavy contamination, localised effects of extended duration
5	Catastrophic	Very heavy contamination, widespread effects of extended duration

The following shall be notified, as soon as practicable after the occurrence of any incident which relates to a discharge to water:

- i. Inland Fisheries Ireland / Department of Agriculture, Food and the Marine in the case of discharges to receiving waters
- ii. Marine Institute (MI), Sea Fisheries Protection Authority (SFPA), Food Safety Authority of Ireland (FSAI) and an Bord Iascaigh Mhara (BIM) in the case of discharges to or likely to impact a shellfish water.
- iii. Cork County Council, in the case of discharges to designated bathing waters
- iv. PoC, Cork County Council and Irish Water, in relation to discharges to sewer

Incident notification records shall include details of the nature, extent, and impact of, and circumstances giving rise to, the incident or accident. The record shall include all corrective actions taken to manage the incident or accident, minimise wastes generated and the effect on the environment, and avoid recurrence. In the case of a breach of the waste licence conditions, measures to restore compliance. The licensee shall, as soon as practicable following notification, submit to the Agency the record.

Environmental incidents relating to the all project works and not just those governed by the proposed EPA waste licence will be reported under the BAM HSE incident reporting system (see company environmental procedures EP-06 Environmental Incident procedure and EP-24 Complaints and Incident Procedure.

Actions with regard to specific incidents including water pollution and exceeding the limit levels for dust, noise and vibration, are detailed in Section 8.

Report all Environmental Incidents immediately to the HSE Department 045 886557.

3.3 Suppliers and Subcontractors

3.3.1 Subcontractors

All subcontractors will be required to work in accordance with BAM Civil site specific Environmental Management Plan. Works operations will be managed by the relevant Project Managers / Site Agents to ensure appropriate procedures are being followed. ISO 14001 states consideration should be given to aspects related to the organisations activities, products and services such as environmental performance and practices of contractors and suppliers. In order to achieve this, we ensure our subcontractors sign contracts which state they must comply with our environmental policy, our EMS and work within the Environmental Legal Framework while working for us on our projects.

During the recruitment stage, we would enquire as to whether they had been prosecuted with regard to breaching environmental legislation and this would also be considered. We would also enquire to the progress of their environmental management system (or equivalent) to ensure they were working in a responsible fashion and in a way which would be of a similar fashion to BAM Civil. Lines of communication would also be outlined during this recruitment stage to ensure they were aware of our environmental management system and how this will affect them and what they need to achieve in order to be suitable candidates for our projects.

A subcontractor appraisal form is in use and can be accessed through COINS. This document will be used to ensure subcontractors who are not sufficient are not permitted on any future BAM sites.

A list of subcontractors has been identified below:-

Contract	Company	Environmental Contact	Commencement Date	Duration
TBC				

3.3.2 Suppliers

All suppliers and sub-contractors are made aware of the company's environmental requirements where it is possible they could produce waste or pollution. An employee supervises all deliveries of environmental hazardous materials e.g. diesel fuel and oil drums.

4. Summary of Emergency Procedures

- Environmental Emergency Preparedness and Response Plan
- Containing and cleaning up spills (EP-15)
- Environmental Incident Procedure (EP-06)
- Environmental Complaints and Incidents Procedure (EP-24)
- Sharepoint online incident tracking system

5. Environmental Planning, Aspects and Controls

5.1 Environmental Risk Assessment

A number of site visits have been carried out by BAM staff where notes were produced which identified any significant environmental aspects. These notes were compared with the environmental information supplied by the client's representative and have been used as a basis for performing the environmental risk assessment.

5.2 Environmental Risk Assessment Report

The significance of all the environmental aspects for each activity on the project have been assessed. The assessment followed the method defined in EP-02 Environmental Risk Assessment.

Please see appendix 3 for the risk assessment report for this project.

5.3 Environmental Assessment and Management Controls

The management controls, which have been put in place, are appropriate to the nature, duration and scale of the activity on this project and the particular sensitivity of the local environment. They will be revised in the event of any significant changes to the scope of the activity during this project, especially when there is additional works, or a change in the method of works.

Additional management controls shall be adopted when there are changes to client requirements, stakeholder interests to a particular local environmental sensitivity.

The significant risks which are highlighted in the risk assessment and the management controls are communicated to the workforce by site inductions and toolbox talks.

5.4 Method Statements

The significant environmental aspects and the actions to apply the required controls are described in the method statement.

Method statements are produced in accordance with the contract requirements by the Site Management Team and reviewed by the Project Managers / Site Agents prior to submission for approval. When developing method statements, the EMP, Site Maps and any other relevant environmental management documents shall be reviewed to assess the potential impacts of the particular activity.

All method statements shall include a section entitled "Environmental & Waste Management". For activities that have significant potential to cause adverse environmental impacts reference will be made in this section of the M/S to the control measures in Section 8 of the EMP. Additional control measures may be included where those in Section 8 prove

inadequate to suit the local conditions at the site of the activity, and/or where specific measures are required by any of the authorities. The method statement must include:-

- Reference to the EMP and WMP
- The proposed method of construction and how impacts shall be mitigated
- Waste (storage, removal, end disposal sites where known)
- Hazardous Substances (storage, removal and end disposal sites where known)
- Works close to waterways (sediment controls if needed)
- Dust
- Noise and Vibrations
- Refuelling
- Fuel storage
- Drip trays/spill kits and other precautionary measures

Prior to the commencement of the works, all Method statements will be reviewed by a competent person by referring to Section 8 of the EMP. Following the review, improvements will be made to the method statements as required.

6. Environmental Compliance Requirements

In accordance with Environmental Procedure 01 (EP-01) Environmental Compliance Assessment, a review of all relevant literature and contractual requirements relevant to the contract will be completed.

- Planning Conditions
- Contract Documents
- Preliminary Health and Safety Plan
- EPA waste Licence (pending)
- All other contractual conditions and documents

These requirements have been tabulated in Appendix 2 (table of contractual requirements) to demonstrate how each of the requirements is addressed in the EMP.

Evaluation of Compliance

Compliance will be evaluated through inspections and audits and also reviewed at the regular site management meetings.

6.1 Consultation with Relevant Authorities

Consultation has been undertaken with the following authorities:

- Bantry Town Council
- Cork County Council
- EPA
- Inland Fisheries Ireland
- Port of Cork
- National Parks & Wildlife Service

6.2 Site Restrictions & Hold Points

In accordance with the contract clauses or notification from the Port of Cork the following environmental restrictions apply to the construction of the works:

Clause	Restriction – refer to Contract and planning conditions for complete details
--------	--

	Bantry Inner Harbour Development Phase 1, Works Requirements Specifications Oct 2015
	Bantry Inner Harbour Development; Environmental Impact Statement; RPS; Aug 2012
	Cork County Council Planning Register Number 12/00735
	EPA Waste Licence (pending)

6.3 Table of Environmental Licences, Permits and Permissions

6.3.1 Maintaining arrangements for environmental licence, permits and permissions

These are all legal documents associated with the work and may be from a contractor/supplier/client, or it may be an EPA or Local Authority Licences/Permit and will be maintained by the Manager Team on site.

6.3.2 Licences and Permits

PoC will be requested to supply information on the licences and permissions that are required for the project. The Port of Cork will have the responsibility for licence applications.

The relevant environmental regulator may be informed early in the project of the environmental aspects of the work. A meeting on site will be arranged where applicable.

N.B. a copy of all formal licences is to be sent to the HSE Department, Kill.

The following table indicates the licences and permissions that may be required:-

Licence / Permission	Regulator	Operations
Discharge consent into watercourse or sewer	Irish Water	Any solid or liquid entering controlled waters (river, pond, stream, ditch) unless it is clean water
Consent for work near a watercourse	Inland Fisheries Ireland	Any work which include work over or under the water
Derogation Licences	National Parks and Wildlife Services	Cutting of protected trees, protected species (bats, badgers, frogs etc), work in or near any SPA, SAC, NHA) Derogation licences for protection species and removal of invasive species
Permissions / Licences	Department of Environmental, Communities and Local Government	Excavation work in any site containing archaeological remains or natural habitat, protected Monument.
Waste Licence	EPA	Waste facility licence for storage and treatment of contaminated dredge material at Bantry pier
Waste Collection Permit	NWCPO	Waste collection permit for haulage of waste offsite
Waste facility licence/permit	EPA/LA	Appropriate facility licence, permit or COR for the disposal of all waste offsite
Planning Permissions	Cork County Council	All works to be carried out as per Planning Register Number 12/00735

6.4 Company Policy & Procedures

A copy of the Company Environmental Policy is displayed at the project site offices. The policy determines the company's overall approach to environmental management, which is developed through the EMS. This EMP has been developed taking into account the:

- Company Environmental Policy;
- Objectives and targets as specified in the Yearly Environment Plan; and

- Requirements of relevant specific procedures as contained in the Environmental Procedures Manual

6.5 Relevant Statutory Provisions

A library of environmental legislation, relevant codes of practice, standards and best practice guidance documents is maintained at the BAM Head office in Kill, Co. Kildare. This library is updated by the Company Environmental Coordinator through regular reviews or as required by changes in legislation and standards and developments in industry best practice. Legal Register is on sharepoint for general viewing.

6.6 Design Requirements

The environmental requirements for design are reviewed by Malachy Walsh and Partners and incorporated into the design as appropriate. The design requirements are reviewed by the Project Managers and Engineers to ensure that the environmental considerations relevant to the construction works are incorporated into the works.

6.7 Control of Documents

All documents relevant to the construction works shall be kept and stored in accordance with the below table. Documents that are part of the site environmental management system, including inspection reports, monitoring records and meeting minutes shall be kept for the duration of the project as per UKAS (United Kingdom accreditation scheme).

No.	Document	Raised By	Retained By	Statute or UKAS	Currently Held	Retention times (years)
1	Register of Environmental Aspects	Env Co-ordinator	Env Co-ordinator	UKAS	Head Office and Sites	3
2	Waste Transfer notes (where applicable)	External	Env Co-ordinator Site	Statute	Sites	3
3	Hazardous waste transfer notes	External	Env Co-ordinator Site	Statute	Sites	5
4	Waste Collection Permits	Local Authority	Env Co-ordinator	UKAS	Sites	Period of validity +1
5	Waste Facility Permits/Licences	Local Authority/EPA	Env Co-ordinator	UKAS	Sites	Period of validity +1
6	Energy Monitoring Records	Env Co-ordinator	Env Co-ordinator	UKAS	Head Office and Sites	3
7	Water Monitoring Records	Env Co-ordinator	Env Co-ordinator	UKAS	Sites	3
8	Local Authority / Environmental Protection Agency Licences	Local Authority / EPA	Env Co-ordinator Site	UKAS	Sites	Period of validity + 1
9	Environmental communication from external sources	External	Env Co-ordinator	UKAS	Sites	3
10	Audit Reports	Env Co-ordinator	Env Co-ordinator Head Office	UKAS	Head Office and Sites	3
11	Corrective Action Forms	Env Co-ordinator	Env Co-ordinator Head Office	UKAS	Head Office and Sites	3
12	Env N/C or Env	Any member of	Env Co-ordinator	UKAS	Head	3

	Incident Report	staff	Head Office		Office	
13	Water treatment log sheets	Site Staff	Site Staff	UKAS	Site	3
14	Calibration Certificates	External testers	Site Staff/ Env Co-ordinator	Statue	Site	3
15	Environmental Management Plans	Site Staff	Site Staff	UKAS	Sites	3
16	Waste Management Plans	Site Staff	Site Staff	UKAS	Sites	3
17	Environmental Risk Assessment	Env Co-ordinator	Env Co-ordinator and HSE Officer	Best Practice	Head Office	3
18	Department of Arts Heritage and Gaeltacht	Env Co-ordinator	Env Co-ordinator Site	Best Practice	Sites	3

Controlled documents will be:

- Reviewed at least annually and updated as appropriate;
- Marked as superseded once obsolete or destroyed;
- Dated and marked with dates of revisions.

7.0. Environmental Objectives & Targets

The objectives and targets are set in relation to the aspects identified from each site in order to reduce our significant aspects. As a minimum they should include:-

- The prevention of pollution, including emissions to air, water and land
- Nuisance impacts including dust, noise and vibration
- Protection of habitat areas and individual species, if applicable
- Storage and use of fuels and hazardous substances, including spills
- Waste management

7.1 Environmental Management Targets

The environmental management targets for the Bantry Inner Harbour project are as follows.

Targets	Measurable	Methodology	Responsibility	Timescale
Ensure no incidents of pollution to water.	Water monitoring (TTS, Turbidity, TBT etc), Slump testing of stabilised dredge material. No of Environmental Incidents. Quarterly audits, No of complaints reported	Sediment controls to be used (environmental bucket, silt curtain, lined cells for stabilisation methods. No contaminated waters to be discharged to the harbour waters. Work with CIRIA guidelines, site EPA waste licence conditions and apply BAM precautionary measures	Site Management Team	Start to completion
Ensure sediment on roads is cleared.	Raise needs for road cleaning duties during wet or busy periods	Ensure roads are swept and cleaned on a regular basis. Road conditions within the site should be kept clean at all times.	Site Management Team	Start to completion

Minimise waste production	Lean Construction Techniques, segregation more, reuse more (waste hierarchy)	Purchase less, ensure packaging is removed by supplier where possible and other materials reused & recycled	Site Management Team	Start to completion
Minimise fuel and oil spillages from site activities. Bunds to be used with all fuels and oils	Environmental Incidents, spills contained in bunds	Ensure that drip trays are used at all times under static plant, when refilling, & storing, ensure fuel storage areas are bunded.	Site Management Team	Start to completion
Ensure correct disposal of all hazardous wastes e.g aerosol cans	Waste segregation, waste costs	All hazardous wastes to be disposed as per Irish Legislation and BAM requirements	Site Management Team	Start to completion
Lower consumption of materials and fuel on monthly basis (relative to project revenue)	Smart meters, energy bills, service costs	Ensure all energy using equipment is switched off when not in use. Select best value for money providers where possible	Site Management Team	Start to completion
Reduce site electricity by 2.5% on monthly basis (relative to project revenue)	Smart meters, energy bills, service costs	Ensure all energy using equipment is switched off when not in use. Select best value for money providers where possible	Site Management Team	Start to completion
Lower emissions of dust, smoke and fumes during works	Air quality, dust particle increase	Ensure all equipment is well serviced and maintained. Switch of equipment when not in use. Use dust suppression techniques when applicable	Site Management Team	Start to completion
Minimise amount of Public complaints	Complaints received to Site Management Team	Ensure when works which will impede public access are taking place, all residents are informed for the timescale (where applicable) and all restrictions are kept to a minimum	Site Management Team	Start to completion
Minimise water usage consumption	Water charges, waste water disposal (discharge volumes)	All grey water to be reused on site where possible. 'Fresh' water supply to be kept to a minimum where possible. TBT-12 Water on Construction Sites	Site Management Team	Start to completion
Minimise airborne & groundbourne noise	Noise triggers breached (where applicable)	All construction noise limits set out in the requirements will be adhered to.	Site Management Team	Start to completion
Minimise vibration	Vibration triggers breached (where applicable)	All vibration limits set out in the works requirements will be adhered to.	Site Management Team	Start to completion
Ensure no vehicle movement and material placement does not cause damage to flora and fauna	Correct habitat protection used. Wildlife surveys where applicable	All fauna/animal species to be untouched where possible. Professional advice to be sought on removal procedures	Site Management Team	Start to completion

The standard environmental management measures for the project are to:

- Conduct all activities in accordance with the:
 - Company environmental policy and procedures;
 - Relevant statutory regulations and provisions;

- Contractual requirements with the client; and
- Requirements of relevant authorities;
- Minimise adverse environmental impacts during construction;
- Enhance natural environments during the course of construction, where practical
- Reduce the significance of our aspects and impacts through our working methods

The standard environments objectives and targets which must be met on all sites as part of our EMS system:

- Conduct all operations within the limit levels set out for noise, dust and vibration (i.e. Zero exceedences);
- Zero water pollution incidents;
- Zero cross contamination of inert or non-hazardous materials with hazardous substances or contaminated soil;
- Hazardous substances including fuels and oils to be banded at all times.
- Compliance regarding waste management i.e. licensed waste contractors, permits etc.
- All contaminated materials to be managed in manner which prevents further contamination and to be disposed to appropriately licensed facilities.

In order to help achieve these targets, the below table highlights compliance tools.

7.2 Initiatives to ensure compliance with BAM Targets

Sites	Area	Objectives & Targets	Method for achieving	Assistance by HSE Dept. (method)	Responsibility
All sites and offices	Waste	Reduce waste sent to landfill by 2%	Adhere to the waste hierarchy. Lean construction techniques	EA-30 Excavated materials on site (<i>Article 27 Notification Forms</i>). CIRIA documents on Lean Construction	Site Teams and HSE Dept.
		Increase site segregation of construction waste by 2%	Additional recycling skips on site Increase staff knowledge and participation	EP-16 waste definitions and classifications, TBT-03 Managing Waste, TBT-02 Environmental Awareness, EB-11 Site Set up	Site Teams and HSE dept.
		Increase recycling rates	Increase site awareness of improved waste management practices	Waste posters, environmental alerts and bullets to be issued focusing on new waste strategies	Site Teams and HSE Dept.
All sites and offices	Energy	SMART Meters for all sites	SMART meters installed in cabins	Advice on installation and data collected	Site Teams and HSE Dept
		Reduce CO ₂ emissions by 2%	Implement an energy reduction initiative in sites and offices	Environmental information to be issued focusing on new waste strategies	Site Teams and HSE Dept
		Temperature control in cabins	Thermostats installed	Advice on installation and data collected	Site Teams and HSE Dept
		Energy initiatives	SEAI Initiatives	<ul style="list-style-type: none"> ● Online calculation tools (energy) ● Energy posters ● Relatively paperless sites 	HSE Dept IT Dept.

Sites	Area	Objectives & Targets	Method for achieving	Assistance by HSE Dept. (method)	Responsibility
		Reduction in fuel usage / air emissions	Car Purchasing	Procurement of low emissions vehicles by Plant Department. Video conferencing capabilities in Offices to cut down on travel times, emissions.	Site Teams and HSE Dept
All sites and offices	Env Auditing & Performance	All sites to achieve 'Pass' mark from quarterly audits	Quarterly audits	Regular environmental information and directions to be issued to the sites	Sites Teams and HSE Dept.
		Appraisal system for environmental performance	Subcontractor appraisal system (COINS)	Detailed information of the systems and scores circulated to all.	Sites Teams and HSE Dept.

8.0. Environmental Control Measures

Control measures will be implemented both on an activity specific basis for the area of works, and independently of any specific activities as part of the general site management. Throughout this section reference may be made to standard procedures contained in the Environmental Procedures Manual that shall be adopted on site. The Environmental Procedures are available on sharepoint.

The project shall be developed in accordance with the control measures and with reference to the following guidance documents:-

- BRE (2003) Control of dust from construction and demolition activities;
- BS 5228-1: 2009 + A1: 2014 : CoP for Noise and vibration control on construction and open sites: Part 1: Noise
- BS 5228-2: 2009 + A1: 2014: CoP for Noise and vibration control on construction and open sites: Part 2: Vibration
- BS 5837: 2012 Trees in relation to design, demolition and construction works
- BS8895-1:2013 Designing material efficiency in building projects Part 1: CoP for strategic definition
- CIRIA 650 (2005) Environmental Good Practice On Site (Second Edition);
- CIRIA 532 (2001) Control of Water Pollution from Construction Sites – Guidance for consultants and contractors;
- Inland Fisheries Ireland (2016) Guidelines on the protection of fisheries during construction in and adjacent to waters
- Fisheries Guidelines for Local Authority Works (Department of Marine and Natural Resources, 1998).
- Dept Arts, Heritage & Gaeltacht (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters

Other guidance documents may be referenced for specific issues throughout this section. Copies of these documents are held by the Company Environmental Coordinator and on Sharepoint.

The control measures and monitoring requirements listed in this section must be implemented throughout the project.

8.1 Water Pollution Control

All watercourses that are potentially impacted by the works are identified on the site maps included in Appendix 4.

8.1.1 Water Pollution Control Measures

The potential for the construction and dredging works to have an impact on the water quality in the harbour and nearby shellfish waters shall be minimised through the implementation of the following control measures, which have been developed with reference to the guidance contained in EP-10 Surface Water Control, EP-13 Bulk Fuel & Oil Storage, EP-14 Storage & Handling of Hazardous Substances and EP-15 Containing & Cleaning Up Spills.

Mitigation measures during the dredging process will include the use of environmental dredging buckets fitted to the dredging excavators and the use of a 'Dig Master' system which facilitates for specific positioning of the dredge bucket. A silt curtain will also be used if required to minimise any sedimentation from the dredge material.

Once the material is excavated from the dump barge it will be placed in cells behind the Amenity area revetment where the water collected during the dredging operation can drain prior to the material being stabilised. The water draining from the dredge material will naturally filter through the geotextile and rock revetment of the Amenity area.

Analysis of the sediment sampling undertaken for the project in 2015 has classified the contaminated dredged material as non-hazardous (EWC Code 17 05 04) according to the HazWasteOnline Classification Tool. Based on the QRA undertaken by the project designers, it is not considered that there is a significant contamination potential from the movement and placement of the dredge spoil material.

Once the material has dewatered it will be treated using cement stabilisation. The stabilisation treatment is a remediation technology that reduces the mobility of contaminants. Immobilisation is achieved by reaction of contaminants with reagents to promote sorption, precipitation or incorporation into crystal lattices, and/or by physically encapsulating the contaminants. The method produces a high strength monolithlike product that physically reduces the mobility and chemically binds contaminants to the produced matrix. The treated mass can then be incorporated into the permanent works as engineered fill.

All treated materials will be tested as per Appendix 1/73 and dredging, treatment and disposal records maintained as per Appendix 6/71 of the Works Requirement Specification.

To mix the cement through the wet dredge material, BAM will mount an Allu PMX500 power mixer to a 35 ton excavator. This is a rotating agitator mixing which will feed and mix the cement from Allu PF7+7 power feeder with Allu DAC system into the dredge material, the attachment is powered by the hydraulics of the excavator. The agitator will be lowered into the cell of dredge material and the cement added through the agitator. The agitator then mixes the cement through the dredge material ensuring the mix is homogeneous throughout. The material is then for a sufficient period for the chemical reaction between the water and cement to take place. Once the moisture content of the material is reduced to the required levels it will be placed and compacted into the permanent works.

Any other wastes such as tyres, trolleys, traffic cones found in the dredge material will be collected in site skips and removed to a licenced/ permitted waste facility by an appropriately permitted waste contractor. These wastes will be identified when loading onto the dredging

barge or at the waste treatment area. In either situation, the waste will be manually separated from the dredge material and placed in quarantine area prior to removal offsite.

Dredging of the harbour will be limited to periods between November to March so as to reduce the potential to pollute or disturb any nearby spawning and shellfish areas.

8.1.2 Water Quality Monitoring

Water monitoring will be carried out through automatic sampler buoys which will be located externally to the harbour and supplied by PoC. These samplers will measure total suspended solids and water turbidity.

In addition to this BAM will take one water sample daily for laboratory analysis. These samples will be analysed for

- Suspended sediment concentration;
- Turbidity;
- TBT

Samples will be taken at the mouth of the harbour and at the higher of mid depth or 3m below the water surface. Water samples will be collected and stored in accordance with the testing laboratory's instructions. The water samples will be transported to the lab every Friday in cooled sample boxes. Consultation will be held with the environmental laboratory to ensure that all testing takes place within recommended timeframes.

Results from this environmental monitoring shall be reviewed by the Site Management team upon receipt to verify that operations are within the limits specified. Limit levels will be set based on background levels. These levels will be determined by the Client prior to works commencing. The limit levels shall not exceed 30% above background levels. Results will be provided by Tuesday of the following week and supplied to the Resident Engineer.

8.1.3 Water Pollution Incidents

Should any monitoring or inspections indicate that pollution of the Bantry Inner Harbour Development Phase 1 project has occurred then the site management team shall immediately inspect the waste treatment area and sediment control facilities to ascertain whether they are operating effectively. All operations may be stopped and/or additional control measures installed to prevent further pollution to the harbour. Appropriate action shall be taken in consultation with the Site Agent. Water sampling with additional parameters will be tested to ensure all pollutants are identified. As described in section 3.2.2, incidents will be reported to the EPA and other relevant authorities immediately, and logged on the BAM Incident Register as per EP-24 Complaints and Incidents Procedure.

8.2 Noise & Vibration Control

The primary sources of noise and vibration associated with the contract have been identified in the project EIS as follows:

- Construction plant

Activity	Plant	Noise Level (dB L _{Aeq}) at 10m
Demolition / Site clearance / Excavation / Removal of waste/rubble	Bulldozer	80
	Excavator	82
	Lorries (drive by)	70
	HGV and tippers	84
Rock Breaking	The Noise level generated during rock breaking, possibly using explosives, will depend on the type and amount of explosive and / or the machinery used. The resultant noise would also be modified by water depth although to what degree is unknown.	
Piling	Hydraulic Piling	89
	Vibratory Piling	88
	Large Rotary Bored Piling	83
	Continuous Flight Auger Piling	79
Dredging	Ship chain bucket	96
	Digging out river bed: Tracked Excavator Water Pump	85
	Loading dredged aggregates: Wheeled Loader	84
Foundations	Compressor	81
	Water Pump	80
	Concrete Pour	86
	Place and vibrate concrete cycle	80
	Cement Mixers	74
Steel Erection	Large crane operations	86
	Articulated lorry	70
Concrete Frame	Large crane operations	86
	Place and vibrate	80
General Construction Works	Surfacing	85
	Internal fit/ bricklaying	70
Road works/landscaping	Surfacing/rolling	76 - 86
Infilling/ Levelling	Dump truck	82
	Wheeled excavator/ Loader	78
	Dozer	80

Activity	Predicted "Worst - Case" Construction Noise Level dB L _{Aeq, 1 hour} at noise sensitive receivers			
	@ 50m	@ 100m	@ 150m	@ 200m
Demolition / Site clearance / Excavation / Removal of waste/rubble	72	64	60	57
Dredging	73	65	61	57
Hydraulic Piling <u>or</u>	74	66	62	58
Vibratory Piling <u>or</u>	73	65	61	57
Large Rotary Bored Piling <u>or</u>	68	60	56	52
Continuous Flight Auger Piling	64	56	52	48
Foundations	73	66	61	58
Steel Erection	71	63	59	56
Concrete Frame	71	64	60	56
General Construction Works	70	62	58	55
Road works/landscaping	64	56	52	48
Infilling/ Levelling	69	62	57	54

Noise limits outside of the normal working hours are as follows:

Period	Hours	Permitted Ambient Noise Level, Leq, measured at Building Facades [dB(A)]	Period of Hours over which Leq, is applicable.	Maximum Sound Level (see note (iv) below) measured at Building Facades [dB(A)]
Monday to Friday	20.00hrs to 06.00hrs	70	1 hour	80
Saturday	-	70	1 hour	80
Sunday and Public Holidays (following PoC and EPA approval)	-	60	1 hour	65
All unattended plant outside normal working hours.		60	18 hours	65

The noise levels (see Note (i) below) for periods outside the normal working hours will only be permitted when consent has been given to exceptional working

Schedule of Total Noise Levels at Building Facades

Notes:

- (i) Noise levels relate to free field conditions. Where noise control stations are located 1 metre from façades of buildings, the permitted noise levels can be increased by 3dB(A).
- (ii) The ambient noise level, Leq, at a noise control station is the total Leq from all the noise sources in the vicinity over the specified period.
- (iii) The existing ambient noise level, Leq, at a control station is the total Leq from all the noise sources in the vicinity over the specified period prior to the Commencement of the Works.

(iv) Maximum sound level is the highest value indicated on a sound level meter which meets the requirements of BS 5969 Type 1 or 2 set to SLOW response, and frequency weighting A

Operating limits for vibration are as follows:

Frequency	Vibration Limit	Location
<10 Hz	5mm/s	A.C Watermains
<10 Hz	8.5mm/s	Any occupied property
10 to 50 Hz	10mm/s	Residential property
50 to 100 Hz	20mm/s	At completed structures

All works are scheduled to be completed within the working hours as specified in the contract.

Working Hours	
Monday to Friday	08:00-1800hrs
Saturday	08:00-1300hrs
Sunday and Bank Holidays	No Working

Best practicable means should be employed to minimise noise levels, in accordance with the British Standard BS 5228 Noise and vibration control on construction and open sites (Parts 1 and 2) for basic information and procedures for noise and vibration control. A copy of this standard is available at the site or from sharepoint.

In accordance with other construction sites and with common local authority guidance the following noise criteria as shown in Table 6.10 taken from the EIS will be implemented throughout the project.

Table 6.10: Noise criteria for construction sites

Day of Week / Times	Maximum L_{Aeq} at Nearest Noise Sensitive Receiver / Site Boundary
<u>Monday to Friday</u>	
07:00 - 19:00	75 dB $L_{Aeq, 12hr}$
19:00 - 22:00	65 dB $L_{Aeq, 1hr}$
22:00 - 07:00	No noise audible
<u>Saturday</u>	
08:00 - 13:00	75 dB $L_{Aeq, 5hr}$
13:00 - 22:00	65 dB $L_{Aeq, 1hr}$
22:00 - 07:00	No noise audible
<u>Sunday</u>	No noise audible

8.2.1 Noise & Vibration Control Measures

Noise reduction measures will be undertaken in accordance with the Procedure EP-09 Noise and Vibration Control, which has been developed taking into account the requirements of BS 5528, particularly Section 10, and include:

- Good communication with landowners and residents in the proximity of the harbour shall be maintained.
- Plan the working hours and duration of work with consideration for the effects of noise/vibration on any noise sensitive receiver;
- The normal working hours shall be Monday to Friday between 0800 and 1900 hours and Saturday between 0800 and 1330 hours, with no working on Sundays or public holidays, except where consent is granted to work outside of these hours.
- Any plant such as generators and pumps which is required to work outside the hours of 0800 hours to 1900 hours, Monday to Friday shall be surrounded by an acoustic enclosure.
- Traffic management proposals shall include measures to minimise journey times during the construction period.
- All vehicles and mechanical plant shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order for the duration of the works in compliance with BS 5228.
- Any item of plant, which is ineffectively silenced, shall be removed from the site.
- Noise barriers (in combination with low surfacing) will be used where necessary.
- All compressors shall be “sound reduced” models fitted with mufflers or silencers of the type recommended by the manufacturers.
- Pumps and mechanical static plant shall be enclosed by acoustic sheds or screens where appropriate.
- Use of hoarding and other noise baffling equipment

8.2.2 Noise & Vibration Monitoring

- Noise and vibration monitoring will take place on a weekly basis at agreed locations via the use of calibrated monitoring equipment.

8.2.3 Noise & Vibration Incidents

Should any monitoring indicate that noise or vibration levels have exceeded the intervention values then the plant or equipment causing the noise / vibration shall be powered down immediately. Appropriate action shall be taken in consultation with the Site Agent to reduce the noise and/or vibration levels. Actions may include:

- Servicing and or modifying the plant / equipment;
- Replacing the plant / equipment;
- Moving the operation away from sensitive receptors;
- Rescheduling the activity;
- Erecting noise barriers where other measures are not practical

When noise and vibration monitoring is taking place, all monitors should take into account the background noise and situation when monitoring. External noise and vibration reports to reference to this fact also.

The incident shall be logged in the Incident Register if levels have been breached and background noise was deemed not a factor at the time of the occurrence.

8.3 Air Pollution Control

The main types of air pollution that will result from the works are dust and exhaust emissions from combustion engines, and plant machinery and vehicles. Activities with the potential to produce dust are:

- Plant and vehicle movement;
- Bulk materials handling;
- Stockpiles;
- Vehicle movement off site.

8.3.1 Dust Minimisation Plan

Dust shall be minimised on site through the implementation of the following control measures developed in accordance with the Procedure EP-08 Air Pollution Control:

- A mechanical road sweeper will be in operation at all time to clean the site hard-standing, roads or footpaths in the vicinity of the site.
- Material handling system and site stockpiling of materials shall be designed and laid out to minimise exposure to wind.
- Mandatory speed limits will be enforced within the harbour area particularly in weather conditions which are conducive to dust generation.
- Dust suppression systems will be used during dredge stabilisation operations.
- Vehicles either delivering or removing material from site which have a dust potential will be covered with tarpaulin to minimise the release of dust.
- Exhaust emissions where practical shall be minimised by ensuring that all plant, equipment and vehicles are in good working order and regularly serviced to ensure efficient running, by using the smallest engine-sized plant and equipment suitable for the task and by ensuring that engines are not left idling unnecessarily.
- Provision of easily cleaned hard-standings for vehicles entering, parking and leaving the site.

8.3.2 Other Air Quality Control Measures

- Exhaust emissions where practical shall be minimised by ensuring that all plant, equipment and vehicles are in good working order and regularly serviced to ensure efficient running, by using the smallest engine-sized plant and equipment suitable for the task and by ensuring that engines are not left idling unnecessarily.
- Burning of materials on site shall not be permitted.

8.3.3 Dust Monitoring

- Daily visual dust monitoring will take place on site.
- The foreman will include formal dust monitoring in his weekly inspection
- Dust deposition monitoring with a threshold limit of 350mg/m²/day will be carried out at the Amenity area as per the site EPA waste licence.

8.4 Habitat (Flora & Fauna) Protection

General ecological mitigation measures have been incorporated into the project design from the project EIS and the requirement during the construction stage is to ensure that these measures are implemented. Any additional mitigation measures will be implemented during construction as required to limit additional habitat and fauna disturbance outside the area of works.

All work activities will comply with the Environmental Protection Agency Act 1992 and amendments and Wildlife Act 1976 and amendments 2000 to 2010 and the European Communities (Birds and Natural Habitats) Regulations 2011.

8.4.1 Construction Mitigation Measures

General habitat control measures shall be implemented in accordance with EP-12 Habitat, Flora and Fauna Protection. Additional site specific controls will also include:

- A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events
- Dredging activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.- Note once normal operations commence, there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.
- In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Where operations occur in waters greater than 200m depth (i.e., >200m), pre-start-up monitoring shall be conducted at least 60 minutes before the sound-producing activity is due to commence.
- If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down or location change) then all pre-start marine mammal monitoring must be undertaken in accordance with the above conditions prior to the recommencement of dredging activity
- Construction works to be avoided during breeding seasons where possible. Controls on noise, lighting, pollution and speed restrictions in certain areas may also be required.

8.4.2 Fish and Fisheries Habitat Mitigation Measures

In addition to the mitigation measures referred to in section 8.1 for water pollution, the following measures will be implemented to reduce the impacts from dredging to include:

- Dredging activities will take between November to March to prevent any potent negative effects during the mussel spawning and shrimp settlement seasons.
- All excavators will be fitted with a "Dig Master" system. The system is run from a global positioning system, from this operator is aware of the location x, y & z respectively and also the orientation of the bucket of the machine. This ensure only the designated areas are dredged.
- All excavators carrying out the dredging works will be fitted with environmental dredging buckets which will minimise the loss of any dredge spoil into the harbour.
- A silt curtain will be put in place in liaison with the Harbour Master on marine traffic.

8.5 Waste Management

A Waste Management Plan will be instituted during the works and the waste management measures for the project are detailed in this separate document, which includes:

- Waste management targets
- The potential waste materials produced during the project;
- Waste handling procedures;

- Waste Permits required;
- Waste reuse, recycling and disposal techniques; and
- A map showing designated waste handling areas.

The Waste Management Plan also covers the handling and disposal of hazardous wastes such as fuels and used absorbent materials.

With regard to potential nuisance from temporary site offices and canteen, the following measures shall be observed:

- Site offices shall be maintained in a tidy condition.
- Litter shall be cleaned up daily, particularly around skip bins, in accordance with EP-19 Litter Management.

8.6 Hazardous Materials Handling & Storage

During the works there will be a requirement for the use of hazardous substances, including:

- | | |
|-----------------|-------------------------|
| • Fuel oil | • Shuttering Oil |
| • Diesel | • Liquid cement |
| • Hydraulic Oil | • Concrete Curing Agent |

The management of such substances shall be carried out in accordance with the procedures for:

- Bulk Fuel and Oil Storage (EP-13);
- Storage and Handling of Hazardous Substances (EP-14);
- Containing and Cleaning Up Spills (EP-15).

All chemicals not covered by EP13, EP14 and EP15 shall be managed in accordance with the requirements of the relevant safety data sheet (SDS) and the Health and Safety Plan.

- Hazardous materials are kept in lockable stores at site compound locations. Spill kits are also kept at these locations. Any hazardous materials must be returned to the stores at the end of each day and not left on site.
- Oil and fuel will be stored in bunded areas and shall be stored well away from any water discharge point or, where not possible, the discharge point will be adequately protected to prevent spills from entering.
- Diesel pumps, generators or similar shall be placed on impervious drip trays to capture minor spills and leaks and located at least 10m from any water discharge point.
- Tools and equipment shall not be washed in or near any watercourses and if undertaken on site wash water shall be directed to appropriate retention controls and not allowed to directly enter any watercourse.

Fuels, lubricants and hydraulic fluids for equipment used on the construction site shall be carefully handled to avoid spillage, properly secured against unauthorised access and provided with spill containment. Fuelling and lubrication of equipment shall not be carried out in the vicinity of water discharge points. Waste oils and hydraulic fluids shall be collected in leak-proof containers and transported off-site for disposal or recycling at appropriately licensed facilities.

8.7 Vermin Control

Control measures associated with are as follows:

- Cabins and offices will be kept clean on a daily basis and formally cleaned at least once per week.
- Bins will be provided to dispose of food waste and other waste which may attract vermin.
- Office doors to remain closed where possible, in particular canteen doors.
- Regular inspection of the offices will be carried out to ensure vermin are not present.
- Where all control measures are implemented and vermin are still found to be present, a vermin removal company shall be contacted.

8.8 Landscape

Any landscape measures shall be implemented in accordance with the Landscape Design required by the contract, to be prepared by the Designer.

8.9 Archaeology

An archaeologist experienced in maritime archaeology will be retained for the duration of the relevant works.

In the event of archaeologically significant features or material being uncovered during the construction phase, machine work should cease in the immediate area to allow the archaeologist/s to inspect any such material.

Once the presence of archaeologically significant material is established, full archaeological recording of such material will be carried out. If it is not possible for the construction works to avoid the material, full excavation would be recommended. The extent and duration of excavation would be a matter for discussion between PoC and the licensing authorities.

It is recommended that an archaeological dive team is retained for the duration of any in-water disturbance works on the basis of a twenty-four or forty-eight hour call-out response schedule, to deal with any archaeologically significant/potential material that is identified in the course of the ground disturbance activities.

9. Management Review

The implementation of the EMP is reviewed monthly on site at the internal site meetings. These meetings are attended by site management and by personnel responsible for the implementation of the EMP. During the meeting all aspects of the environmental management are considered, including:

- Upcoming work
- Environments risks foreseen
- Control measures for the protection of the environment
- Internal and external audit results
- Inspection and monitoring results;
- Environmental alerts and bullet-ins
- Any issues raised by site staff or in relation to environmental management
- Site goals and targets
- Control measures for protection of the environment
- Any other significant issues;

Changes are made to the on-site management as required to achieve a continual improvement in environmental performance.

Environmental issues will be brought to the attention of the workforce through toolbox talks and through the Monthly HSE Meeting.

The EMP itself shall be reviewed at least every three months by the Site Management Team to ensure that it continues to be adequate and effective and changes made as required. Any changes shall be made by the Site HSE Officer and a new revision of the EMP issued to all personnel on the circulation list on page 1 of this document. Site audits carried out by the PoC will also include a review of the project EMP, changes made as required.

10. Training & Competence

The environmental management goals and strategy shall be communicated to all staff and contractors at the safety and environmental induction. All employees and contractors are required to undertake a site induction prior to conducting any work on site (for further details refer to the Health and Safety Plan) and employees shall be made aware of their responsibilities in accordance with this management plan. A record of inductions shall be kept by the Safety, Health & Environmental Officer.

Toolbox talks will be conducted with relevant employees on various aspects of the environmental management plan, activity control measures and environmental procedures. Three toolbox talks on environmental or waste issues must be conducted per quarter.

Toolbox talks shall be conducted by the Site HSE Officer, Section Engineers or others nominated by the Site HSE Officer. The schedule for toolbox talks shall be at the discretion of the Site Management Team and additional toolbox talks will be given in response to complaints, or where the particular environmental risks have been identified.

10.1 Recommended Toolbox Talks

Toolbox Talk Topic	Reference Material	When*	Recipients
Environmental Management	Environmental Policy, EMP, Environmental Procedures Manual	Commencement of site activities	All site crews
TBT 01	Hazardous Substances	Regular Intervals	All site crews
TBT 02	Environmental Awareness	Regular Intervals	All site crews
TBT 03	Managing Waste	Regular Intervals	All site crews
TBT 04	Spill Control	Regular Intervals	All site crews
TBT 05	Waste Pollution Prevention (Fuel & Oil)	Regular Intervals	All site crews
TBT 06	Silt Management	Regular Intervals	All site crews
TBT 07	Fire	Regular Intervals	All site crews

TBT 08	Storage of Hazardous Waste on Site	Regular Intervals	All site crews
TBT 10	Chemical & Fuel on site	Regular Intervals	All site crews
TBT 12	Water on Construction Sites	Regular Intervals	All site crews
TBT 13	Dust and Air Quality	Regular Intervals	All site crews
TBT 14	Noise and Vibration	Regular Intervals	All site crews
TBT 15	Archaeology	Regular Intervals	All site crews
TBT 16	Working in previous developed areas	Regular Intervals	All site crews
TBT 17	Pumping and over pumping	Regular Intervals	All site crews
TBT 18	Water pollution - cement and concrete	Regular Intervals	All site crews
TBT 19	Material handling and housekeeping	Regular Intervals	All site crews
TBT 20	Washing down plant and equipment	Regular Intervals	All site crews
TBT 21	Energy conservation - electricity and fuel	Regular Intervals	All site crews
TBT 22	Bentonite	Regular Intervals	All site crews
TBT 23	Be a good neighbour	Regular Intervals	All site crews
TBT 24	Sustainability	Regular Intervals	All site crews
TBT 25	Bantry Harbour environmental issues	Prior to commencement and at regular intervals there after	All site crews

Appendix 1:

Table of Requirements for ISO14001

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Table of Requirements for ISO14001

	ISO14001	EMP	Section
4.2	Environmental Policy	Company Environmental Policy	Appendix 5
4.3.1	Environmental aspects	Site Environmental Risk Assessment	5
4.3.2	Legal and other requirements	Relevant Statutory Provisions	6.5
		Contract Requirements	Appendix 2
4.3.3	Objectives, targets and programmes	Environmental Management Goal	7
4.4	Implementation and operation	Strategy to Achieve this Goal	1.1
4.4.1	Resources, roles, responsibility and authority	Organisation & Responsibilities	2.1
4.4.2	Competence, training and awareness	Training and competence	10
4.4.3	Communication	Environmental Management Strategy	3.2
4.4.4	Documentation	Environmental Management Documents	8
4.4.5	Control of documents	Control of Documents	6.7
4.4.6	Operational control	Environmental Control Measures	8
4.4.7	Emergency preparedness and response	Environmental Control Measures	4
4.5	Checking	Monitoring and Audit	3.1.2
4.5.1	Monitoring and measurement	Monitoring	3.1.2
4.5.2	Evaluation of compliance	Evaluation of compliance	6
4.5.3	Nonconformity, corrective action and preventative action	Inspections	3.1.2
4.5.4	Control of records	Control of Documents	6.7
4.5.5	Internal audit	Audit	3.2.1
4.6	Management review	Management Review	9

Appendix 2:

Table of Contractual Requirements for Environmental Management

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Table of Contractual Requirements for Environmental Management
(From Project Specific Construction Requirements)

EMP Section	Section / Clause
	TBC

For inspection purposes only.
Consent of copyright owner required for any other use.

Appendix 3:

Environmental Risk Assessment Report

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Appendix 4:

Site Maps

*For inspection purposes only.
Consent of copyright owner required for any other use.*

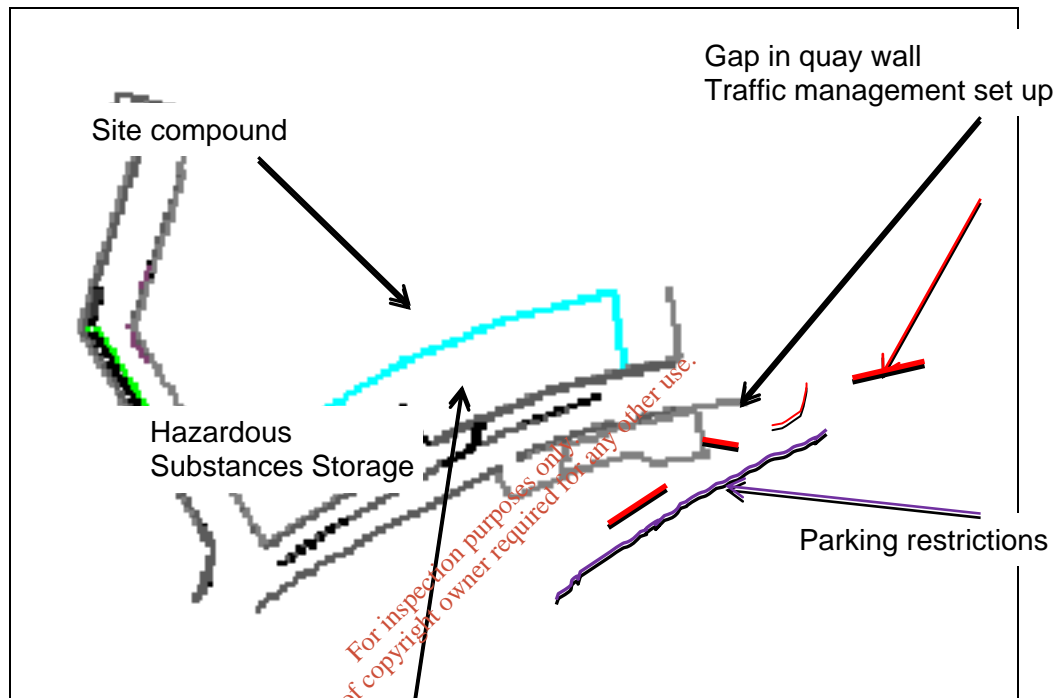
Location of the Works



Proposed access routes for the project and site location

- 1) – Pier
- 2) – Amenity Area
- 3) – Cove Works Area

Proposed Works Area



Appendix 5:

Environmental Policy

*For inspection purposes only.
Consent of copyright owner required for any other use.*



Environmental Policy

BAM Civil, one of Ireland's largest construction organisations, provides services in design, civil engineering, building, facilities management, project management and property development, across a wide range of construction projects.

The organisation promotes a responsible and proactive approach to environmental and waste management at every level of the business and on all sites of operation.

BAM Civil recognise that business aims must be balanced against environmental considerations. We are committed to continually improving our environmental performance and managing our operations to minimise potentially adverse impacts on the environment.

Specifically, where it is within the organisation's control or influence, BAM Civil will:

- Identify the significant environmental aspects of our activities by assessing their potential impact on the environment.
- Based on our significant environmental aspects, set specific objectives and targets, against which we shall monitor and review our performance.
- Comply with legal and other compliance obligations that are applicable to our activities and relevant to the environmental aspects of the business.

- Develop management processes and procedures that prevent pollution, protect native species and habitat, minimise waste generation, promote recycling and the use of recyclable materials, and maximise the efficient use of material and energy resources.
- Implement strategies to communicate our environmental commitments and requirements to employees, customers, suppliers, subcontractors and other interested parties.
- Provide training and support to employees, so they understand and can fulfil their responsibilities with regard to environmental impact and performance.
- It is the individual responsibility of all persons working for or on behalf of BAM Civil to support and apply the Environmental Policy and Environmental Management System as it pertains to their activities.



T. Cullinane, CEO

Date: February 2016

