MOTT MACDONALD

Best Practicable Environmental Option Assessment Report

New Islay Vessel Enabling Works Colonsay

January 2024

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1 Introduction

1.1 Introduction

This report has been prepared by Mott MacDonald on behalf of Caledonian Maritime Assets Limited (CMAL) in support of a Marine Licence application and to determine the best disposal method of the dredge material required for the new Islay vessel enabling works. It compares various options for the disposal of dredge material and identifies the Best Practicable Environmental Option (BPEO).

Under the Marine (Scotland) Act 2010, Section 21(1), a Marine Licence issued by Marine Directorate (formally known as Marine Scotland) is required for the dredging and the deposit of substances or objects within waters adjacent to Scotland. Under Part 4, Section 27(2), Marine Directorate has an obligation to consider the availability of practical alternatives when considering applications involving disposal of material at sea. Applications for a Marine Licence to dispose of dredged spoil at sea require a BPEO assessment, determining that alternatives to sea disposal have been investigated and that sea disposal does not pose an unacceptable risk to the marine environment and other legitimate users.

Marine Licences for these activities are currently valid in Scotland for up to three years[1]. This application is expected to cover the period from October 2023 to December 2024.

1.2 The Need for Dredging and Spoil Disposal

Caledonian Maritime Assets Limited (CMAL) seek to undertake upgrade works at the four ferry terminals (Port Ellen, Kennacraig, Port Askaig and Colonsay (shown in Figure 1.1)) on the Islay route prior to the introduction of new vessels, which are planned to be operational around mid-2024.

[1] Guidance+for+Marine+Licence+Applicants.pdf (www.gov.scot)

Figure 1.1: Terminals on the Islay Ferry Service

The new vessels are planned to have a larger beam, length, draught and displacement than the current vessels that serve the route, as well as having a hybrid diesel-electric propulsion system. Enabling works to the four terminals are therefore necessary to safely and reliably berth, moor, load and unload the vessels at all four ports together with shore power for charging the vessels at Port Ellen, Kennacraig and Port Askaig.

The focus of this Best Practical Environmental Option Assessment (BPEO) Report is the New Islay Vessel Port Enabling Works at Colonsay Ferry Terminal, hereafter referred to as the 'Proposed Development'. The Proposed Development would upgrade the ferry terminal to facilitate future accommodation of a new vessel with deeper draught and higher displacement. The new vessel will moor to the existing bollards positioned at the roundhead, along the existing pier and on both the inner and outer lifting dolphins. The works to accommodate this new type of vessel would comprise the following proposed modifications and alterations:

- Replacement of existing fenders with new fenders;
- Replacement of two bollards at the roundhead from T Head bollards to mushroom bollards;
- Provision of gangways which are to be at least 17m long;
- Installation of existing pile toe protection, likely in the form of concrete filled steel collars with dowels into rock or concrete mattress to replace the overburden on the pile toe;
- Installation of timber piles adjacent to existing piles; and
- Dredging to 5.5m below Chart Datum (CD) (0-3.5m below sea bed (bsb)) in order to maintain at least 1 metre of underkeel clearance. The approximate dredged area would be approximately 4120m^2 and volume 6000m^3.

Works below the mean high water springs (MHWS) include:

- Installation of toe protection;
- Installing timber piles; and
- Dredging works.

The focus of this BPEO Report is the dredging works at the Proposed Development. This is further explained in Section 1.3 below.

1.3 Proposed Dredging and Disposal Options

1.3.1 Location of Dredging

It is proposed to undertake dredging around the proposed development as shown in the Dredging Plan provided in Appendix B (105612-MMD-CO-ZZ-DR-C-0101 – New Islay Vessel Port Enabling Works Colonsay Dredging Plan). The approximate area dredged would be 6720m^2 with a volume of 6894m^3..

The boundary coordinates of the proposed dredge area are detailed in Table 1.1 below.

Table 1-1: Coordinates of Dredge Area

	Easting	Northing
SOP-CO-100	139733.2678	694149.2260
SOP-CO-101	139718.5230	694127.1660
SOP-CO-102	139724.4523	694124.4944
SOP-CO-103	139723.0165	694118.1515
SOP-CO-104	139627.6272	694110.3385
SOP-CO-105	139629.2457	694090.1394
SOP-CO-106	139651.1437	694075.6743
SOP-CO-107	139675.7454	694071.8987
SOP-CO-108	139755.4875	694078.2883

The base of the dredge will have an elvation of -5.5m CD, equating to a dredge depth of between 0m and 3.5m bsb.

1.3.2 Method of Dredging

Dredging works would likely be undertaken either by a backhoe dredger only or by a trailer suction hopper dredger working in conjunction with a backhoe dredger (for areas of the structures which are inaccessible by trailer suction hopper). If required, bedrock would be pre-fractured by drilling and splitting using Cardox (a CO_2 driven hydraulic breaker). Non-explosive blasting methods would be used.

1.3.2.1 Dredging Process (backhoe dredger)

The spuds extend to the seabed and provide lateral resistance and stability for the pontoon (Figure 1.2). The dredge material will be loaded into a split hopper barge (SHB) (Figure 1.3).

The dredging process consists of:

1. Digging and filling the bucket;
2. Lifting the bucket;
3. Swinging towards the SHB;
4. Emptying the bucket into the SHB;
5. Swinging towards the next digging location;
6. Lowering the bucket;
7. Positioning at the next digging location; and
8. Digging and filling the bucket.

The excavator is located above the dredged face and digs towards itself, in an upward motion, to fill the bucket. With the pontoon positioned in one location, the excavator covers an area along an arc, with arc length dependent on the length of boom and stick.

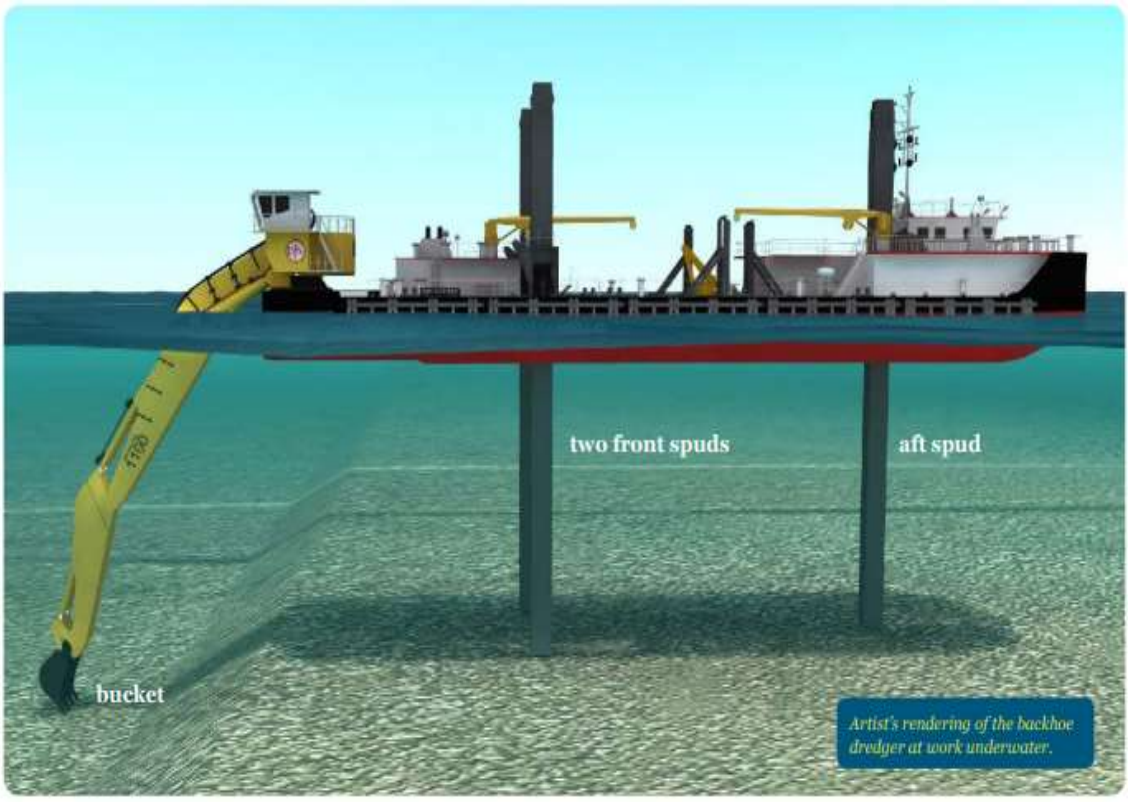

Figure 1.2: Backhoe dredger example

Source: Backhoe Dredging (graphic sourced at International Association of Dredging Companies, 2016 https://www.iadc-dredging.com/wp-content/uploads/2016/07/facts-about-backhoe-dredgers.pdf)

SHB are the self-propelled barges, which transport the dredge material once loaded by the backhoe dredger to the assigned disposal/dump area.

Figure 1.3: Split hopper barge example

Source: Backhoe Dredging onto SHB (graphic sourced at International Associated of Dredging Companies, 2016 www.iadc-dredging.com)

1.4 Scope of Report

This report provides an appraisal of available disposal options and short-lists those that are considered to be practicable. Options are reviewed according to the waste hierarchy, as outlined in the Waste (Scotland) Regulations 2012[2]. The options on the short-list are then reviewed against environmental and cost considerations. The options are then compared and the BPEO identified through an options appraisal process.

The report also includes the results from completed sediment testing. Sixteen samples from six sampling locations were tested for a suite of contaminants including heavy metals and metalloids, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (BDEs) and pesticide organochlorines. Interpretation of the results is provided in Section 2.

This report is structured as follows:

- Chapter 2: Sediment Sampling
- Chapter 3: BPEO Method
- Chapter 4: Discussion of Available Disposal Options
- Chapter 5: Conclusion

[2] The Waste (Scotland) Regulations 2012 (legislation.gov.uk)

1.5 Limitations

This document is issued to the party which commissioned it and for specific purposes connected with the above-described project only. It should not be relied upon by any other party or used for any other purpose.

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Mott MacDonald is not insured for, and therefore will not undertake surveys to identify asbestos or provide any guidance on the treatment of asbestos, or similarly for toxic mould. Should the presence of asbestos or toxic mould be suspected during the course of the study, Mott MacDonald would recommend the appointment of a specialist contractor to address the issue and would not provide advice on risk or remedial measures.

2 Sediment Sampling

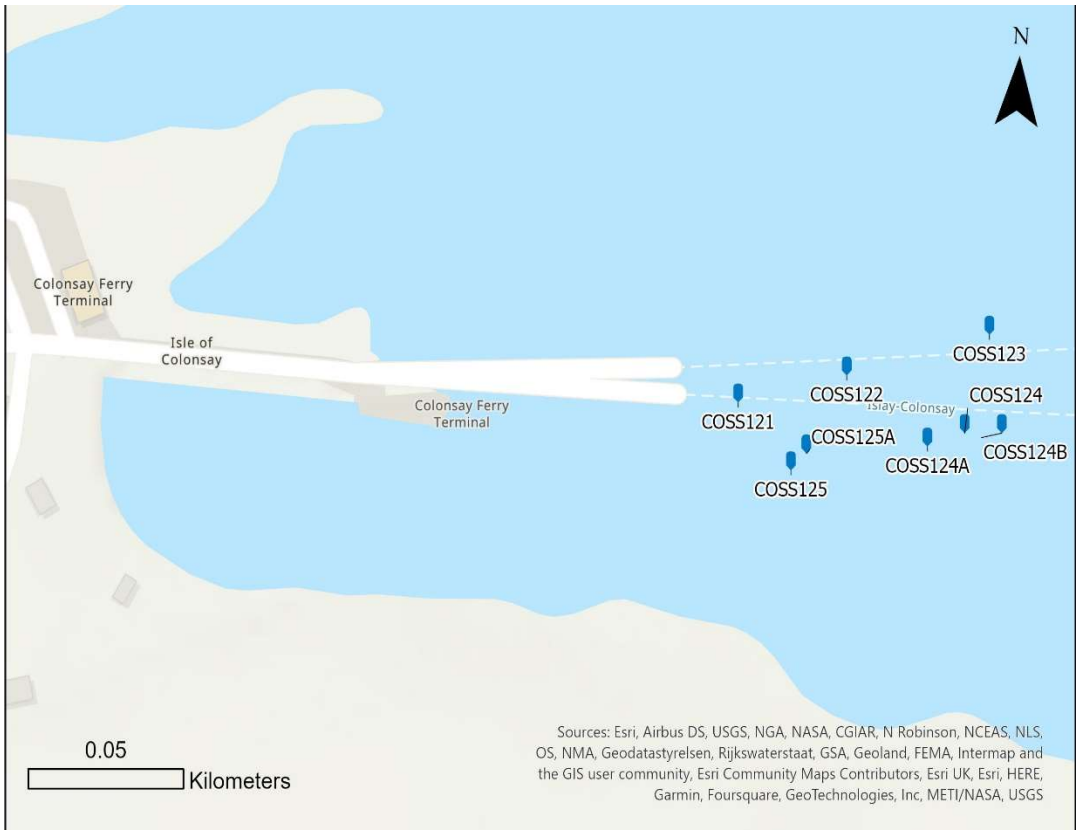
2.1 Description of Sediment to be Dredged and Disposed

In line with Marine Directorate guidelines on pre-dredge sampling protocol[3], sampling was undertaken on the 3rd of November 2022 and 3rd June 2023. As the dredge volume proposed is less than 25,000m3, at least three sampling locations were required.

A sub-bottom profile geophyscial survey undertaken at Colonsay prior to the sediment sampling indicates that shallow rock is present within the dredge area and the maximum sediment thickness to be dredged is around 2.0m. Therefore, sampling was designed to collect samples of the sediment to be dredged for testing.

Sampling was attempted at eight locations using vibrocore methods as shown in Figure 2.1 and summarised in Table 2-1.

Figure 2.1: Borehole locations at Colonsay (both monitoring rounds)



[3] Marine Scotland. 2017. Pre-disposal sampling guidance Version 2. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/02/marine-licensing-applications-and-guidance/documents/guidance/pre-disposal-sampling-guidance/pre-disposal-sampling-guidance/govscot%3Adocument/Pre-disposal%2Bsampling%2Bguidance.pdf

Table 2-1: Sampling Summary

Location ID	Location		Termination Depth (m bsb)	Comments
	Easting	Westing		
COSS121	139649.61	694096.02	0.1	Terminated on encountering probable rockhead
COSS122	139685.44	694103.59	0.3	Proved full sediment dredge depth
COSS123	139370.83	694116.03	1.35	Proved full sediment dredge depth
COSS124	139722.58	694087.10	1.15	Proved full sediment dredge depth
COSS124A	139735.21	694083.39	2.30	Proved full sediment dredge depth
COSS124B	139735.21	694087.04	2.0	Proved full sediment dredge depth
COSS125	139666.80	694075.80	1.25	Terminated on encountering coarse gravel. Probable rockhead.
COSS125B	139672.50	694081.48	0.5	Refused at 0.5m with no recovery.

The following limitations were encountered during the sampling works:

- COSS121 refused at 0.1m bsb, and collected insufficient sample for laboratory testing. A geophysical survey undertaken at Colonsay indicates that rockhead in this area is <0.5m below seabed level as shown on the Colonsay Dredging Plan (105612-MMD-CO-ZZ-DR-C-0101) in Appendix B. As such is it considered likely that COSS121 refused on shallow rock, and that therefore no samples from deeper depths would be achievable.
- COSS125 refused at 1.25m within "coarse gravel" before the base of the proposed dredge.
- COSS125B refused at 0.5m then was not able to recovery any sample.

Despite the limitations encountered during the GI a total of 5 sampling locations proved the full dredge sequence and a total of 17 samples were collected in accordance with the with the Sediment Sampling and Analysis Plan provided in Appendix B. Of these 17 samples, 15 were chosen for laboratory testing as summarised in Table 2-2 and Table 2-3.

Table 2-2: Sampling at Colonsay – November 2022

Borehole ID	Seabed Level (m CD)	Depths sampled (m bsb)	Testing suites
COSS122	-5.59	0.0, 0.8	Heavy metals and metalloids, TPH, PAH, PCBs, BDEs, organochlorine pesticides, tributyltin (TBT), dibutyltin (DBT), asbestos
COSS123	-6.58	0.0, 0.5, 1.35	

Table 2-3: Sampling at Colonsay – June 2023

Borehole ID	Depth below chart datum (m CD)	Depths sampled (m bsb)	Testing suites
COSS124	-5.06	0.0, 0.5	Heavy metals and metalloids, TPH, PAH, PCBs, BDEs, organochlorine pesticides, tributyltin (TBT), dibutyltin (DBT), asbestos
COSS124A	-4.86	0.0, 0.5, 1.0	
COSS124B	-4.90	0.0, 0.5, 1.0	
COSS125	-2.87	0.0, 0.5	

Laboratory testing was undertaken by the following laboratories pre-approved by Marine Directorate as detailed in Table 2-4.

Table 2-4: Analytical laboratory details

Laboratory name	Address	UKAS Accreditation Number	Samples Tested
RPS Bedford	13 St Martins Way, Bedford, Bedfordshire, MK42 0LF	1663	November 2022
RPS Manchester	Unit 12, Waters Edge Business Park, Modwen Road, Cadishead, M5 3EZ	0605	November 2022
SOCOTEC	Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent, DE15 0YZ	1252	June 2023

The results of the laboratory testing are provided in Appendix D.

The results are summarised in Section 2.2.

2.2 Results of Sediment Sampling

2.2.1 Sediment Description

A summary of the physical description of the sediments collected duing the sampling works is included in Table 2-5. No visual or olfactory evidence of contamination was noted in either investigation.

Table 2-5: Summary of sediment descriptions

Borehole ID	Elevation (m CD)	Depth (m bsb)	Description
COSS121	-2.84 to -2.94	0.0 – 0.1	Grey fine to coarse SAND of shell fragments
COSS122	-5.59 to -5.94	0.0 – 0.35	Dark grey silty organic fine to coarse SAND with shell fragments
	-5.94 to -6.44	0.35 – 0.80	Grey slightly fine becoming coarse with depth angular GRAVEL predominantly of shell fragments
COSS123	-6.58 to -7.48	0.0 – 0.90	Dark grey silty fine to coarse organic SAND with shell fragments
	-7.48 to -7.93	0.90 – 1.35	Grey slightly and fine becoming coarse with depth angular GRAVEL predominantly of shell fragments
COSS124	-5.06 to -5.46	0.0 – 040	Grey slightly gravelly slightly clayey organic SAND with shells and fragments of shells. Gravel is fine to medium rounded to angular.
	-5.46 to -5.91	0.40 – 0.85	Grey slightly sandy becoming sandy with depth slightly clayey fine to coarse sub rounded to angular GRAVEL with shells and fragments of shells. Sand is fine to coarse. Layer of grey fine to medium SAND between -5.83 and -5.91m CD (0.77 – 0.85 m bsb).
	-5.91 to -6.21	0.85 – 1.15	Grey gravelly silty fine to coarse organic SAND with shells and fragments of shells. Gravel is fine to coarse rounded to angular.
COSS124A	-4.86 to -5.11	0.0 – 0.25	Grey very silty fine to medium organic SAND
	-5.11 to -6.06	0.25 – 1.20	Light grey slightly gravelly slightly silty fine to coarse organic SAND with shells and fragments of shells. Gravel is fine to medium rounded to angular.
	-6.06 to -6.60	1.20 – 1.75	Light grey to grey slightly sandy slightly silty fine to medium GRAVEL with shells and fragments of shells. Sand is fine to coarse.
	-6.60 to -7.16	1.75 – 2.30	Grey sandy clayey fine to coarse GRAVEL with shells and fragments of shells. Sand is fine to coarse.
COSS124B	-4.90 to -5.50	0.0 – 0.65	Grey slightly silty coarse organic SAND and fine angular GRAVEL with shells and fragments of shells
	-5.50 to -6.30	0.65 – 1.40	Layer of light grey silty fine to medium organic SAND between -5.50 and -5.55m CD. Light grey gravelly slightly silty coarse organic SAND with shells and

Borehole ID	Elevation (m CD)	Depth (m bsb)	Description
			fragments of shells. Gravel is fine angular.
	-6.30 to -6.90	1.40 – 2.0	Grey very sandy silty fine to coarse rounded to angular GRAVEL with low cobble content. Sand is fine to coarse.
COSS125	-2.87 to -3.42	0.0 – 0.55	Dark grey slightly gravelly silty fine to coarse organic SAND with seaweed, shells, and fine to medium shell fragment. Gravel is fine to coarse rounded to angular.
	-3.42 to -4.12	0.55 – 1.25	Dark grey gravelly slight silty fine to coarse organic SAND with shells and fragments of shells. Gravel is fine to coarse sub-rounded to angular. Layer of dark grey fine to medium tabular subrounded to angular GRAVEL between 4.02 and -4.12m CD.
COSS125A	-3.61 to -4.11		No recovery

The average particle size distribution of the sediment material sampled comprises 14% gravel, 57% sand, and 29% silt/clay.

2.2.2 Environmental Laboratory Test Results (Marine Directorate Action Levels)

As advised in the pre-dredge sampling protocol[4], analysis results were screened against Marine Directorate action levels (AL1 and AL2; Appendix C) where applicable. The Pre-Disposal Form containing the full assessment for the results, is provided in **Appendix A.** A summary of the exceedances is provided below.

No exceedances of AL2 were noted in any sample.

The recorded AL1 exceedances are summarised in Table 2-6. No AL1 exceedances were recorded of TPH, PCBs, BDEs, or pesticide organochlorines

Table 2-6: Recorded AL1 exceedances at Colonsay

Borehole ID:			COSS122	COSS123	COSS124	COSS125
Sample Elevation (m CD):			-5.59	-7.93	-5.56	-3.37
Depth Depth (m bsb):			0.00	1.35	0.50	0.50
Determinand	Units	AL1				
Chromium	mg/kg	50	64.80	60	35.30	31.10
Nickel	mg/kg	30	23	18.60	32.30	23.30
Fluoranthene	µg/kg	100	27.90	0.95	2.83	162
Phenanthrene	µg/kg	100	14.80	1.34	9.17	111
Pyrene	µg/kg	100	25.30	0.86	3.70	122

As contamination has been identified which is >AL1 and <AL2, the relevant excerpt of Marine Directorate guidance[5] is included below:

“ *If contamination >AL1, <AL2, the following restrictions may apply:*

- Restriction on sea disposal of certain areas of dredge spoil;
- Monitoring of dredge material and disposal site; and

[4] Marine Scotland. 2017. Pre-disposal sampling guidance Version 2. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/02/marine-licensing-applications-and-guidance/documents/guidance/pre-disposal-sampling-guidance/pre-disposal-sampling-guidance/govscot%3Adocument/Pre-disposal%2Bsampling%2Bguidance.pdf

[5] Marine Scotland. 2017. Pre-disposal sampling guidance Version 2. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/02/marine-licensing-applications-and-guidance/documents/guidance/pre-disposal-sampling-guidance/pre-disposal-sampling-guidance/govscot%3Adocument/Pre-disposal%2Bsampling%2Bguidance.pdf

- Treatment or mitigation measures . ”

2.2.3 Results Interpretation

Heavy metals: chromium and nickel

The only recorded metallic exceedances of AL1 are two exceedances of chromium (maximum of 64.80mg/kg) and one exceedance of nickel (32.30mg/kg).

These values are slightly above AL1 (chromium of 50mg/kg; nickel of 30mg/kg) but are significantly below AL2 (chromium of 370mg/kg; nickel of 150mg/kg). Therefore, for a higher resolution analysis of results, the NOAA Screening Quick Reference Tables (SQuiRT) cards were used (Buchman, 2008).

The SQuiRT cards display a variety of different values, corresponding to different toxicological responses on ecological receptors in different environments (for example, in freshwater or marine sediments). These values range from the most conservative T_{20} and Threshold Effect Levels (TELs) where toxicological responses may begin to be seen in some infaunal communities, to the least conservative Effects Range Median (ERM) and Apparent Effects Threshold (AET), detailing contaminant concentrations which are likely to produce a significant toxicological effect in infaunal communities.

The two chromium concentrations which exceeded AL1 exceed the TEL of 52.3mg/kg therefore small detectible changes in the infauna community are possible at these concentrations. There is no certainty as to whether the analysed chromium is present in a bioavailable format, or whether the local infaunal receptors are sensitive to chromium.

Sampling to inform the other dredging at Port Ellen, Kennacraig and Port Askaig have indicated that thirteen of seventeen samples were >AL1 for chromium (76%). This provides a potential line of evidence that the elevated chromium concentrations may be representative of natural background levels.

This may indicate that the local infaunal communities are more tolerant to these concentrations.

The nickel AL1 exceedance exceeded the Effects Range Low (ERL) threshold of 20.9mg/kg. This is a low level (10^{th} percentile) where a toxicological effect may occur in an infaunal community. However, it should be noted that six of the other nickel concentrations exceed the ERL, but are below AL1. There is no certainty as to whether the nickel sampled in the investigation was present in a bioavailable format, or whether the local infaunal receptors are sensitive to nickel.

PAHs: fluoranthene, phenanthrene and pyrene

The measured exceedances of PAHs were localised to one location: COSS125 at -3.37 to -4.12m CD. There is no indication from borehole logs as to the source of these contaminants. Whilst it is noted that the exceedances are minor (maximum of 62µg/kg over AL1), Marine Directorate does not provide an AL2 value for these contaminants. Therefore, the SQuiRT cards were applied to contextualise the PAH exceedances.

The measured pyrene exceedance (122µg/kg) does not exceed the most conservative SQuiRT value (T_{20} of 125µg/kg). Therefore, it is not considered to be of a magnitude where it would adversely impact ecological receptors.

Both fluoranthene and phenanthrene (measured at 162 and 111µg/kg, respectively) exceeded their TELs (113 and 86.7µg/kg, respectively). It is at this level that effects on the infaunal community may be detectable, but not significant.

2.3 Conclusions

Contamination has been identified in the material to be dredged at Colonsay. Dredging will remove this contaminated material. The greatest risk is posed by nominal sediment re-mobilisation as the dredged material is removed.

Each AL1 exceedance is minor. Where there are AL2 values (for chromium and nickel), measured values are far below these. The chromium exceedance may reflect the natural background contamination of the regional environment and, concerning both chromium and nickel, there is no certainty that ecological receptors will be sensitive to these metals, nor whether these contaminants are present in a bioavailable format. If the chromium is reflective of natural background contamination, then it is likely that the local ecological receptors are tolerant to chromium. Thus, any sediment remobilisation – which will represent a fraction of removed sediment – will pose a low risk to ecological receptors.

The exceedances of PAHs are localised, being identified in one location only. The measured exceedance of pyrene is unlikely to result in changes in the infauna community. Fluoranthene and phenanthrene exceed the NOAA TELs, but this does not indicate that there will be significant effects on infaunal receptors. Thus, sediment remobilisation – which will represent a fraction of removed sediment – will pose a low risk to ecological receptors.

3 BPEO Method

3.1 Options Identification

A review of dredge material disposal options was undertaken through a desk-based review of typical disposal options. The long list of options identified during the review are summarised in Section 4.4.

3.2 Screening of Long List Options to Short List of Options

The long list options were screened through a desk-based study which considered:

- Feasibility of the option in relation to the physical constraints in proximity to the Proposed Development;
- Availability of on-site areas where dredge material could be re-used;
- Availability of off-site areas where dredge material could be reused or disposed of within the vicinity of the Proposed Development; and
- Suitability of the material following chemical screening.

3.3 Attribute Identification and Scoring of Feasible Options

3.3.1 Comparison of Short-List Options and Identification of the BPEO

MD-LOT's general licensing guidance[6] states the following in relation to BPEO assessment: 'consideration must be given to the availability of practical alternatives when considering any applications involving disposal of material at sea. In order for MD-LOT to assess the available alternative options, all sea disposal licence applications must be supported by a detailed assessment of the alternative options. This should include a statement setting out the reasons, including financial, that have led to the conclusion that deposit of the materials at sea is the BPEO.'

There is no formal guidance available in Scotland on BPEO assessment for disposal of dredge material. This BPEO assessment adopts an approach that considers the following aspects: strategic, health, safety and environmental and cost. The short-list of options were assessed against these aspects, details of which are provided in Sections 3.3.2 to 3.3.4 below.

3.3.2 Strategic Considerations

Strategic considerations include the following:

- Operational feasibility – whether the option is technically practicable.
- Availability of sites/facilities – whether there are any sites or facilities which can accept the dredge material.
- General public acceptability – whether the public are likely to object to or support the proposal.
- Likely agency acceptability – whether public agencies are likely to object or support the proposal.
- Legislative implications – assessing compliance with relevant legislation and any potential management controls required.

[6] Guidance+for+Marine+Licence+Applicants.pdf (www.gov.scot)

3.3.3 Health, Safety and Environmental Considerations

The factors used to assess the health, safety and environmental performance of the options are summarised below:

- Public health – assessing whether there would be any risk of detrimental effect on public health based on predicted pathways and receptors.
- Safety – considering potential sources of hazard and the probability that there would be any risk to the general public or workers.
- Contamination/pollution – evaluating whether there is potential for pollution or contamination.
- Ecological impact – assessing the significance of any potential impact on important habitats or species including designated sites.
- Interface with other legitimate users – considering whether they are likely to be impacts on other activities such as other users of the port.
- Amenity/Aesthetic – assessing whether there is likely to be visual or noise impacts resulting from the disposal or any impact on local amenity.

3.3.4 Cost Considerations

The cost of disposing of dredge material was considered in terms of capital costs (construction of facilities and equipment hire/purchase costs).

3.3.5 Comparison of Options and Identification of the BPEO

The performance of each option was evaluated on a scale from low to high according to definitions presented in Table 3.1. Intermediate grades (low to medium and medium to high) were also used where the assessment was marginal between low, medium or high based on professional judgement.

Table 3-1: Definitions of performance

	Classification		
Consideration	High	Medium	Low
Strategic Considerations			
Operational feasibility	Practical, easy to operate and achievable as process is robust and established. Low number of stages and each stage easy to control.	Some practical difficulties. Moderate number of stages with some difficulties.	Major practical difficulties. Large number of steps with some major difficulties.
Availability of sites/facilities	Suitable site/facility available within 1km of the port by road and 10km by sea.	Suitable site/facility available within 10km of the port by road and 20km by sea.	No suitable sites/facilities within the vicinity (over 10km by road and 20km by sea).
General public acceptability	Likely to be generally acceptable to the public based on reaction to similar developments.	Unlikely to provoke a strong negative or positive reaction based on reaction to similar developments.	Likely to provoke a strong negative reaction based on reaction to similar operations.

	Classification		
Consideration	High	Medium	Low
Likely agency acceptability	Likely to be generally acceptable to statutory bodies after consultation.	Statutory bodies may have some concerns that may be overcome through further consultation.	Statutory bodies may have major concerns that may not be overcome through consultation.
Legislative implications	Would easily comply with legislation with a low level of management and physical control.	Requires some control/intervention to achieve compliance.	Requires a high level of management control and intervention to achieve compliance.
Health, Safety and Environmental Considerations			
Safety	No significant risk to workers and the general public.	Low risk to workers and the general public which is easily controlled.	Moderate to high risk to workers and general public.
Public health	Will not cause workers or public to be exposed to substances potentially hazardous to health.	May cause some low level intermittent exposure to substances potentially hazardous to health.	Risk of exposing workers and general public to substances potentially hazardous to health.
Pollution/ contamination (This will be reviewed in line with the Marine Directorate Action Levels identified in Table C.1)	Compliant with emission standards and water quality objectives. Low risk of harm from substances released to environment.	Marine Directorate action levels may be approached or breached occasionally. Some risk of harm to environment.	Marine Directorate action levels may be breached regularly and there is a moderate or high risk of harm to environment.
Ecological impact (This will be reviewed in line with the Marine Directorate Action Levels identified in Table 2.1)	Priority species and habitats under the UK Biodiversity Action Plan and qualifying features and species under the EU Habitats and Birds Directives will not be affected.	Priority species and habitats under the UK Biodiversity Action Plan and qualifying features and species under the EU Habitats and Birds Directives may be affected but effects are unlikely to be significant.	Priority species and habitats under the UK Biodiversity Action Plan and qualifying features and species under the EU Habitats and Birds Directive are likely to be significantly affected.
Interference with other legitimate activities	Little potential for interference with other activities.	Some potential for interference with other activities.	High potential for interference with other activities.
Amenity/aesthetic	No significant impact on local amenity or aesthetic qualities.	Potential for impacts of moderate significance on local amenity or aesthetic qualities.	Potential for impacts of high significance on local amenity or aesthetic qualities
Cost			

	Classification		
Consideration	High	Medium	Low
Capital costs for the disposal	More than £10m	Between £5m and £10m.	£5m or less

4 Discussion of Available Disposal Options

4.1 Introduction

This section describes the various options that are available to dispose of the dredged material. A long list of options are described and are screened to identify a reasonable short list of options, with section 4.5 providing an assessment of the short listed options.

4.2 Long list of Options

The long list of options are listed below and can generally be split into land-based or sea-based disposal options. They are described in more detail in Section 4.4:

- Option 1a/1b: Do Nothing / Do Minimum;
- Option 2: Reuse in land-based construction on site;
- Option 3: Reuse as construction material off site;
- Option 4: Disposal to landfill;
- Option 5: Beach restoration / other coastal protection;
- Option 6: Offshore sea disposal; and
- Option 7: Spreading on agricultural land.

4.3 Common Activities for Land-Based Disposal Options

The disposal options that have land-based components include:

- Option 2: Reuse in land-based construction on site;
- Option 3: Reuse as construction material off site;
- Option 4: Disposal to landfill;
- Option 5: Beach restoration / other coastal protection; and
- Option 7: Spreading on agricultural land.

The activities that are common to land-based disposal options are:

- Landing the dredge material;
- Storage of dredge material;
- Dewatering the dredge material; and
- Loading and transport for disposal.

4.4 Common Activities for Sea-Based Disposal Options

The steps that are common to sea-based disposal options are:

- Transporting the dredge material to the disposal location; and
- Dispose of the material at licenced sea disposal location.

4.5 Screening of Long List Options

Section 4.5.1 to 4.5.8 set out each option in further detail and describe the screening of each. During the screening process, options that are considered to be impracticable (based on considerations set out in Section 3.2) have been discounted.

Conversely, short-listed options that have been considered as potentially practicable are further considered in Section 4.6. The options are then assessed based on strategic, environmental, health and safety and cost implications outlined in Section 3.3.

4.5.1 Option 1a/1b: Do Nothing / Do Minimum

Option 1a/1b is the baseline scenario which considers the current situation where no dredging would take place. For this option, the new vessels which are under construction would not be useable at the Colonsay Ferry terminal due to their larger size. As such, in a do-nothing / do minimum scenario no dredging would take place and it would be expected that existing vessels would be used in the short-term. The existing vessels are currently prone to breaking down and requiring regular repairs. Under a do-nothing scenario, these vessels would no longer be repaired through time, these vessels and ferry services would cease to exist. Under a do minimum scenario, the vessels would be repaired in the short term, however, in the long-term the existing vessels would no longer be operational due to their age and would reach a stage whereby they are no longer repairable. As such, the ferry services via these vessels would cease to exist. This option is impractical as the new vessels would ground if no dredging were to be carried out and therefore has been discounted.

4.5.2 Option 2: Re-use In Land-based Construction on Site

This option would re-use any dredge materials within other areas of the construction site. Any material that is re-used on site will need to be assessed to ensure it is geotechnically suitable.

For the Proposed Development, there would be potential to re-use some of the dredge material on site, e.g. use as infill in a small area of the Proposed Development. However, as there are limitations with the suitability of materials and even where suitable, not all dredged material would be able to be used.

The saline content of the dredge material makes it unsuitable as a construction material. The individual descriptions of the cores are included in Table 2-5, with the sediment generally consisting grey, fine to coarse sand with gravel and shells and shell fragments. There were cobbles noted in COSS124B, and multiple boreholes were terminated due to obstructions. The grading and washing required coupled with the drying and storage challenges (suitable land for drying lagoons is not available within vicinity of Colonsay) makes this option uneconomical and impractical. This option has been discounted.

4.5.3 Option 3: Re-use as Construction Material off Site

This option would re-use dredge material off-site at another construction site, within the vicinity of the Proposed Development. Any material that is re-used off site will need to be assessed to ensure it is geotechnically suitable, however, as noted above, there are limitations with the suitability of materials.

The saline content of the dredge material makes it unsuitable as a construction material. The individual descriptions of the cores are included in Table 2-5, with the sediment generally consisting grey, fine to coarse sand with gravel and shells and shell fragments. There were cobbles noted in COSS124B, and multiple boreholes were terminated due to obstructions. The grading and washing required coupled with the drying and storage challenges (suitable land for drying lagoons is not available within vicinity of Colonsay) makes this option uneconomical and impractical. This option has been discounted.

4.5.4 Option 4: Disposal to Landfill

This option would dispose dredge material within a landfill site on land. The most common use of dredge material within landfill sites is as capping or restoration material. Material would need

to be brought ashore within the port estate and dewatered before being transported by HGVs and taken by road to a landfill site.

Suitable land for drying lagoons to dewater the dredge material is not available within the vicinity of Colonsay and would be impractical. Additionally, there are no suitable landfill sites in the immediate vicinity of Colonsay that could cope with a relatively large volume of material, Bonaveh Landfill on Colonsay is no longer operational. The closest operational landfill site to the Proposed Development is Gartbreck Landfill, Bowmore, Isle of Islay, PA43 7JG (Licence Number: PPC/A/1025163) approximately 40km south. The annual capacity of this landfill is approximately 9,815 tonnes.

It is estimated that dredge material would be approximately 20,000 wet tonnes. Although it is recognised that dredge material would need to be dewatered and the weight would be lower. The existing landfill sites must cope with large volumes of domestic and industrial waste, and marine dredging at the scale of the Proposed Development would exceed the capacity of the landfill site. Transportation of material from the harbour to a landfill site would generate significant vehicle movements on local roads, contributing to traffic congestion and air and noise pollution with associated carbon emissions.

This option has been discounted.

4.5.5 Option 5: Beach Restoration / Other Coastal Protection

This option would use dredge material for beach recharge as a sustainable beneficial use, generating a purpose for the material that benefits a local amenity. Material is typically deposited direct from the dredging vessel via a pipeline or by ‘rainbowing’ onto the beach, where it is reprofiled using land-based plant. As previously discussed, the dredged sediment is expected to generally consist of grey, fine to coarse sand with gravel and shells and shell fragments. There were cobbles noted in COSS124B, and multiple boreholes were terminated due to obstructions.

There are no known sites available within close proximity to the Proposed Development that require beach recharge and as such, this option has been discounted.

4.5.6 Option 6: Offshore Sea Disposal

Disposal at sea involves the dredge material being transported to a licensed disposal site in a dredging vessel. This approach takes place at sea and does not require the landing of any materials.

Whilst the dredged material meets the chemical requirements for deposition at sea (<AL2), due to the measured exceedances of AL1 and SQuiRT levels, engagement with Marine Directorate is recommended, and may be required, to agree disposal strategies (see Section 0).

Deposit sites in the marine environment are designated by MD-LOT. The closest disposal site is approximately 50km south of the Proposed Development, on the south side of the Island of Islay at Portnahaven - Site ID MA035 south of Port Wemyss. This disposal site is within an accessible distance from the Proposed Development and is likely to have the capacity to store the volumes of dredge material taken from Colonsay.

Disposal at the Site

Portnahaven - Site ID MA035 south of Port Wemyss has been identified to receive the dredged sediment. As this is a licenced disposal site, it is evaluated that Portnahaven has effective pollution prevention control measures to limit sediment dispersal. Due to the limited dredged volume of disposal sediment (~7,000m^3) and the comparative size of the disposal site, the

resultant contaminant concentrations post-disposal will be diluted far below AL1 and SQuiRT value levels.

Option 6 is considered practical.

4.5.7 Option 7: Spreading on Agricultural Land

This option would involve placing dredge material on agricultural land. There is no known requirement for a supply of imported material at Colonsay. The dredge material would have to be de-watered and desalinated to make it suitable for soil conditioning or spreading, and no land is available within the port estate to locate a drying lagoon. Additionally, there is unlikely to be available agricultural land which is able to use the volumes of dredge material taken from Colonsay.

Transportation of material from the harbour to agricultural land would generate significant vehicle movements on local roads, contributing to traffic congestion and air and noise pollution with associated carbon emissions.

This option has been discounted.

4.5.8 Summary of Short listed Options

The above screening of potential options concluded that options 1-5 and 7 are not viable for reasons described in Section 4.4 above. A summary of screening the long list of options is outlined in Table 4.1.

Table 4-1: Short-listing of Options

Option	Screening Assessment	Result
Option 1a/1b: Do Nothing/Do Minimum	No dredging is practical. However, in the long-term ferry services from existing vessels would cease to exist. This would not meet the project requirements however it has been included in the assessment as a baseline comparison. New vessels will ground if dredging is not undertaken.	Discounted
Option 2: Reuse in land-based construction on site	Unsuitable as a construction material. Although some material could be re-used on site, the majority cannot.	Discounted
Option 3: Reuse as construction material off site	Unsuitable as a construction material. The grading and washing required coupled with the drying and storage challenges (suitable land for drying lagoons is not available within vicinity of Colonsay and would be impractical) makes this option uneconomical and unpractical.	Discounted
Option 4: Disposal to landfill	Suitable land for drying lagoons is not available within vicinity of Colonsay and would be impractical. Additionally, there are no suitable landfill sites in the immediate vicinity of Colonsay that could cope with a large volume of material and transportation of material would have a number of environmental impacts.	Discounted

Option	Screening Assessment	Result
Option 5: Beach restoration / other coastal protection	Unsuitable as a beach recharge material. There are no known sites available within proximity to the Proposed Development that require beach recharge and as such, this option has been discounted.	Discounted
Option 6: Offshore sea disposal	The dredge material meets the chemical requirements for deposition at sea (>AL1, <AL2) and disposal site is an accessible distance from the Proposed Development. However, due to the exceedances of AL1, agreement with Marine Directorate may be required prior to disposal.	Short-listed
Option 7: Spreading on agricultural land	The dredge material would have to be de-watered and desalinated to make it suitable for soil conditioning or spreading, and no land is available within the port estate to locate a drying lagoon. Additionally, there is unlikely to be available agricultural land which is able to use the volumes of dredge material taken from Colonsay and transportation of material would have a number of environmental impacts.	Discounted

Following the screening the only option that was considered to be suitable was Option 6: Offshore Sea disposal.

4.6 Assessment of Feasible Options

An assessment of Option 6 against the considerations (strategic, health, safety and environmental and cost) identified in Table 3.1 has been carried out as shown in Table 4.2 below.

Table 4-2: Assessment of Feasible Option

Criteria	Option 6: Offshore Sea Disposal
Operational feasibility	Operationally, disposal offshore at sea is practical and easy to operate after material has been dredged. Dredge material would be transported via a hopper.
	Classification: High
Availability of sites/ facilities	The closest disposal sites are on the south side of the Island of Islay (Portnahaven - Site ID MA035 approximately 20km west of Port Ellen (55.63621, -6.51789). This disposal site exists within an accessible distance from the Proposed Development and is likely to have the capacity to store the volumes of dredge material taken from Port Ellen.
	Classification: Medium

Criteria	Option 6: Offshore Sea Disposal
General public acceptability	There may be some minor disruption during dredging operations due to e.g. noise. However, in the long term, and overall, the works would enable ferry services to use new vessels and enable more reliable services for the general public. As offshore disposal sites are already operational for disposal of dredge materials this is not expected to affect the general public.
	Classification: Medium to High
Likely agency acceptability	Consultation with some regulatory bodies in relation to the Proposed Development has been undertaken and no concerns raised to date. Further discussion is needed with MD-LOT. Disposal site is already a licenced site.
	Classification: Medium
Legislative implications	Disposal of the dredge material at sea would have negligible legislative implications as long as all appropriate licences are applied for and in place prior to the works.
	Classification: High
Safety	Disposal at sea would have negligible implications for safety providing that normal navigational and maritime procedures are observed and carried out under marine licence conditions.
	Classification: High
Public health	There are no known threats to public health associated with disposal at sea.
	Classification: High
Pollution/ contamination	Consideration has been given to the results from sampling and analysis of dredged material at the site. Despite the localised recorded exceedances, effective sampling and transportation of the dredged sediment to the disposal site (Portnahaven - Site ID MA035 south of Port Wemyss) will result in low contaminative risk. Although sediment re-mobilisation will occur, this will only constitute a fraction of the dredged sediment. Measured exceedances of Marine Directorate AL1 values were minimal. It is unlikely that re-mobilisation will provide risk to ecological receptors. Furthermore, the disposal at Portnahaven - Site ID MA035 south of Port Wemyss - will dilute the contaminant concentrations far below unacceptable levels. If workers are chronically exposed to the dredged material, under the CDM regulations (2015), a risk assessment by the employer must be

Criteria	Option 6: Offshore Sea Disposal
	undertaken. Workers should wear appropriate PPE at all times when collecting, transporting and disposing of the sediment.
	Classification: High to Medium
Ecological impact	Geo-environmental results indicate that there would be little or no known risk of ecological impact arising from disposal to sea at a licenced site. As the disposal sites are permitted it has been assumed that any required licences are already in place. However, consultation with Marine Directorate is recommended to confirm this.
	Classification: High to Medium
Interference with other legitimate activities	The dredging works are necessary to facilitate the new vessels at the Proposed Development location. There will be minimal impact on other users within the area.
	Classification: High
Amenity/ aesthetic	No amenity or aesthetic implications have been identified for this option. Dredge material disposal site is out at sea.
	Classification: High
Capital	£5m or less
	Classification: Low

5 Conclusion

This report has been prepared in support of a Marine Licence application and to determine the best disposal method of the dredge material required for the new Islay vessel enabling works. It compares various options for the disposal of dredge material and identifies the Best Practicable Environmental Option (BPEO). A long-list of options were considered which included do nothing/do minimum, reuse within construction, disposal to landfill, use for beach restoration, offshore sea disposal and spreading agricultural land. These options were screened against a number of different criteria to develop a short list. Only one option was taken forward to short-list – Option 6 Offshore sea disposal.

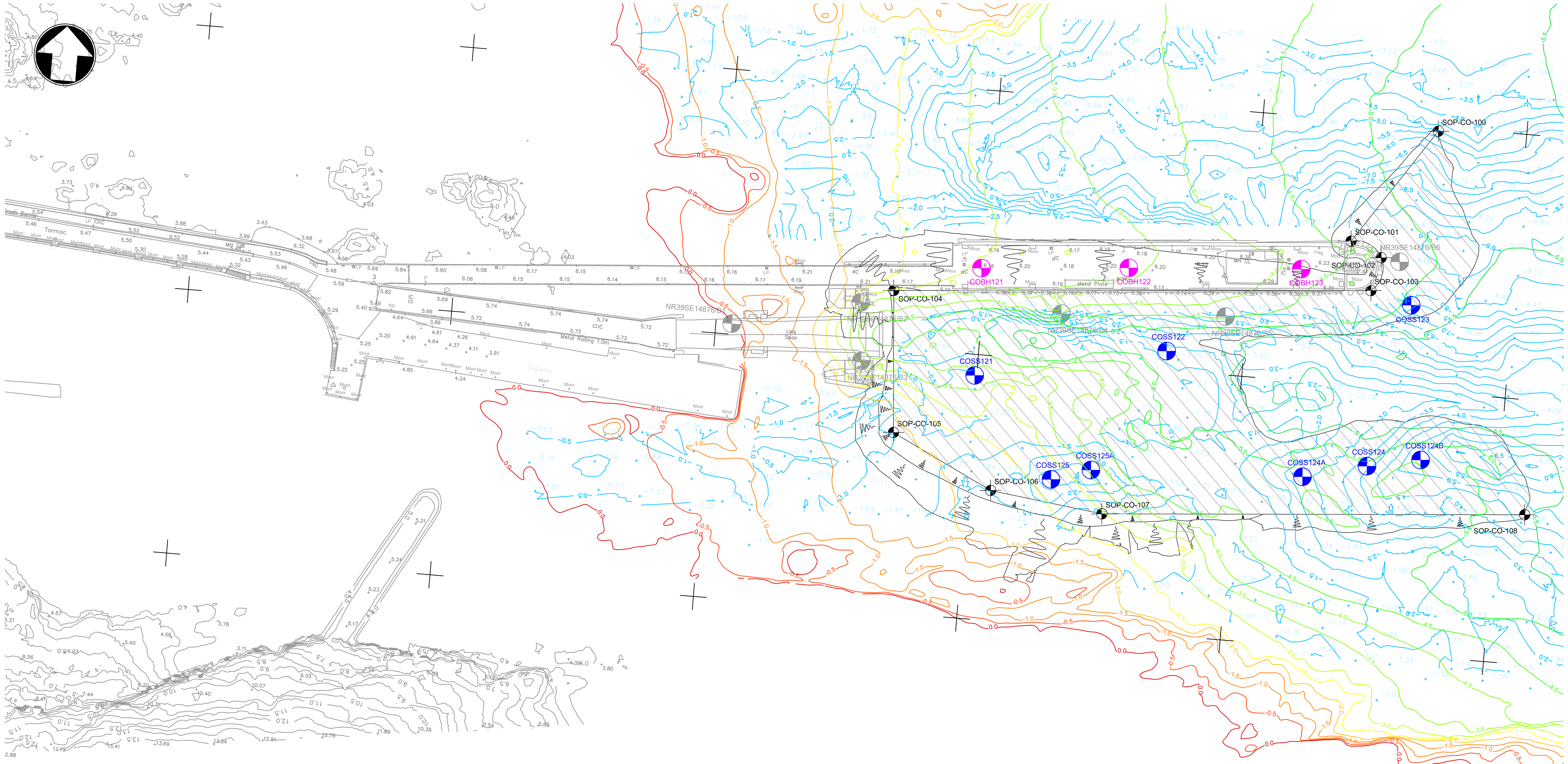
Analysis of dredge sampling concluded that, whilst the dredged material meets the chemical requirements for deposition at sea (<AL2), due to the measured exceedances of AL1 and NOAA SQuiRT values, engagement with Marine Directorate is recommended, and may be required to agree disposal strategies. The design has been reviewed to minimise the amount of sediment removed, though no consideration has currently been given to operational changes to further limit suspended sediment spread. Although, a wide dispersion of sediments upon release at the disposal site is inevitable, it is noted that underwater disposal sites are usually located within areas that do not contain sensitive ecological receptors. If ecological receptors are present, dispersal upon release would result in only small concentrations of contaminants being received by potentially sensitive receptors at the seafloor, and no significant impact is anticipated. However, should further discussion with Marine Directorate on additional measures and conditions required will be undertaken a part of the dredge licensing.

Appendices

A. Sediment Sampling Results

See accompanying Microsoft Excel Spreadsheet

B. Dredging, Sampling and Analysis Plan



Plan
Scale 1:500

Dredge depth (CD)	Dredge Pocket Plan Area (m²)	Dredge Slope Plan Area (m²)	Dredge Volume (m³)	Dredge Volume Marine Deposits (m³)	Dredge Volume Rock (m³)
-5.5m	4121	1787	5851	3970	1881

Dredging Setting Out

Setting Out Point	Easting	Northing
SOP-CO-100	139733.2678	694149.2260
SOP-CO-101	139718.5230	694127.1660
SOP-CO-102	139724.4523	694124.4944
SOP-CO-103	139723.0165	694118.1515
SOP-CO-104	139633.0474	694110.7711
SOP-CO-105	139635.1879	694083.9936
SOP-CO-106	139654.4042	694074.5897
SOP-CO-107	139675.7454	694071.8987
SOP-CO-108	139755.4875	694078.2883

LAND BASED BOREHOLE LOCATION

Name	Scheduled Depth (m)	Eastings	Northings	Comments
COBH121	12	139649.23	694116.34	
COBH122	12	139677.02	694118.67	
COBH123	12	139709.55	694121.12	

SEABED SAMPLING LOCATION (Vibrocore)

Name	Scheduled Depth (m)	Eastings	Northings	Termination Depth (m)	Ground Conditions Encountered	Comments
COSS121	8	139649.61	694096.02	0.1	0.0m-0.1m Grey fine to coarse SAND.	Terminated on practical refusal. Possibly rockhead. Position attempted twice. 0 samples collected
COSS122	8	139685.44	694103.59	0.8	0m-0.35m Dark grey silty organic SAND 0.35m-0.8m Grey slightly fine to coarse GRAVEL.	Terminated on practical refusal. 2 samples collected
COSS123	8	139730.83	694116.03	1.35	0m-0.9m Dark grey silty organic SAND 0.9m – 1.35m Grey slightly sandy coarse GRAVEL.	Terminated on practical refusal. 3 samples collected
COSS124	1	139725	694085	TBC	TBC	Additional sampling location to be completed.
COSS124A	1	139713	694082	TBC	TBC	Additional optional VC locations to be undertaken only if COSS124 is not successful.
COSS124B	1	139735	694087	TBC	TBC	Additional optional VC locations to be undertaken only if COSS124 is not successful.
COSS125	2	139666	694078	TBC	TBC	Additional sampling location to be completed.
COSS125A	2	139673	694080	TBC	TBC	Additional optional VC locations to be undertaken only if COSS125 is not successful.

1:500 — 0 — 25m — 50m

C:\Users\BRO97296\Mott MacDonald\105612 Islay - Do\00 DR - Drawings\WIP_CO Colonsay\105612-MMD-CO-ZZ-DR-C-0101.dwg Mar 9, 2023 - 3:07PM BRO97296

Notes

1. All chainages are in metres.
2. All dimensions in millimetres unless noted otherwise.
3. All levels in metres relative to Chart Datum (mCD) unless noted otherwise.
4. DO NOT SCALE. Follow written dimensions only.
5. The Client accepts no liability for the accuracy of the topographical & bathymetrical information provided
6. The Contractor shall verify all dimensions, elevations, coordinates, and site conditions prior to execution.
7. For general notes refer to drawing 105612-MMD-(**)-ZZ-0011 (**) denotes field 3 Volume or system varies per project site PA,PE,CO & KE

Key to symbols

- Area to be Dredged to -5.5m C.D.
- SOP-CO-100 — -5.5m C.D. Dredge Area Setting Out Point

Bathymetric Contours (2022 Survey):

- 0.0 — 0.0m C.D. Contour
- -0.5 — -0.5m C.D. Contour
- -1.0 — -1.0m C.D. Contour
- -1.5 — -1.5m C.D. Contour
- -2.0 — -2.0m C.D. Contour
- -2.5 — -2.5m C.D. Contour
- -3.0 — -3.0m C.D. Contour
- -3.5 — -3.5m C.D. Contour
- -4.0 — -4.0m C.D. Contour
- -4.5 — -4.5m C.D. Contour
- -5.0 — -5.0m C.D. Contour
- -5.5 — -5.5m C.D. Contour
- -6.0 — -6.0m C.D. Contour
- COBH — As-Built Land Based Borehole Location
- COSS — Seabed Sampling Location (Vibrocore)
- BH — Approximate Historical Exploratory Hole Locations
- 2.3 — Sub Base Profile Thickness
- Sub Base Profile Thickness Contour

Key Reference Information

External Drawings:
Topographical Survey
Reference: A8351_CD
Date of Survey: 29.11.2022
Bathymetric Survey
Reference: A8351_CD
Date of Survey: 29.11.2022

Rev	Date	Drawn	Description	Ch'k'd	App'd
C01	17.03.2023	CC	Tender Issue	BR	CO

Status Stamp
TENDER

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Title
New Islay Vessel Port Enabling Works Colonsay Dredging Sampling Plan

Designed	K. Wells	KW	Eng check	K. Wells	KW
Drawn	C. Campbell	CC	Coordination	G. Mather	GM
Dwg check	G. Mather	GM	Approved	C.Ohl	CO

MMD Project Number	Scale at A1	Security
105612	1:500	STD

Suitability Description	Suit. Code
Authorised and Accepted	A1

Drawing Number	Rev
105612-MMD-CO-ZZ-DR-C-0101	C01

C. Marine Directorate Action Levels

Table C.5-1 identifies the Marine Directorate action levels for sediment disposal. These are the applicable guidance values used when assessing suitability for disposal to sea to ensure the water and ecological environment is protected against any potential contaminants within the dredge material.

Table C.5-1: Marine Directorate action levels

Contaminant	Revised AL1 mg/kg dry weight (ppm)	Revised AL2 mg/kg dry weight (ppm)
Arsenic (As)	20	70
Cadmium (Cd)	0.4	4
Chromium (Cr)	0	370
Copper (Cu)	30	300
Mercury (Hg)	0.25	1.5
Nickel (Ni)	30	150
Lead (Pb)	50	400
Zinc (Zn)	130	600
Tributyltin	0.1	0.5
Polychlorinated Biphenyls	0.02	0.18
Polyaromatic Hydrocarbons		
Acenaphthene	0.1	
Acenaphthylene	0.1	
Anthracene	0.1	
Fluorene	0.1	
Naphthalene	0.1	
Phenanthrene	0.1	
Benzo[a]anthracene	0.1	
Benzo[b]fluoranthene	0.1	
Benzo[k]fluoranthene	0.1	
Benzo[a]pyrene	0.1	
Benzo[g,hi]perylene	0.1	
Dibenzo[a,h]anthracene	0.01	
Chrysene	0.1	
Fluoranthene	0.1	
Pyrene	0.1	
Indeno(1,2,3cd0pyrene	0.1	
Total hydrocarbons	100	

D. Laboratory Test Certificates

Certificate of Analysis

Report No.: **22-01633-2A**

Issue No.: **2**
Date of Issue **08/03/2023**

Customer Details:	Holequest Ltd, Winston Road, Galashiels, Scotland, TD1 2DA
Customer Contact:	Craig Rodger
Customer Order No.:	21814
Customer Reference:	Islay Routes
Quotation Reference:	Q22-00446 (Issue: 3)
Description:	2 sediment samples
Date Received:	29/11/2022
Date Started:	09/12/2022
Date Completed:	06/02/2023
Test Methods:	Details available on request (refer to SOP code against relevant result/s)
Notes:	None

[Redacted]

Approved By: **David Long, LIMS Manager**

UKAS TESTING
1663

Results Summary - Dry Weights, Moisture, Total Organic Carbon, TPH, Organotins, Density & Asbestos

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

						Customer Sample No	Certified Reference Material			AQC spike			PASS131 @ 0.0	PASS133 @ 0.0
						RPS Sample No							7406	7407
						Sample Type	SEDIMENT			SEDIMENT			Sediment	Sediment
						Sample Matrix	CRM PACS 3CRM NIST 1944			Spike on clean sediment			SED_MAR	SED_MAR
						Sampling Date							03/11/2022	03/11/2022
Determinand	**CAS No**	**Codes**	**SOP**	**Units**	**RL**	**Assigned Value**	**Measured Value**	**Recovery %**	**Assigned Value**	**Measured Value**	**Recovery %**			
dry solids (at 105°C)		N	397	% w/w		n/a	n/a	n/a	n/a	n/a	n/a		72.8	72.9
moisture (at 105°C)		N	In house	% w/w		n/a	n/a	n/a	n/a	n/a	n/a		27.2	27.1
specific gravity		N	In house			n/a	n/a	n/a	n/a	n/a	n/a		1.2	1.4
total organic carbon		UO	404	% w/w AD	0.3	4.4	5.04	114.5%	1.5	1.2	80.0%		1.18	1.27
total petroleum hydrocarbons by GCFID (C10 - C40)		N	In house	mg/kg DW	1	n/a	n/a	n/a	n/a	n/a	n/a			108
dibutyltin (DBT)	1002-53-5	UO	395	µg/kg DW	5	1236.76	1174.96	95.0%	40	40.66	101.7%		17.3	< 5.0
tributyltin (TBT)	56573-85-4	UO	395	µg/kg DW	2	1049.2	814.1	77.6%	40	41.18	103.0%		283	< 2.0
asbestos (on as received solid)		US	In house			n/a	n/a	n/a	n/a	n/a	n/a		Not detected	Not detected

Results Summary - Metals

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

							Customer Sample No	Standard Reference Material		PASS131 @ 0.0	PASS133 @ 0.0
							RPS Sample No			7406	7407
							Sample Type	SEDIMENT		Sediment	Sediment
							Sample Matrix	SRM NIST 2702		SED_MAR	SED_MAR
							Sampling Date			03/11/2022	03/11/2022
Determinand	**CAS No**	**Codes**	**SOP**	**Units**	**RL**	**Assigned Value**	**Measured Value**	**Recovery %**			
arsenic (HF digest)	7440-38-2	USI	M-129	mg/kg DW	0.5	45.3	43	94.9%		7.4	3.7
barium (HF digest)	7440-39-3	USI	M-129	mg/kg DW	1	397.4	393	98.9%		209	198
cadmium (HF digest)	7440-43-9	USI	M-129	mg/kg DW	0.1	0.817	0.784	96.0%		0.2	< 0.10
chromium (HF digest)	7440-47-3	USI	M-129	mg/kg DW	0.5	352	300	85.2%		40.2	58.9
copper (HF digest)	7440-50-8	USI	M-129	mg/kg DW	0.5	117.7	100	85.0%		19.1	15.3
iron (HF digest)	7439-89-6	USI	M-129	mg/kg DW	10	74000	68870	93.1%		16200	9620
lead (HF digest)	7439-92-1	USI	M-129	mg/kg DW	0.5	132.8	118	88.9%		19	244
mercury (HF digest)	7439-97-6	USI	M-129	mg/kg DW	0.01	0.4474	0.4	89.4%		0.07	0.04
nickel (HF digest)	7440-02-0	USI	M-129	mg/kg DW	0.5	75.4	67	88.9%		20.3	29.8
vanadium (HF digest)	7440-62-2	USI	M-129	mg/kg DW	1	357.6	325	90.9%		44.7	32.7
zinc (HF digest)	7440-66-6	USI	M-129	mg/kg DW	2	485.3	434	89.4%		327	18.7

Results Summary - Polycyclic Aromatic Hydrocarbons

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

					Customer Sample No	Certified Reference Material		AQC spike			PASS131 @ 0.0	PASS133 @ 0.0
					RPS Sample No						7406	7407
					Sample Type	SEDIMENT		SEDIMENT			Sediment	Sediment
					Sample Matrix	CRM IAEA_459		Spike on clean sediment			SED_MAR	SED_MAR
					Sampling Date						03/11/2022	03/11/2022
Determinand	**CAS No**	**Codes**	**SOP**	**Units**	**RL**	**Assigned Value**	**Measured Value**	**Recovery %**	**Assigned Value**	**Measured Value**	**Recovery %**		
naphthalene	91-20-3	U	396	µg/kg DW	3	n/a	n/a	n/a	25	24	96.0%	19.70	84.90
acenaphthylene	208-96-8	U	396	µg/kg DW	2	3.2	2.14	66.9%	25	25.81	103.2%	< 1.41	< 1.41
acenaphthene	83-32-9	U	396	µg/kg DW	1.7	1.78	2.14	120.2%	25	23.02	92.1%	6.45	78.30
fluorene	86-73-7	U	396	µg/kg DW	1.7	4.7	2.99	63.6%	25	23.58	94.3%	27.50	195.00
phenanthrene	85-01-8	U	396	µg/kg DW	4	33.9	26.89	79.3%	25	21.79	87.2%	253.00	580.00
anthracene	120-12-7	U	396	µg/kg DW	2.5	6	5.07	84.5%	25	23.09	92.4%	10.80	139.00
fluoranthene	206-44-0	U	396	µg/kg DW	2.5	37.3	36.43	97.7%	25	23.04	92.2%	40.00	197.00
pyrene	129-00-0	U	396	µg/kg DW	2.8	46.3	41.45	89.5%	25	23.16	92.6%	47.60	268.00
benzo(a)anthracene	56-55-3	U	396	µg/kg DW	1.6	19.3	18.26	94.6%	25	21.58	86.3%	30.80	146.00
chrysene	218-01-9	U	396	µg/kg DW	1.7	18.56	19.49	105.0%	25	26.29	105.2%	57.40	138.00
benzo(b)fluoranthene	205-99-2	U	396	µg/kg DW	1.6	44.1	34.97	79.3%	25	19.87	79.5%	30.20	225.00
benzo(k)fluoranthene	207-08-9	U	396	µg/kg DW	2	19	25.58	134.6%	25	21.47	85.9%	8.84	80.80
benzo(a)pyrene	50-32-8	U	396	µg/kg DW	0.9	22.7	27.48	121.1%	25	25.39	101.6%	24.20	216.00
indeno(1,2,3-c,d)pyrene	193-39-5	U	396	µg/kg DW	2.2	36	38.02	105.6%	25	23.89	95.6%	15.70	163.00
dibenzo(a,h)anthracene	53-70-3	U	396	µg/kg DW	1.6	n/a	n/a	n/a	25	22.65	90.6%	8.49	37.70
benzo(g,h,i)perylene	191-24-2	U	396	µg/kg DW	1.4	36	47.07	130.8%	25	25.88	103.5%	20.90	254.00

Results Summary - Organochlorine Pesticides & Polychlorinated Biphenyls

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

						Customer Sample No	Certified Reference Material			AQC spike			PASS131 @ 0.0	PASS133 @ 0.0
						RPS Sample No							7406	7407
						Sample Type	SEDIMENT			SEDIMENT			Sediment	Sediment
						Sample Matrix	CRM BCR-536			Spike on clean sediment			SED_MAR	SED_MAR
						Sampling Date							03/11/2022	03/11/2022
Determinand	**CAS No**	**Codes**	**SOP**	**Units**	**RL**	**Assigned Value**	**Measured Value**	**Recovery %**	**Assigned Value**	**Measured Value**	**Recovery %**			
alpha-hexachlorocyclohexane (alpha-HCH)	319-84-6	N	In house	µg/kg AD	0.45	n/a	n/a	n/a	n/a	n/a	n/a		< 0.45	< 0.45
beta-hexachlorocyclohexane (beta-HCH, beta-BHC)	319-85-7	N	In house	mg/kg AD	0.02	n/a	n/a	n/a	n/a	n/a	n/a		< 0.02	< 0.02
gamma-hexachlorocyclohexane (lindane)	58-89-9	N	In house	µg/kg AD	0.38	n/a	n/a	n/a	n/a	n/a	n/a		< 0.38	< 0.38
hexachlorobenzene (HCB)	118-74-1	N	In house	µg/kg AD	0.84	n/a	n/a	n/a	n/a	n/a	n/a		< 0.84	< 0.84
dieldrin	60-57-1	N	In house	µg/kg AD	0.21	n/a	n/a	n/a	n/a	n/a	n/a		< 0.21	< 0.21
p,p'-DDD	3424-82-6	N	In house	µg/kg AD	0.58	n/a	n/a	n/a	n/a	n/a	n/a		< 0.58	< 0.58
p,p'-DDT	72-54-8	N	In house	µg/kg AD	0.31	n/a	n/a	n/a	n/a	n/a	n/a		< 0.31	< 0.31
p,p'-DDE	50-29-3	N	In house	µg/kg AD	0.75	n/a	n/a	n/a	n/a	n/a	n/a		< 0.75	< 0.75
PCB congener 18	37680-65-2	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.26	81.5%		< 0.08	< 0.08
PCB congener 28	7012-37-5	UO	403	µg/kg AD	0.08	44	39.89	90.7%	4	3.42	85.5%		< 0.08	< 0.08
PCB congener 31	16606-02-3	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.6	90.0%		< 0.08	< 0.08
PCB congener 44	41464-39-5	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.27	81.8%		< 0.08	< 0.08
PCB congener 47	2437-79-8	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.35	83.8%		< 0.08	< 0.08
PCB congener 49	41464-40-8	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.41	85.3%		< 0.08	< 0.08
PCB congener 52	35693-99-3	UO	403	µg/kg AD	0.08	38	37.07	97.6%	4	3.31	82.8%		< 0.08	< 0.08
PCB congener 66	32598-10-0	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.48	87.0%		< 0.08	< 0.08
PCB congener 101	37680-73-2	UO	403	µg/kg AD	0.08	44	52.31	118.9%	4	3.48	87.0%		< 0.08	< 0.08
PCB congener 105	32598-14-4	UO	403	µg/kg AD	0.08	3.5	4.03	115.1%	4	3.9	97.5%		< 0.08	< 0.08
PCB congener 110	38380-03-9	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.62	90.5%		< 0.08	< 0.08
PCB congener 118	31508-00-6	UO	403	µg/kg AD	0.08	27.5	25.89	94.1%	4	3.84	96.0%		< 0.08	< 0.08
PCB congener 128	38380-07-3	UO	403	µg/kg AD	0.08	5.4	4.78	88.5%	4	3.95	98.8%		< 0.08	< 0.08
PCB congener 138	35065-28-2	UO	403	µg/kg AD	0.08	44.2	49.78	112.6%	4	4.55	113.8%		< 0.08	< 0.08
PCB congener 141	52712-04-6	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.89	97.3%		< 0.08	< 0.08
PCB congener 149	38380-04-0	UO	403	µg/kg AD	0.08	49	43.69	89.2%	4	3.58	89.5%		< 0.08	< 0.08
PCB congener 151	52663-63-5	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.54	88.5%		< 0.08	< 0.08
PCB congener 153	35065-27-1	UO	403	µg/kg AD	0.08	50	52.18	104.4%	4	3.83	95.8%		< 0.08	< 0.08
PCB congener 156	38380-08-4	UO	403	µg/kg AD	0.08	3	3.78	126.0%	4	4.46	111.5%		< 0.08	< 0.08
PCB congener 158	74472-42-7	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.96	99.0%		< 0.08	< 0.08
PCB congener 170	35065-30-6	UO	403	µg/kg AD	0.08	13.4	13.92	103.9%	4	4.56	114.0%		< 0.08	< 0.08
PCB congener 180	35065-29-3	UO	403	µg/kg AD	0.08	22.4	26.86	119.9%	4	4.35	108.8%		< 0.08	< 0.08
PCB congener 183	52663-69-1	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.94	98.5%		< 0.08	< 0.08
PCB congener 187	52663-68-0	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	3.89	97.3%		< 0.08	< 0.08
PCB congener 194	35694-08-7	UO	403	µg/kg AD	0.08	n/a	n/a	n/a	4	4.6	115.0%		< 0.08	< 0.08

Results Summary - Polybrominated diphenyl ethers (PBDEs)

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

Customer Sample No	AQC spike	**PASS131 @ 0.0**	**PASS133 @ 0.0**
Customer Sample ID			
RPS Sample No		7406	7407
Sample Type	**SEDIMENT**	**Sediment**	**Sediment**
Sample Matrix	Spike on clean sediment	SED_MAR	SED_MAR
Sample Depth (m)			
Sampling Date		03/11/2022	03/11/2022
Sampling Time			

Determinand	CAS No	Codes	SOP	Units	RL	Assigned Value	Measured Value	Recovery %		
2,4-dibromodiphenyl ether (BDE-7)	147217-71-8	N	In house	mg/kg AD	0.01	0.8	0.55164	69.0%	< 0.01	0.05
4,4'-dibromodiphenyl ether (BDE-15)	2050-47-7	N	In house	mg/kg AD	0.01	0.8	0.91016	113.8%	< 0.10	< 0.01
2,2',4-tribromodiphenyl ether (BDE-17)	147217-75-2	N	In house	mg/kg AD	0.01	1.6	1.67897	104.9%	< 0.01	< 0.01
2,4,4'-tribromodiphenyl ether (BDE-28)	41318-75-6	N	In house	mg/kg AD	0.01	0.8	0.82283	102.9%	< 0.01	< 0.01
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)	5436-43-1	N	In house	mg/kg AD	0.01	0.8	0.83801	104.8%	< 0.01	0.02
2,2',4,5'-tetrabromodiphenyl ether (BDE-49)	243982-82-3	N	In house	mg/kg AD	0.01	0.8	0.8561	107.0%	< 0.01	< 0.01
2,3',4,4'-tetrabromodiphenyl ether (BDE-66)	189084-61-5	N	In house	mg/kg AD	0.01	0.8	0.83023	103.8%	< 0.01	< 0.01
2,3',4',6-tetrabromodiphenyl ether (BDE-71)	189084-62-6	N	In house	mg/kg AD	0.01	0.8	0.81167	101.5%	< 0.01	< 0.01
3,3',4,4'-tetrabromodiphenyl ether (BDE-77)	93703-48-1	N	In house	mg/kg AD	0.01	0.8	0.88113	110.1%	< 0.01	< 0.01
2,2',3,4,4'-pentabromodiphenyl ether (BDE-85)	182346-21-0	N	In house	mg/kg AD	0.01	0.8	0.7617	95.2%	< 0.01	< 0.01
2,2',4,4',5-pentabromodiphenyl ether (BDE-99)	60348-60-9	N	In house	mg/kg AD	0.01	0.8	0.78581	98.2%	< 0.01	< 0.01
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)	189084-64-8	N	In house	mg/kg AD	0.01	0.8	0.86571	108.2%	< 0.01	< 0.01
2,3',4,4',6-pentabromodiphenyl ether (BDE-119)	189084-66-0	N	In house	mg/kg AD	0.01	0.8	0.8204	102.6%	< 0.01	< 0.01
3,3',4,4',5-pentabromodiphenyl ether (BDE-126)	366791-32-4	N	In house	mg/kg AD	0.01	0.8	0.74875	93.6%	< 0.01	< 0.01
2,2',3,4,4',5'-hexabromodiphenyl ether (BDE-138)	182677-30-1	N	In house	mg/kg AD	0.01	1.6	1.52865	95.5%	< 0.01	< 0.01
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)	68631-49-2	N	In house	mg/kg AD	0.01	1.6	1.25113	78.2%	< 0.01	< 0.01
2,2',4,4',5,6'-hexabromodiphenyl ether (BDE-154)	207122-15-4	N	In house	mg/kg AD	0.01	1.6	1.58977	99.4%	< 0.01	< 0.01
2,3,3',4,4',5-hexabromodiphenyl ether (BDE-156)	405237-85-6	N	In house	mg/kg AD	0.01	1.6	1.54479	96.5%	< 0.01	< 0.01
2,2',3,4,4',5',6-heptabromodiphenyl ether (BDE-183)	207122-16-5	N	In house	mg/kg AD	0.01	1.6	1.65545	103.5%	< 0.01	< 0.01
2,2',3,4,4',6,6'-heptabromodiphenyl ether (BDE-184)	117948-63-7	N	In house	mg/kg AD	0.01	1.6	1.62043	101.3%	< 0.01	< 0.01
2,3,3',4,4',5',6-heptabromodiphenyl ether (BDE-191)	446255-30-7	N	In house	mg/kg AD	0.01	1.6	1.62854	101.8%	< 0.01	< 0.01
2,2',3,3',4,4',5,6'-octabromodiphenyl ether (BDE-196)	446255-39-6	N	In house	mg/kg AD	0.01	1.6	1.2001	75.0%	< 0.01	< 0.01
2,2',3,3',4,4',6,6'-octabromodiphenyl ether (BDE-197)	117964-21-3	N	In house	mg/kg AD	0.01	4	1.45887	36.5%	< 0.01	< 0.01
2,2',3,3',4,4',5,5',6-nonabromodiphenyl ether (BDE-206)	63387-28-0	N	In house	mg/kg AD	0.01	4	2.87345	71.8%	0.0200	< 0.01
2,2',3,3',4,4',5,6,6'-nonabromodiphenyl ether (BDE-207)	437701-79-6	N	In house	mg/kg AD	0.01	4	2.88934	72.2%	< 0.01	< 0.01
decabromodiphenyl ether (BDE-209)	1163-19-5	N	In house	mg/kg AD	0.01	4	3.28529	82.1%	0.6000	0.0100

Results Summary - PSA Results

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

Customer Sample No	**PASS131 @ 0.0**	**PASS133 @ 0.0**
RPS Sample No	7406	7407
Sample Type	**Sediment**	**Sediment**
Sample Matrix	SED_MAR	SED_MAR
Sampling Date	03/11/2022	03/11/2022

Determinand	CAS No	Codes	SOP	Units		
sample type		S	In-house		Bimodal, Extremely Poorly Sorted	Trimodal, Extremely Poorly Sorted
textural group (GRADISTAT)		S	In-house		Muddy Gravel	Muddy Gravel
sediment name		S	In-house		Fine Silty Coarse Gravel	Fine Silty Coarse Gravel
arithmetic mean (method of moments)		S	In-house	µm	12000	9200
arithmetic sorting (method of moments)		S	In-house	µm	10300	11500
arithmetic skewness (method of moments)		S	In-house	µm	0.24	0.71
arithmetic kurtosis (method of moments)		S	In-house	µm	1.54	1.68
geometic mean (method of moments)		S	In-house	µm	2300	497
geometic sorting (method of moments)		S	In-house	µm	24.2	41.8
geometic skewness (method of moments)		S	In-house	µm	-1.37	-0.41
geometic kurtosis (method of moments)		S	In-house	µm	3.54	1.67
logarithmic mean (method of moments)		S	In-house	phi	-1.2	1.01
logarithmic sorting (method of moments)		S	In-house	phi	4.59	5.39
logarithmic skewness (method of moments)		S	In-house	phi	1.37	0.41
logarithmic kurtosis (method of moments)		S	In-house	phi	3.54	1.67
mean (Folk and Ward method - µm)		S	In-house	µm	1600	451
sorting (Folk and Ward method - µm)		S	In-house	µm	-0.77	-0.2
skewness (Folk and Ward method - µm)		S	In-house	µm	-0.77	-0.2
kurtosis (Folk and Ward method - µm)		S	In-house	µm	1.08	0.53
mean (Folk and Ward method - phi)		S	In-house	phi	-0.68	1.15
sorting (Folk and Ward method - phi)		S	In-house	phi	4.68	5.25
skewness (Folk and Ward method - phi)		S	In-house	phi	0.77	0.2
kurtosis (Folk and Ward method - phi)		S	In-house	phi	1.08	0.53
mean description (Folk and Ward method)		S	In-house		0	0
sorting description (Folk and Ward method)		S	In-house		Extremely Poorly Sorted	Extremely Poorly Sorted
skewness description (Folk and Ward method)		S	In-house		0	0
kurtosis description (Folk and Ward method)		S	In-house		0	0
MODE 1 - µm		S	In-house	µm	27000	27000
MODE 2 - µm		S	In-house	µm	427	427
MODE 3 - µm		S	In-house	µm	0	9.43
MODE 1 - phi		S	In-house	phi	-4.73	-4.73
MODE 2 - phi		S	In-house	phi	1.25	1.25
MODE 3 - phi		S	In-house	phi	0	6.75
D10 - µm		S	In-house	µm	6.31	3.09
D50 - µm		S	In-house	µm	10300	685
D90 - µm		S	In-house	µm	27000	27500
(D90/D10) - µm		S	In-house	µm	4270	8880
(D90 - D10) - µm		S	In-house	µm	26900	27500
(D75/D25) - µm		S	In-house	µm	34.5	2390
(D75 - D25) - µm		S	In-house	µm	20400	22400
D10 - phi		S	In-house	phi	-4.75	-4.78
D50 - phi		S	In-house	phi	-3.37	0.55
D90 - phi		S	In-house	phi	7.31	8.34
(D90/D10) - phi		S	In-house	phi	-1.54	-1.74
(D90 - D10) - phi		S	In-house	phi	12.1	13.1
(D75/D25) - phi		S	In-house	phi	-0.16	-1.5
(D75 - D25) - phi		S	In-house	phi	5.11	11.2
% gravel		S	In-house	% w/w	70.1	46.3
% sand		S	In-house	% w/w	12.5	19.6
% mud		S	In-house	% w/w	17.4	34.1
% very coarse gravel (>32<64mm or <-5>-6phi)		S	In-house	% w/w	0.00	0.00

% coarse gravel (>16<32mm or <-4>-5phi)		S	In-house	% w/w	38.90	31.80
% medium gravel (>8<16mm or <-3>-4phi)		S	In-house	% w/w	17.50	5.09
% fine gravel (>4<8mm or <-2>-3phi)		S	In-house	% w/w	9.06	5.66
% very fine gravel (>2<4mm or <-1>-2phi)		S	In-house	% w/w	4.62	3.79
% very coarse sand (>1<2mm or <0>-1phi)		S	In-house	% w/w	4.10	3.22
% coarse sand (>0.5<1mm or <1>0phi)		S	In-house	% w/w	1.83	3.96
% medium sand (>0.25<0.5mm or <2>1phi)		S	In-house	% w/w	6.33	12.20
% fine sand (>0.125<0.25mm or <3>2phi)		S	In-house	% w/w	0.24	0.26
% very fine sand (>0.0625<0.125mm or <4>3phi)		S	In-house	% w/w	0.00	0.00
% very coarse silt (>0.03125<0.0625mm or <5>4phi		S	In-house	% w/w	0.01	0.02
% coarse silt (>0.015625<0.03125mm or <6>5phi)		S	In-house	% w/w	1.52	2.97
% medium silt (>0.007813<0.015625mm or <7>6phi)		S	In-house	% w/w	4.29	9.07
% fine silt (>0.003906<0.007813mm or <8>7phi)		S	In-house	% w/w	4.71	9.86
% very fine silt (>0.001953<0.003906mm or <9>8phi		S	In-house	% w/w	2.86	5.41
% clay (<0.001953mm or >9phi)		S	In-house	% w/w	4.02	6.74

Results Summary - PSA Size Class & Statistics

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

			Customer Sample No	**PASS131 @ 0.0**	**PASS133 @ 0.0**
			RPS Sample No	7406	7407
			Sample Type	**Sediment**	**Sediment**
			Sample Matrix	SED_MAR	SED_MAR
			Sampling Date	03/11/2022	03/11/2022
Sediment	**mm**	**phi f**	**Units**		
Very coarse gravel	>32<64	<-5>-6	% w/w	0.00	0.00
Coarse gravel	>16<32	<-4>-5	% w/w	38.90	31.80
Medium gravel	>8<16	<-3>-4	% w/w	17.50	5.09
Fine gravel	>4<8	<-2>-3	% w/w	9.06	5.66
Very fine gravel	>2<4	<-1>-2	% w/w	4.62	3.79
Very coarse sand	>1<2	<0>-1	% w/w	4.10	3.22
Coarse sand	>0.5<1	<1>0	% w/w	1.83	3.96
Medium sand	>0.25<0.5	<2>1	% w/w	6.33	12.20
Fine sand	>0.125<0.25	<3>2	% w/w	0.24	0.26
Very fine sand	>0.0625<0.125	<4>3	% w/w	0.00	0.00
Very coarse silt	>0.03125<0.0625	<5>4	% w/w	0.01	0.02
Coarse silt	>0.015625<0.03125	<6>5	% w/w	1.52	2.97
Medium silt	>0.007813<0.015625	<7>6	% w/w	4.29	9.07
Fine silt	>0.003906<0.007813	<8>7	% w/w	4.71	9.86
Very fine silt	>0.001953<0.003906	<9>8	% w/w	2.86	5.41
Clay	<0.001953	>9	% w/w	4.02	6.74
Statistics*	Mean (phi)			-0.68	1.15
	Sorting			-0.77	-0.2
	Skewness			-0.77	-0.2
	Kurtosis			1.08	0.53
	% Silt/Clay		% w/w	17.41	34.07
	Textural Group**			Muddy Gravel	Muddy Gravel

* Folk & Ward

** GRADISTAT classification system (Blott, S. J. & Pye, K., 2001)

Results Summary - PSA Wentworth Scale

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

Customer Sample No		PASS131 @ 0.0	PASS133 @ 0.0
RPS Sample No		7406	7407
Sample Type		**Sediment**	**Sediment**
Sample Location		SED_MAR	SED_MAR
Sampling Date		03/11/2022	03/11/2022
Parameter	**Units**		
Pebble	% w/w	65.46	42.55
Granule	% w/w	4.62	3.79
Very coarse sand	% w/w	4.10	3.22
Coarse sand	% w/w	1.83	3.96
Medium sand	% w/w	6.33	12.20
Fine sand	% w/w	0.24	0.26
Very fine sand	% w/w	0.00	0.00
Silt Clay	% w/w	17.41	34.07
Total	% w/w	100.0	100.1

Comments

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

RPS Sample Number	Customer Number	Sample Comments
7406	PASS131 @ 0.0	The response for phenanthrene and BDE15 was outside the calibrated range of the method and it was necessary to dilute the sample in order to bring the response within range
7407	PASS133 @ 0.0	None

Deviating Samples

Report No.: 22-01633-2A

Customer Reference: Islay Routes

Customer Order No: 21814

Our policy on Deviating Samples has been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).
RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling. Samples submitted may be declared to be deviating.
Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be compromised.
Where no sampling date was supplied, samples have been declared to be deviating. If the date can be supplied, results may be reissued if assessed not deviating.
Where the sample container used was unsuitable or broken, the sample is flagged as deviating and re-sampling/re-submisson may be required.

RPS No.	Customer No.	Customer ID	Date Sampled	Containers Received	Deviating	Reason for Deviation
7406	PASS131 @ 0.0		03/11/2022	500 mL aluminium pot, 2 x 500mL plastic jars	Yes	No sampling time provided.
7407	PASS133 @ 0.0		03/11/2022	500 mL aluminium pot, 2 x 500mL plastic jars	No	No sampling time provided.

Key Codes	Description
N	Not Accredited Test
U	UKAS Accredited Test - UKAS accreditation is only implied if the report carries the UKAS logo
UF	UKAS Flexible Scope Test
M	MCERTS Accredited Test - MCERTS accreditation is only implied if the report carries the MCERTS logo
O	Marine Management Organisation (MMO) Validated
SN	Subcontracted to approved laboratory not accredited for the test
SU	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
SIN	Subcontracted to internal RPS Group laboratory not accredited for the test
SIU	Subcontracted to internal RPS Group laboratory UKAS Accredited for the test
SIM	Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test
I/S (in results)	Insufficient Sample
U/S (in results)	Unsuitable Sample
S/C (in results)	See Comments
ND (in results)	Not Detected
L (in results)	Result is outside normal limits
DW (in units)	Results are expressed on a dry weight basis

Sample Type	Sample Retention and Disposal Period
Foodstuff	1 month (if frozen) from the issue date of this report
Waters	2 weeks from the issue date of this report
Other Liquids	1 month from the issue date of this report
Solids / Soils	1 month from the issue date of this report
Sediments	1 month from the issue date of this report

Note: Sample retention may be subject to agreement with the customer for particular projects

Where the dry solids value of a sample is low (<50%), reporting limits are automatically raised for all determinants analysed on an as-received basis.

Soil Typing	Description
Type 1	Clay - Brown
Type 2	Clay - Grey/Black
Type 3	Sand
Type 4	Top Soil (Standard)
Type 5	Top Soil (High Peat)
Type 6	Made Ground (>50% Clay)
Type 7	Made Ground (>50% Sand)
Type 8	Made Ground (>50% Top Soil)
Type X	Other

Analytical Methods	
PAH's and PCB's	GCMS analysis following extraction of the wet sediment with DCM:acetone by ASE 350 extraction. Extract cleaned-up with silica and activated copper.
Metals	ICP-MS analysis following microwave assisted digestion in hydrofluoric acid of the dried (<30°C) and ground sediment.
TOC	Combustion and infrared analysis following carbonate removal with hydrochloric acid.
PSA	Wet and dry sieving followed by laser diffraction analysis.
Density	Determination of density from the dry sediment by gravimetric analysis of a known volume of sediment.
Dry solids at 105°C	A portion of the wet sediment is dried at 105°C to constant weight.
TBT and DBT	GCMS analysis following the extraction of the wet sediment and subsequent derivatisation.

Note: All testing carried out using the <2mm fraction

Laboratories	
RPS Bedford	UKAS Accreditation Laboratory No. 1663
RPS Manchester (Metals only)	UKAS Accreditation Laboratory No. 0605

Note: Where the following information is included in this certificate, it has usually been supplied by the customer: Customer Sample ID, Sample Location, Sample Depth, Sampling Date and Sampling Time. The laboratory shall not be responsible for any information that is supplied by the customer that may affect the validity of results.

RPS Bedford and Manchester Laboratories participate in the QUASIMEME Proficiency Testing Scheme

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

SOCOTEC

Test Report ID MAR01919

Issue Version: 1

Customer: Holequest Ltd, Winston Road, Galashiels, TD1 2DA

Customer Reference: 23-027 Port Colonsay

Date Sampled: 03-Jun-23

Date Samples Received: 12-Jun-23

Test Report Date: 03-Jul-23

Condition of samples: Frozen Satisfactory

Opinions and Interpretations expressed herein are outside the scope of our UKAS accreditaion
The results reported relate only to the sample tested
The results apply to the sample as received

[Redacted]

Authorised by: Jane Colbourne

Position: Customer Service Specialist

UKAS TESTING
1252

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	%	%	%	%	%	Mg/m3
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_03*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Particle Density**
COSS124 0m-0.5m	MAR01919.001	Sediment	21.2	78.8	38.00	50.76	11.24	2.64
COSS124 0.5m-1m	MAR01919.002	Sediment	18.7	81.3	54.15	40.22	5.63	Not Amenable
COSS124A 0m-0.5m	MAR01919.003	Sediment	27.7	72.3	42.39	44.24	13.38	2.64
COSS124A 0.5m-1m	MAR01919.004	Sediment	22.8	77.2	15.77	68.95	15.28	2.69
COSS124A 1m-1.5m	MAR01919.005	Sediment	18.5	81.5	26.31	56.26	17.43	2.73*
COSS124B 0m-0.5m	MAR01919.006	Sediment	26.1	73.9	54.02	37.62	8.36	
COSS124B 0.5m-1m	MAR01919.007	Sediment	24.6	75.4	25.69	64.16	10.15	
COSS124B 1m-1.5m	MAR01919.008	Sediment	17.6	82.4	38.05	48.56	13.39	2.67
COSS125 0m-0.5m	MAR01919.009	Sediment	14.9	85.1	4.69	89.09	6.21	2.66
COSS125 0.5m-1.25m	MAR01919.010	Sediment	22.0	78.0	38.44	49.32	12.23	2.69
Reference Material (% Recovery)			N/A	N/A	N/A	N/A	N/A	N/A
QC Blank			N/A	N/A	N/A	N/A	N/A	N/A

*Samples MAR01919.005, 006, 007 combined to give result from Gas Jar method.

* See Report Notes

NAIIS - No Asbestos Identified In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	N/A	% M/M
		Method No	SUB_02*	WSLM59*
		Limit of Detection	N/A	0.02
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Asbestos**	**TOC**
COSS124 0m-0.5m	MAR01919.001	Sediment	NAIIS	0.40
COSS124 0.5m-1m	MAR01919.002	Sediment	NAIIS	0.43
COSS124A 0m-0.5m	MAR01919.003	Sediment	NAIIS	0.44
COSS124A 0.5m-1m	MAR01919.004	Sediment	NAIIS	0.45
COSS124A 1m-1.5m	MAR01919.005	Sediment	NAIIS	0.48
COSS124B 0m-0.5m	MAR01919.006	Sediment	NAIIS	0.47
COSS124B 0.5m-1m	MAR01919.007	Sediment	NAIIS	0.53
COSS124B 1m-1.5m	MAR01919.008	Sediment	NAIIS	0.45
COSS125 0m-0.5m	MAR01919.009	Sediment	NAIIS	0.51
COSS125 0.5m-1.25m	MAR01919.010	Sediment	NAIIS	0.39
		Reference Material (% Recovery)	N/A	91
		QC Blank	N/A	<0.02

*Samples MAR01919.005, 006, 007 combined to give result from Gas Jar method.

* See Report Notes

NAIIS - No Asbestos Identified In Sample

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	mg/Kg (Dry Weight)							
		Method No	ICPMSS*							
		Limit of Detection	0.5	0.04	0.5	0.5	0.01	0.5	0.5	2
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Mercury**	**Nickel**	**Lead**	**Zinc**
COSS124 0m-0.5m	MAR01919.001	Sediment	7.9	0.19	33.8	7.3	0.03	22.7	4.1	36.5
COSS124 0.5m-1m	MAR01919.002	Sediment	9.3	0.30	35.3	18.4	0.02	32.3	18.2	62.8
COSS124A 0m-0.5m	MAR01919.003	Sediment	6.3	0.17	30.0	8.9	0.01	22.7	5.8	42.3
COSS124A 0.5m-1m	MAR01919.004	Sediment	0.7	<0.04	2.1	2.1	<0.01	2.1	0.5	6.7
COSS124A 1m-1.5m	MAR01919.005	Sediment	7.6	0.12	21.9	6.8	0.03	18.8	3.8	40.8
COSS124B 0m-0.5m	MAR01919.006	Sediment	3.6	0.10	27.9	8.1	0.02	21.1	4.0	41.2
COSS124B 0.5m-1m	MAR01919.007	Sediment	3.5	0.08	18.6	6.3	0.04	14.3	4.0	29.2
COSS124B 1m-1.5m	MAR01919.008	Sediment	5.8	0.15	24.6	6.0	0.02	19.0	3.4	40.7
COSS125 0m-0.5m	MAR01919.009	Sediment	5.6	<0.04	27.7	12.5	0.03	20.9	5.5	59.8
COSS125 0.5m-1.25m	MAR01919.010	Sediment	6.9	0.10	31.1	12.5	0.01	23.2	6.9	68.9
Certified Reference Material SETOC 768 (% Recovery)			96	102	99	108	106	101	92	102
QC Blank			<0.5	<0.04	<0.5	<0.5	<0.01	<0.5	<0.5	<2

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	
		Method No	ASC/SOP/301	
		Limit of Detection	1	1
		Accreditation	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Dibutyltin (DBT)**	**Tributyltin (TBT)**
COSS124 0m-0.5m	MAR01919.001	Sediment	<5	<5
COSS124 0.5m-1m	MAR01919.002	Sediment	<5	<5
COSS124A 0m-0.5m	MAR01919.003	Sediment	<5	<5
COSS124A 0.5m-1m	MAR01919.004	Sediment	<5	<5
COSS124A 1m-1.5m	MAR01919.005	Sediment	<5	<5
COSS124B 0m-0.5m	MAR01919.006	Sediment	<5	<5
COSS124B 0.5m-1m	MAR01919.007	Sediment	<5	<5
COSS124B 1m-1.5m	MAR01919.008	Sediment	<5	<5
COSS125 0m-0.5m	MAR01919.009	Sediment	<5	<5
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<5	<5
Certified Reference Material BCR-646 (% Recovery)			65	64
QC Blank			<1	<1

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ACENAPTH**	**ACENAPHY**	**ANTHRACN**	**BAA**	**BAP**	**BBF**
COSS124 0m-0.5m	MAR01919.001	Sediment	<1	<1	<1	<1	<1	<1
COSS124 0.5m-1m	MAR01919.002	Sediment	<1	<1	<1	1.24	1.19	3.94
COSS124A 0m-0.5m	MAR01919.003	Sediment	<1	<1	<1	1.72	1.86	2.06
COSS124A 0.5m-1m	MAR01919.004	Sediment	<1	<1	<1	<1	<1	<1
COSS124A 1m-1.5m	MAR01919.005	Sediment	<1	<1	<1	<1	<1	<1
COSS124B 0m-0.5m	MAR01919.006	Sediment	<1	<1	<1	1.32	1.41	1.38
COSS124B 0.5m-1m	MAR01919.007	Sediment	<1	<1	<1	<1	<1	<1
COSS124B 1m-1.5m	MAR01919.008	Sediment	<1	<1	<1	<1	<1	<1
COSS125 0m-0.5m	MAR01919.009	Sediment	<1	<1	<1	<1	<1	<1
COSS125 0.5m-1.25m	MAR01919.010	Sediment	41.6	2.91	10.1	48.6	51.6	50.6
Certified Reference Material NIST 1941b (% Recovery)			86	99	68	61	55	78
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.
As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.
*See report notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304
		Limit of Detection	1	1	1	1	1	1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**BENZGHIP**	**BKF***	**CHRYSENE ***	**DBENZAH**	**FLUORANT**	**FLUORENE**
COSS124 0m-0.5m	MAR01919.001	Sediment	<1	<1	<1	<1	<1	<1
COSS124 0.5m-1m	MAR01919.002	Sediment	4.44	<1	4.51	<1	2.83	2.01
COSS124A 0m-0.5m	MAR01919.003	Sediment	1.60	2.08	2.40	<1	3.84	<1
COSS124A 0.5m-1m	MAR01919.004	Sediment	<1	<1	<1	<1	<1	<1
COSS124A 1m-1.5m	MAR01919.005	Sediment	<1	<1	<1	<1	<1	<1
COSS124B 0m-0.5m	MAR01919.006	Sediment	1.25	1.73	1.71	<1	3.19	<1
COSS124B 0.5m-1m	MAR01919.007	Sediment	<1	<1	<1	<1	<1	<1
COSS124B 1m-1.5m	MAR01919.008	Sediment	<1	<1	<1	<1	<1	<1
COSS125 0m-0.5m	MAR01919.009	Sediment	<1	<1	1.02	<1	<1	<1
COSS125 0.5m-1.25m	MAR01919.010	Sediment	28.8	47.8	62.5	7.53	162	14.1
Certified Reference Material NIST 1941b (% Recovery)			67	75	81	99	77	55
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.
As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.
*See report notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/304	ASC/SOP/303/306
		Limit of Detection	1	1	1	1	100
		Accreditation	UKAS	UKAS	UKAS	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
COSS124 0m-0.5m	MAR01919.001	Sediment	<1	<1	1.15	<1	4920
COSS124 0.5m-1m	MAR01919.002	Sediment	1.17	3.15	9.17	3.70	8630
COSS124A 0m-0.5m	MAR01919.003	Sediment	1.09	<1	2.91	3.19	4990
COSS124A 0.5m-1m	MAR01919.004	Sediment	<1	<1	1.32	<1	2640
COSS124A 1m-1.5m	MAR01919.005	Sediment	<1	1.46	1.56	<1	2970
COSS124B 0m-0.5m	MAR01919.006	Sediment	1.03	1.41	2.23	3.69	7740
COSS124B 0.5m-1m	MAR01919.007	Sediment	<1	<1	1.37	<1	5460
COSS124B 1m-1.5m	MAR01919.008	Sediment	<1	1.26	1.46	<1	1630
COSS125 0m-0.5m	MAR01919.009	Sediment	<1	2.41	2.15	1.34	2180
COSS125 0.5m-1.25m	MAR01919.010	Sediment	32.6	14.8	111	122	9300
Certified Reference Material NIST 1941b (% Recovery)			65	57	77	68	89~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries
~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.
As the method uses surrogate standards to correct for losses, the RM results are reported as percentage trueness, not recovery.
*See report notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material NIST 1941b (% Recovery)			55	80	80	78	94	86
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries
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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB18**	**PCB105**	**PCB110**	**PCB128**	**PCB141**	**PCB149**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material NIST 1941b (% Recovery)			70	75	90	68	106~	80
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries
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Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB151**	**PCB156**	**PCB158**	**PCB170**	**PCB180**	**PCB183**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material NIST 1941b (% Recovery)			110~	70	103	83	86	61
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries
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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.08	0.08	0.08	0.08	0.08	0.08	0.08
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PCB187**	**PCB194**	**PCB31**	**PCB44**	**PCB47**	**PCB49**	**PCB66**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material NIST 1941b (% Recovery)			74	70	88	89	112~	90	100
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries
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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302
		Limit of Detection	0.56
		Accreditation	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**ICES7**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.56
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.56
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.56
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.56
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.56
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.56
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.56
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.56
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.56
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.56
Certified Reference Material NIST 1941b (% Recovery)			80
QC Blank			<0.56

For full analyte name see method summaries
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Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**AHCH**	**BHCH**	**GHCH**	**DIELDRIN**	**HCB**	**DDE**	**DDT**	**DDD**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.1	<0.1	<0.1	0.10	<0.1	<0.1	<0.1	<0.1
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.1	<0.1	<0.1	0.22	<0.1	0.26	1.22	5.93
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Certified Reference Material NIST 1941b (% Recovery)			114~	109~	111~	118~	97	92	54	76
QC Blank			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

For full analyte name see method summaries
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Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
Issue Version 1
Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308
		Limit of Detection	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	N*	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PBDE 17**	**PBDE 28**	**PBDE 47**	**PBDE 66**	**PBDE 100**	**PBDE 99**	**PBDE 85**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Certified Reference Material QBC63MS (% Recovery)			83~	114	100	86~	100	72	93~
QC Blank			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

* See Report Notes

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Specialist Chemistry, Etwall House, Bretby Business Park, Ashby Road, Bretby, Burton-upon-Trent DE15 0YZ

Test Report ID MAR01919
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Customer Reference 23-027 Port Colonsay

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308	ASC/SOP/308
		Limit of Detection	0.05	0.05	0.05	0.05	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**PBDE 154**	**PBDE 153**	**PBDE 138**	**PBDE 183**	**PBDE 209**
COSS124 0m-0.5m	MAR01919.001	Sediment	<0.05	<0.05	<0.05	<0.05	24.9
COSS124 0.5m-1m	MAR01919.002	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS124A 0m-0.5m	MAR01919.003	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS124A 0.5m-1m	MAR01919.004	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS124A 1m-1.5m	MAR01919.005	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS124B 0m-0.5m	MAR01919.006	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS124B 0.5m-1m	MAR01919.007	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS124B 1m-1.5m	MAR01919.008	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS125 0m-0.5m	MAR01919.009	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
COSS125 0.5m-1.25m	MAR01919.010	Sediment	<0.05	<0.05	<0.05	<0.05	<0.5
Certified Reference Material QBC63MS (% Recovery)			104	113	100~	79~	99
QC Blank			<0.05	<0.05	<0.05	<0.05	<0.5*

* See Report Notes

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Test Report ID MAR01919
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Customer Reference 23-027 Port Colonsay

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR01919.001-010	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMSS*	MAR01919.001-010	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR01919.001-010	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR01919.001-010	Analysis was conducted by an approved subcontracted laboratory.
SUB_03*	MAR01919.001-010	Analysis was conducted by an approved subcontracted laboratory.
SUB_03*	MAR01919.002	Sample reported as Not Amenable as sample was unsuitable (too gravelly) for the small pyknometer method and insufficient for the Gas Jar method.
SUB_03*	MAR01919.005, 006, 007	Samples MAR01919.005, 006 & 007 were combined to be able to give a result from the Gas Jar Method. Samples were unsuitable (too gravelly) for the small pyknometer method.
ASC/SOP/301	MAR01919.001-010	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted, but in doing so, the detection limit for this test has been elevated.
ASC/SOP/303/304	MAR01919.001-010	Benzo[k]fluoranthene is known to coelute with Benzo[j]fluoranthene and these peaks can not be resolved. It is believed Benzo[j]fluoranthene is present in these samples therefore it is suggested that the Benzo[k]fluoranthene results should be taken as a Benzo[k]fluoranthene (inc. Benzo[j]fluoranthene). Benzo[j]fluoranthene is not UKAS accredited. This should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR01919.001-010	Chrysene is known to coelute with Triphenylene and these peaks can not be resolved. It is believed Triphenylene is present in these samples therefore it is suggested that the Chrysene results should be taken as a Chrysene (inc. Triphenylene).This should be taken into consideration when utilising the data.
ASC/SOP/308	MAR01919.001-010	The Primary process control blank data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with BDE209 falling above acceptable reporting limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected.However in line with our QMS policy the report limit for this compound has been raised and samples have been blank subtracted.
ASC/SOP/308	MAR01919.001-010	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected.However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (PBDE 99) . These circumstances should be taken into consideration when utilising the data.

DEVIATING SAMPLE STATEMENT

Deviation Code	Deviation Definition	Sample ID	Deviation Details. The following information should be taken into consideration when using the data contained within this report
D1	Holding Time Exceeded	N/A	N/A
D2	Sample Contaminated through Damaged Packaging	N/A	N/A
D3	Sample Contaminated through Sampling	N/A	N/A
D4	Inappropriate Container/Packaging	N/A	N/A
D5	Damaged in Transit	N/A	N/A
D6	Insufficient Quantity of Sample	N/A	N/A
D7	Inappropriate Headspace	N/A	N/A
D8	Retained at Incorrect Temperature	N/A	N/A
D9	Lack of Date & Time of Sampling	N/A	N/A
D10	Insufficient Sample Details	N/A	N/A
D11	Sample integrity compromised or not suitable for analysis	N/A	N/A

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

Test Report ID	MAR01919
Issue Version	1
Customer Reference	23-027 Port Colonsay

Method	Sample and Fraction Size	Method Summary
Total Solids	Wet Sediment	Calculation (100%-Moisture Content).Moisture content determined by drying a portion of the sample at 120°C to constant weight.
Particle Size Analysis	Wet Sediment	Wet and dry sieving followed by laser diffraction analysis.
Total Organic Carbon (TOC)	Air dried and ground	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Metals	Air dried and seived to <63µm	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Solvent extraction and clean up followed by GC-FID analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Brominated Flame Retardants (PBDEs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

Analyte Definitions

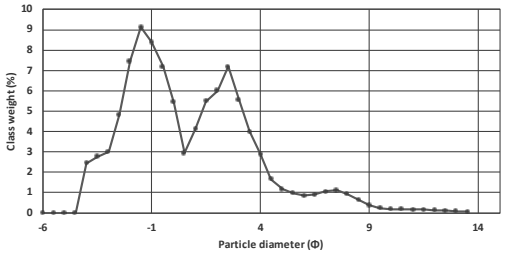
Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name	Analyte Abbreviation	Full Analyte name
ACENAPTH	Acenaphthene	C2N	C2-naphthalenes	THC	Total Hydrocarbon Content
ACENAPHY	Acenaphthylene	C3N	C3-naphthalenes	AHCH	alpha-Hexachlorcyclohexane
ANTHRACN	Anthracene	CHRYSENE	Chrysene	BHCH	beta-Hexachlorcyclohexane
BAA	Benzo[a]anthracene	DBENZAH	Dibenzo[ah]anthracene	GHCH	gamma-Hexachlorcyclohexane
BAP	Benzo[a]pyrene	FLUORANT	Fluoranthene	DIELDRIN	Dieldrin
BBF	Benzo[b]fluoranthene	FLUORENE	Fluorene	HCB	Hexachlorobenzene
BEP	Benzo[e]pyrene	INDPYR	Indeno[1,2,3-cd]pyrene	DDD	p,p'-Dichlorodiphenyldichloroethane
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	DDE	p,p'-Dichlorodiphenyldichloroethylene
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	DDT	p,p'-Dichlorodiphenyltrichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		

Aperture	MAR01919.001	MAR01919.002	MAR01919.003	MAR01919.004	MAR01919.005	MAR01919.006	MAR01919.007	MAR01919.008	MAR01919.009	MAR01919.010
63000.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
45000.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31500.000	0.000	13.579	8.768	0.000	0.000	0.000	0.000	14.646	0.000	0.000
22400.000	0.000	4.218	5.780	0.000	0.000	2.598	0.000	3.063	0.000	0.000
16000.000	2.443	2.160	1.133	0.000	1.181	3.239	0.000	0.372	0.000	7.490
11200.000	2.771	3.650	5.478	0.000	1.231	4.683	1.774	0.532	0.000	7.419
8000.000	3.007	3.701	3.624	0.748	1.439	3.561	2.039	2.378	0.132	5.141
5600.000	4.820	5.256	4.337	0.392	2.833	6.242	2.535	2.448	0.149	4.485
4000.000	7.452	6.691	4.602	2.005	5.299	9.292	4.568	4.365	0.580	3.626
2800.000	9.122	7.411	4.523	5.310	7.178	12.740	6.669	4.940	1.328	4.610
2000.000	8.384	7.486	4.140	7.315	7.150	11.662	8.110	5.303	2.504	5.673
1400.000	7.173	6.295	3.908	7.382	7.044	11.524	9.687	5.202	3.972	6.215
1000.000	5.443	4.669	3.431	7.519	5.847	8.733	8.684	4.621	5.126	5.647
707.000	2.940	2.260	3.178	7.074	3.461	3.026	7.892	3.093	9.301	4.832
500.000	4.123	2.527	4.740	7.861	4.872	3.090	7.561	4.543	13.198	5.350
353.600	5.489	3.140	4.441	6.710	4.904	2.828	5.077	4.535	16.421	6.520
250.000	5.995	5.968	3.416	4.769	3.992	1.973	3.019	3.760	16.509	7.710
176.800	7.171	8.433	3.699	4.789	4.649	2.057	3.356	4.344	12.475	6.246
125.000	5.553	4.843	4.750	6.285	5.716	1.763	5.503	5.534	6.907	3.401
88.390	3.993	1.263	7.022	9.172	8.528	1.465	7.972	7.387	3.541	1.643
62.500	2.885	0.820	5.652	7.389	7.244	1.160	5.408	5.544	1.643	1.760
44.190	1.665	0.692	2.573	3.244	3.457	0.948	2.005	2.464	0.882	1.531
31.250	1.175	0.599	1.471	1.722	1.953	0.925	1.089	1.416	0.731	1.322
22.097	0.991	0.532	1.137	1.285	1.464	0.922	0.884	1.090	0.673	1.134
15.625	0.848	0.447	0.959	1.053	1.206	0.933	0.769	0.967	0.593	0.947
11.049	0.919	0.471	0.928	1.041	1.125	0.918	0.819	0.966	0.616	0.980
7.813	1.074	0.514	1.027	1.144	1.239	0.884	0.893	1.045	0.604	1.122
5.524	1.111	0.513	1.112	1.206	1.376	0.828	0.874	1.129	0.539	1.171
3.906	0.936	0.438	0.987	1.060	1.252	0.648	0.713	1.016	0.418	1.006
2.762	0.652	0.332	0.712	0.776	0.920	0.405	0.493	0.746	0.291	0.722
1.953	0.387	0.228	0.450	0.500	0.605	0.200	0.302	0.478	0.191	0.464
1.381	0.241	0.162	0.321	0.353	0.462	0.103	0.203	0.340	0.141	0.332
0.977	0.194	0.131	0.287	0.308	0.426	0.084	0.174	0.298	0.118	0.285
0.691	0.188	0.117	0.279	0.300	0.407	0.093	0.170	0.285	0.101	0.263
0.488	0.187	0.107	0.267	0.292	0.378	0.100	0.168	0.271	0.085	0.240
0.345	0.178	0.096	0.243	0.272	0.336	0.099	0.158	0.247	0.070	0.210
0.244	0.159	0.083	0.210	0.239	0.284	0.090	0.141	0.213	0.056	0.175
0.173	0.130	0.066	0.167	0.193	0.221	0.073	0.115	0.169	0.042	0.135
0.122	0.102	0.051	0.128	0.150	0.168	0.057	0.090	0.130	0.032	0.101
0.086	0.067	0.033	0.082	0.096	0.106	0.037	0.059	0.083	0.020	0.064
	0.032	0.015	0.037	0.044	0.048	0.017	0.028	0.037	0.010	0.029

Station	Treatment	Textural Group Classification	Folk and Ward Description	Folk and Ward Sorting	Mean µm
MAR01919.001	Sediment	msG: Muddy Sandy Gravel	Coarse Sand	Very Poorly Sorted	809.021610
MAR01919.002	Sediment	msG: Muddy Sandy Gravel	Very Fine Gravel	Very Poorly Sorted	2334.152853
MAR01919.003	Sediment	msG: Muddy Sandy Gravel	Very Coarse Sand	Very Poorly Sorted	1037.343121
MAR01919.004	Sediment	gmS: Gravelly Muddy Sand	Medium Sand	Very Poorly Sorted	370.743995
MAR01919.005	Sediment	gmS: Gravelly Muddy Sand	Medium Sand	Very Poorly Sorted	420.787551
MAR01919.006	Sediment	msG: Muddy Sandy Gravel	Very Coarse Sand	Very Poorly Sorted	1705.619581
MAR01919.007	Sediment	gmS: Gravelly Muddy Sand	Coarse Sand	Very Poorly Sorted	595.903688
MAR01919.008	Sediment	msG: Muddy Sandy Gravel	Very Coarse Sand	Extremely Poorly Sorted	1162.345977
MAR01919.009	Sediment	(g)S: Slightly Gravelly Sand	Medium Sand	Poorly Sorted	378.687418
MAR01919.010	Sediment	msG: Muddy Sandy Gravel	Very Coarse Sand	Very Poorly Sorted	1112.683623

Mean phi	Sorting Coefficient	Skewness	Kurtosis	Major Sediment Fractions		
				% Gravel	% Sand	% Mud
0.3057495	2.953391016	0.2611175	1.0187504	38.00%	50.76%	11.24%
-1.2229016	3.226000632	0.0965986	0.8051370	54.15%	40.22%	5.63%
-0.0528914	3.801977517	0.0560524	0.8350424	42.39%	44.24%	13.38%
1.4315050	2.619755253	0.1875791	1.0026578	15.77%	68.95%	15.28%
1.2488367	3.076194913	0.1156890	0.9448752	26.31%	56.26%	17.43%
-0.7702949	2.639672000	0.3332633	1.7238017	54.02%	37.62%	8.36%
0.7468488	2.634094059	0.2612213	0.9442494	25.69%	64.16%	10.15%
-0.2170363	4.026833791	-0.0511624	0.9493812	38.05%	48.56%	13.39%
1.4009204	1.498612365	0.0722853	1.4047954	4.69%	89.09%	6.21%
-0.1540452	3.286029617	0.1019952	1.0366137	38.44%	49.32%	12.23%

MAR01919.001



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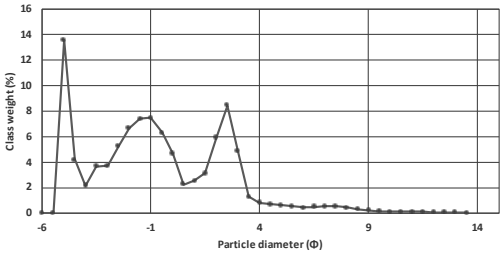

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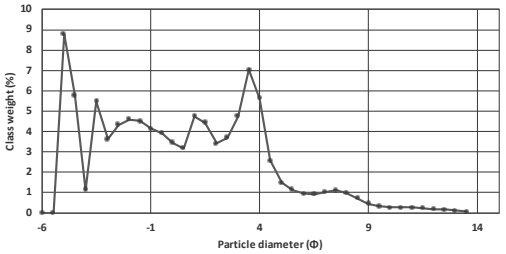

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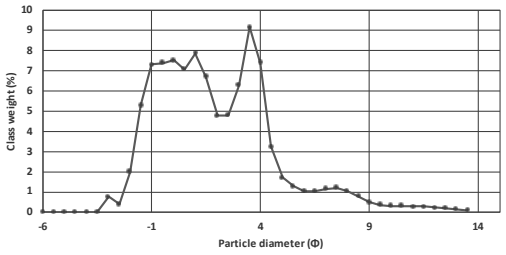

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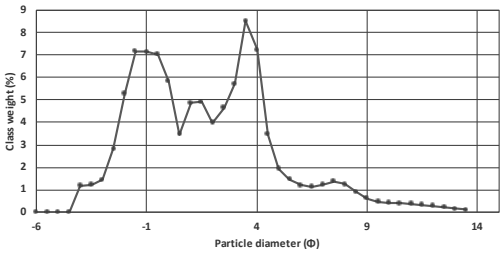

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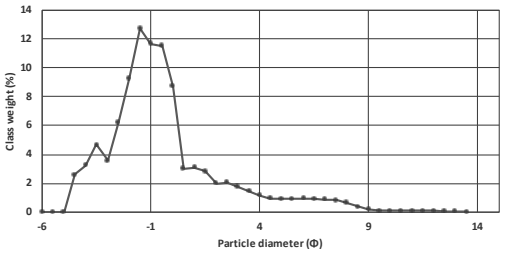

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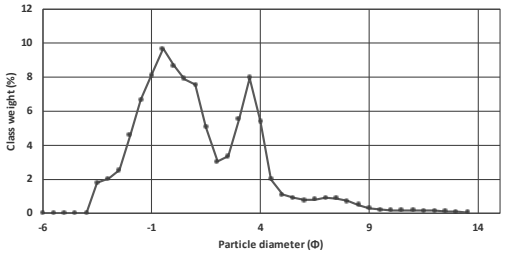

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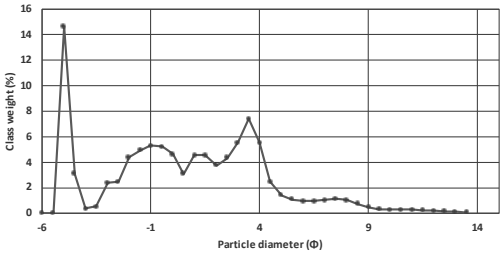

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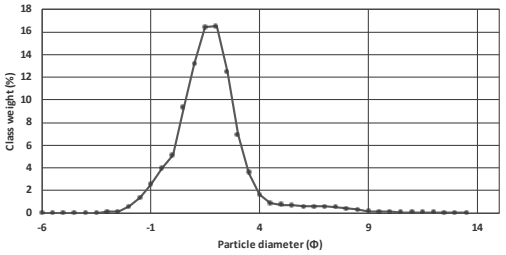

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