Stranraer Marina
Best Practicable Environmental Option (BPEO) Report

January 2026

CONTROL SHEET

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1 INTRODUCTION

1.1 Background

Fairhurst Group LLP (Fairhurst), working on behalf of Balfour Beatty Civil Engineering Limited (BBCEL) has appointed EnviroCentre Ltd to complete a Best Practicable Environmental Option (BPEO) assessment to inform proposed capital dredging at Stranraer Marina. The assessment has been informed using sediment quality results from sampling undertaken in April 2025.

The dredging works proposed are part of a wider proposed redevelopment of the Stranraer Harbour and Marina to increase capacity for visiting vessels. The proposed dredge volumes are summarised in Table 1-1:

Table 1-1: Estimated Dredge Volumes

Area	Target Dredge Depth (mCD)	Estimated Dredge Volume (m^2)
Marina Entrance	-3.5	30,023
Deeper Draft Berths	-4.5	16,916
General Marina Basin	-3.0	52,980
Outer Eastern Marina	-2.0	13,629
Note – this does not include for slope areas (19,068 m^3)		
TOTAL		**132,616**

An estimated quantity of 132,616 m^3 is proposed to be dredged across the area shown in Drawing No. 181539-GIS002 in Appendix A. It is understood that this would be considered a capital dredge (i.e. no dredging has been undertaken on site in the last seven years).

The purpose of these the samples analysis is to provide supporting information to the Marine Directorate during the licensing process on sediment quality within the proposed dredge areas to assess the suitability for sea-based disposal should that be identified as a viable option. The dredging and disposal activities are regulated by the Marine Directorate under the Marine (Scotland) Act 2010. The licensing conditions require representative samples to be collected and the nature (*i.e.* physical composition), quality and contamination status to be determined.

The results of the 2025 sediment analysis will then be used to compare the best practicable environmental options (BPEO) for each of the available potential disposal options for the dredged materials.

1.2 Scope of Report

The following report details the sampling methodology, field and laboratory analysis and provides a summary of the sediment quality present within the proposed dredge areas.

The report will then use the available sediment analysis results to compare the best practicable environmental options (BPEO) for each of the available potential disposal options for the dredged materials. The options which are not considered to be practicable are rejected and the reasons for doing so are explained.

Those options which are practicable are examined in detail and assessed against the following considerations:

- Environmental;
- Strategic; and
- Cost.

The report then compares the practicable disposal options and draws a conclusion on the BPEO.

1.3 Action Levels – AL1 vs AL2

Two action levels are currently used to assess the suitability of sea-based disposal of dredged sediment material: Revised Action Level 1 (RAL1) and Revised Action Level 2 (RAL2).

Sediment with contaminant concentrations below RAL1 is generally considered to be below background levels for contamination and is suitable for disposal at sea.

For samples between RAL1 and RAL2, additional risk assessment may be required including further sampling and testing to fully identify pockets of contamination or implementation of bioassays to assess the materials suitability for sea disposal.

Material above RAL2 is generally considered to be unsuitable for disposal to sea. If the sea disposal route is to be pursued, further testing along the lines of bioassay accompanied by a robust justification for selecting sea disposal as the BPEO may be required. This would need to be supported further with additional information regarding any mitigation measures which could be put in place as part of these works. This would require further discussion and agreement with the Marine Directorate.

2 SAMPLING LOCATIONS AND METHODOLOGY

Sampling works (comprising collection of samples from 10 locations) were undertaken on the 28th to 30th of April 2025, as per the Sampling Plan prepared by Fairhurst (ref. JM/161379/001, dated 20/12/2024) and subsequently agreed with the Marine Directorate Licensing Operations Team (MD-LOT). The following section details the sampling methodology used to retrieve sediment samples. Amendments and deviations from the agreed Sampling Plan are noted in Section 2.4.

2.1 Sample Locations

Sediment cores were collected from 10 locations, with supplementary grab samples collected where required. Sample station locations are outlined in Table 2-1.

Sample Station ID	Latitude	Longitude	Easting	Northing
SS1	54°54.539	-5°01.645	206024.25	561337.0641
SS2	54°54.501	-5° 01.679	205984.7821	561268.907
SS3	54°54.465	-5° 01.662	205999.5633	561201.1522
SS3A	54°54.469	-5° 01.706	205952.5384	561210.1875
SS4	54°54.442	-5° 01.683	205975.3733	561159.2964
SS4A	54°54.442	-5° 01.720	205935.9095	561161.3484
SS5	54°54.414	-5° 01.765	205885.3381	561110.5149
SS6	54°54.417	-5° 01.664	205993.6293	561111.7755
SS7 (#3)	54°54.445	-5° 01.602	206061.6287	561161.232
SS8	54°54.452	-5° 01.712	205945.4324	561179.6113

Sample locations are shown in Drawing No. 181539-GIS002, included in Appendix A.

2.2 Survey Vessel

The works were undertaken from the multi-cat workboat – Challenger of Leith, supplied and operated by Coastworks Ltd.

2.3 Navigation and Sample Location

Pre-determined sample station locations were programmed into a Trimble TDC600 GPS device. The vessel was manoeuvred on to position using the GPS and held in position using spud legs. Upon successful recovery of sample, the location was logged on the GPS device before moving to the next location.

2.4 Sampling Constraints and Deviation from Sampling Plan

Due to the ground conditions and depth at some locations, full depth could not be achieved in a single coring run. This was encountered at sample stations SS3 and SS4, where cores were progressed into gravelly sand and clay respectively. To collect the bottom sections of sample to desired dredge depth, a second core for each was collected (SS3A and SS4A) from deeper waters to allow sediments to be

collected to the full dredge depth. Material at the base of SS3A and SS4A comprised dense/stiff clay. The sample depths against proposed dredge depths are shown in below. This approach was agreed in principle with MD-LOT in email correspondence with EnviroCentre dated 13th February 2025.

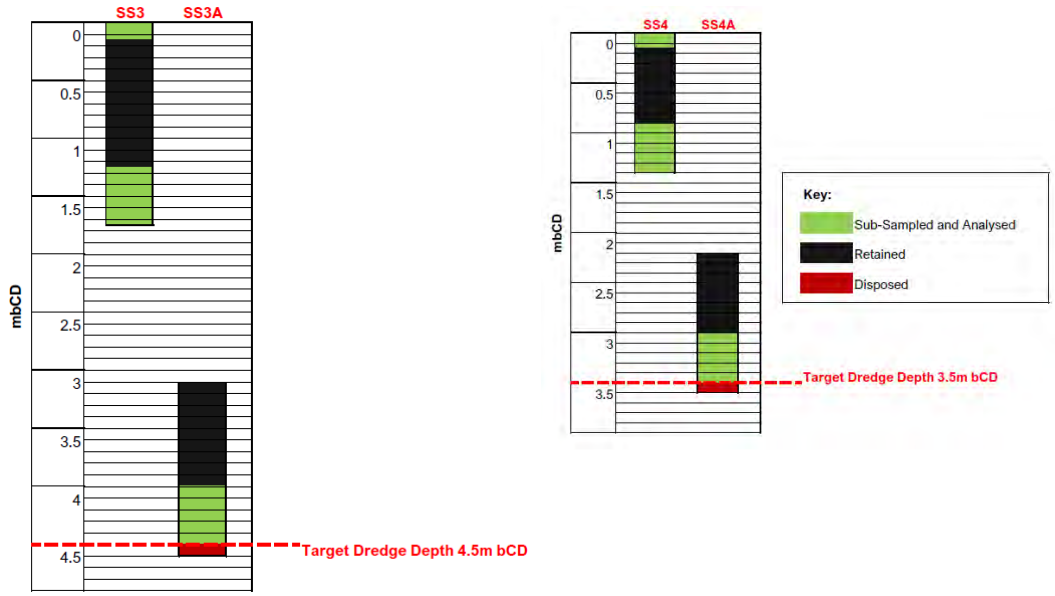

Figure 2-1: SS3/SS3A and SS4/SS4A Sub-Sampled Core Depths

Sediment samples were collected using a vibrocorer, and the majority of locations yielded successful core recovery. The primary constraint encountered during fieldwork was tidal restrictions, with particularly low tides limiting access to certain sampling stations. Parts of the proposed dredge area currently dry out completely at low tide. As a result, there was only a short operational window, for collecting some vibrocore samples at high tide. While this required minor adjustments to the planned schedule, overall sample recovery was not significantly affected.

At sampling station SS6, the recovered core included silty fine to medium sand overlying a very stiff brown clay layer. The vibrocorer is not designed to penetrate stiff clay deposits and therefore recovery of this horizon would typically be limited.

At SS7, three attempts were made to collect a sample. Attempt #1 was conducted at the proposed sample station point; despite eight grab efforts, only gravel, cobbles, and shell fragments were retrieved, and no vibrocore penetration was possible. The top of the corer remained above water level with no downward progress. Attempt #2, relocated slightly north, again yielded no core or grab recovery, aside from a few pieces of gravel and cobbles after six attempts. Attempt #3, moved further north still from the proposed location, resulted in successful grab recovery and 0.5 m of material retrieved by vibrocoring. The core comprised silty fine to medium sand with shell fragments overlying very stiff grey clay. Again, the vibrocorer is not designed to penetrate stiff clay deposits and therefore recovery of this horizon would typically be limited.

2.5 Sample Collection

Grab samples were collected at all locations to supplement surface material where required. All grab samples were collected by a 0.045m^2 stainless steel Van Veen grab sampler. Recovered material was

emptied into a plastic bucket prior to sub-sampling. Where required, the grab was deployed multiple times to ensure sufficient material was recovered for testing where required.

Core samples were recovered using a vibrocorer with 75mm aluminium core tube. The vibrocorer was deployed and recovered on a workboat and crane. Once the tube was recovered, the core was detached from the head unit, and the recovery depth and sediment type at the base were noted. Where necessary, additional attempts were made at the same location to obtain a better recovery, confirm penetration i.e. limited success and/or meet the required sampling depth. Cores were then sub-sampled in preparation for laboratory analysis.

2.6 Field Information

The following field data was recorded for each sample obtained:

- A unique sample ID;
- Sample location;
- Sample coordinate in latitude and longitude in degrees, minutes and decimals of minutes;
- Date, time and depth of collection;
- Sampler's ID;
- Sediment description;
- Sample photographs; and,
- Details of any deviation from sampling protocol.

2.7 Sample Preparation

Grab samples were photographed and logged prior to sub-sampling.

Cores were cut into subsections and extruded into a plastic core holder, spilt in half lengthways, photographed and logged prior to sub sampling. Grab samples were also photographed and logged prior to sub-sampling.

Samples for metals and particle size analysis were sub-sampled using a plastic spoon and stored in plastic tubs. Samples for organic analysis were collected using stainless steel spoons and stored in amber glass jars.

Sampling equipment (spoons etc.) were cleaned with fresh water between samples to minimise the risk of cross contamination.

Once samples had been placed within appropriate containers, they were labelled and placed immediately into cool boxes. Samples were frozen as soon as practicable prior to being dispatched to the project laboratory (Socotec) on 1st May 2025.

2.8 Analysis Requirements

The laboratory analysis required by the Marine Directorate (MD-LOT), and undertaken as part of this investigation, was as follows (subject to the deviations noted above):

- Heavy metals suite;
- Total Organic Carbon;
- Particle Size Analysis;

- Moisture Content;
- Organotins (TBT/DBT);
- Polycyclic Aromatic Hydrocarbons (PAH USEPA 16);
- Polychlorinated Biphenyls (PCBs);
- Total Hydrocarbons; and
- Asbestos (presence/absence).

Samples were sent to the Socotec Marine Laboratory for analysis.

3 RESULTS

The following section details sample results. Sediment sample logs are provided in Appendix B. The laboratory certificates are provided in Appendix C and a summary sheet highlighting exceedances above the RALs in Excel format accompanies this report in the submission to the Marine Directorate.

3.1 Sediment Summary

The sediment profiles primarily consist of silts overlying clays ranging from very soft to very stiff consistency. Clays were often slightly sandy. Dark grey to black silts are common, often with faint to moderate hydrogen sulphide odours. Several cores show interbedded sand or gravel layers and occasional mottling in clays. Surface layers often contain shells or biological material (such as shells, vegetation or lugworms), while deeper sections tend toward stiffer clays with occasional fine sand layers. Anthropogenic inputs are minimal or absent across the samples.

Full descriptions and photographs for each sample station are provided in Appendix B.

3.2 Physical Analysis

3.2.1 Particle Size Analysis (PSA)

Generally, the sediment samples exhibit a range of particle sizes from very fine silts and clays to fine, medium, and occasionally coarse sands, with some gravel present mainly toward the base of certain cores. The upper layers tend to be dominated by finer particles such as soft silts and clays, often slightly sandy, while coarser materials like sands and gravels are more frequent in deeper sections or interbedded within finer sediments.

The Particle Size Analytical data sets for each sample are included within Appendix C.

3.3 Chemical Analysis

3.3.1 Chemical Analysis Assessment Criteria

All chemical analysis results were assessed against Revised Action Levels (RAL) criteria as adopted by the Marine Directorate. The results are summarised in sections 3.3 and 3.4. Summary reports detailing exceedances in the Marine Directorate format have been submitted along with the supporting information for the application. The laboratory certificates are provided in Appendix C.

Where contaminants have RALs as adopted by the Marine Directorate, exceedances above these criteria are summarised in Table 3-1, along with the maximum concentration recorded for each parameter.

Table 3-1: Exceedances of Revised Action Levels and Maximum Concentrations

Contaminant	No. Exceedances (of 22 samples)		Maximum Concentration (mg/kg) and Location
	RAL1	RAL2	
Arsenic	0	0	15.5 @ SS6 (0.7-1.2m)
Cadmium	0	0	0.29 @ SS4A (0.8-1.3m)
Chromium	9	0	106 @ SS6 (0.7-1.2m)
Copper	5	0	37.4 @ SS6 (0.7-1.2m)
Mercury	0	0	0.12 @ SS5 (0.3-0.8m)
Nickel	18	1	161 @ SS6 (0.7-1.2m)
Lead	0	0	29.2 @ SS7 (0.15-0.5m)
Zinc	0	0	105 @ SS8 (0.5-1.0m)
PAH (All Species)	9	-	0.625 – Pyrene @ SS5 (0.3-0.8m)
PCBs	0	0	0.01634 @ SS8 (1.0-1.5m)
TBT	0	0	0.018 @ SS5 (0.0-0.15m)
THC	8	-	224 @ SS2 (0.0-0.15m)

Out of the 22 samples analysed, results for chromium, copper, nickel, PAHs and THC recorded exceedances above RAL1. One sample for nickel exceeded RAL 2.

3.4 Asbestos

Asbestos was not detected in any of the samples analysed.

4 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

The BPEO process is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of any one selected scheme. It is a structured and systematic process to identify and compare strategic options in a transparent manner. Alternatives are evaluated in terms of their projected implications for the environment together with consideration of practicability, social and economic issues as well as within a wider strategic context.

The key stages of a BPEO are:

- Identification of options;
- Screening of options;
- Selection of assessment criteria;
- Analysis and evaluation of criteria; and
- Evaluation of BPEO.

Further details on methodology are provided within each section.

4.1 Identification and Screening of Available Disposal Options

A number of options are available for disposal of dredged sediments. The options considered are provided in along with justification for screening out those options which have not been taken forward for further consideration.

Table 4-1: Initial Best Practicable Available Options

Location	Options	Screening Assessment	Carry forward?
Coastline	Leave in situ	Not an option as without the proposed dredge, the proposed marina and harbour extension cannot be progressed.	No
	Infilling of an existing dry dock/harbour facility, or land reclamation (re-use)	A land reclamation project is currently proposed in close proximity to the dredge site, and it is understood that the dredged material would ideally be used for this purpose, providing a sustainable alternative to importing material from elsewhere. Given the relatively large volume of sediment to be removed (~132,616m³), it is considered sufficient to make a meaningful contribution to the infilling requirements of the development. Once brought ashore, the material will fall under the regulatory oversight of SEPA. Accordingly, additional geotechnical and chemical testing may be required to confirm its suitability for reuse in land reclamation or construction applications. The material is also likely to require dewatering before placement at the infill site.	Yes
	Beach Nourishment	The majority of sediment cores exhibited an upper layer of silt overlying clay, though at some locations sand was present overlying silt. Sand deposits were occasionally interbedded with other deposits. The finer grained material (i.e. silts and clays) are unlikely to be considered to be suitable for beach nourishment in the traditional sense. Separating interbedded sands is likely to be technically challenging. Moreover, Dumfries and Galloway Council have not expressed a requirement for a beach nourishment project to be undertaken within a reasonable distance of the dredge site.	No

Location	Options	Screening Assessment	Carry forward?
Land	Landfill Disposal	This is technically possible but it is unlikely that this option will offer a long term solution due to lack of space at landfills, with other waste types likely to be prioritised. Landfill space is currently at a premium and does not offer a sustainable solution either financially or environmentally for the disposal of dredged arisings. Dredged material is likely to require treatment first in a dewatering facility. There will be significant cost associated with set up of dewatering facility at the quayside or elsewhere plus transportation and additional costs associated with gaining the necessary planning and regulatory consents. Other disposal and/or re-use routes are likely to be preferable which would re-introduce sediment back into the coastal cells for sediment transport. According to the SEPA Waste Sites and Capacity Tool[1], the closest landfill noted as "operational" is a Straid Farm landfill, ~38km north by road to Lendalfoot. However, it appears to be at capacity. The next closest operational landfill site is Garlaff Landfill near Cumnock, approximately 91km by road from Stranraer. The site is classified as non-hazardous and has an annual capacity of 250,000 tonnes. Given the significant distance and that disposal of dredgings would take up a significant proportion of the site's annual capacity, this is unlikely to be a viable option.	No
	Land Incineration	The dredged material consists primarily of non-combustible material (silts, sands, gravel, shells) with a low combustible component.	No
	Application to Agricultural Land	The dredged material would need to be treated to reduce salt concentrations to acceptable levels. It would require detailed chemical analysis and assessment as well as a Waste Management Licence Exemption. It would require special precautions during spreading in relation to the risk of odour and watercourses / aquifers. Disposal of sediments in this manner would potentially have a detrimental effect on existing terrestrial habitats.	No
	Recycling	Recycling of dredged material is theoretically possible, however, due to the varied lithology there would need to be either segregation during dredging works, or energy and water rich processing on land. EnviroCentre have not been made aware by the harbour authority of an established disposal and reuse route in Dumfries and Galloway at present. In addition, given the logistics involved, this unlikely to be a cost-effective option.	No

[1] https://informatics.sepa.org.uk/WasteSiteCapacity/

Location	Options	Screening Assessment	Carry forward?
Sea	Aquatic disposal direct to seabed.	The closest dredge spoil disposal ground is MA010 North Channel Scotland, located approximately 38km by sea, up Loch Ryan and around Corsewall Point. It is requested that a second named disposal site is included on the licence as a back-up option which will assist in managing weather / sea condition risk during dredging operations. The proposed back up site is MA025 Girvan and will be detailed on the licence application. Overall disposal costs associated with sea disposal are generally lower than land-based disposal, with low environmental risk due to appropriate sediment quality screening measures applied during the licensing process.	Yes

4.2 Summary of Identified BPEO Options

Following review of the available options, three options were identified for further detailed BPEO assessment which are as follows:

- Land reclamation (re-use); and
- Sea Disposal.

A brief summary of the necessary works or methodology for each option being taken forward for detailed BPEO assessment is provided below.

4.2.1 Land Reclamation (Re-use)

The specific arrangements for this method are to be confirmed, but it is anticipated that material will be dredged using a grab or cutter suction dredger, with material placed on land for dewatering or further treatment if required. The disused Stena Line ferry terminal on the East Pier would, in theory, offer an area of land and quayside that may facilitate such transfer of materials, away from the existing working harbour, as well as a large area of flat land to accommodate stockpiles of materials. However, use of this area of land would be subject to landowner/stakeholder engagement, which has not been undertaken to date. As such, use of the East Pier for this purpose may not be operationally possible. 'Rainbowing' of dredged materials directly into the deposit area could also be given consideration if circumstances allow.

The drawings showing the draft proposals for the area of land reclamation are included in Appendix A. The deposited sediment will be retained behind a newly installed rock armour bund.

The total volume required for the land reclamation project is in the region of 65,000 m^3. although this volume includes the requirement for sub-base and finished surfaces, for which dredged materials would be unsuitable. The total estimated dredge volume is approximately 132,616 m^3, therefore this route would only be able to accommodate a relatively small proportion of the expected dredgings, assuming that the material meets strict geotechnical and engineering specifications to enable their inclusion.

It is understood that the Client is in discussions with a specialist contractor with regards treatment of material to improve its geotechnical suitability.

4.2.2 Sea Disposal

A licenced sea disposal site is located to the east of Stranraer within the North Channel (MA010 – North Channel Scotland) – located approximately 38km by sea from the dredge area. The proposed back up site for bad weather is MA025 Girvan is located c. 42km to the north of the dredge area.

It is anticipated that dredging would be undertaken using a grab or cutter suction dredger with a split hull hopper, or a similar configuration. This would mean that dredging and disposal can take place without the need for double handling of material or bringing the dredged material ashore.

This would potentially offer a disposal solution for any material surplus to requirements or deemed unsuitable for the land reclamation exercise.

5 FURTHER CONSIDERATION OF REMAINING DISPOSAL OPTIONS

5.1 Detailed BPEO Assessment

Each of the identified options was assessed against the criteria detailed in Table 5-1 below.

Table 5-1: BPEO Detailed Assessment Criteria

Primary Criteria	Description and Attributes
Strategic	• Operational aspects, including handling, transport etc. • Availability of suitable sites/facilities • General Public/local acceptability • Legislative Implications • Summary of the outcome of consultation with third parties
Environmental	• Safety Implications • Public Health Implications • Pollution/ Contamination Implications • General Ecological Implications • Interference with other legitimate activities *e.g.* fishing • Amenity/Aesthetic Implications
Costs	• Operating costs *e.g.* labour, site operations, environmental monitoring • Capital *e.g.* Transport, equipment hire

5.1.1 BPEO Strategic Assessment

Table 5-2 below provides details of the strategic assessment for each option taken forward for the detailed BPEO assessment:

Table 5-2: BPEO Strategic Assessment

Criteria	Land Reclamation	Sea Disposal
Operational Aspects (inc. handling and transport)	Depending upon the specific method utilised, there is likely to be some double handling of material – with dredgings placed on land for dewatering and further treatment if required. It would then require to be moved into the area to be infilled. It is understood that some or all material may require to undergo some form of treatment to make it geotechnically suitable for infill. A large area of flat land is present close to the dredge and proposed reclamation site at the former Stena Line terminal on the East Pier. It is possible that this land could be utilised for storage or treatment of sediment, though this would be subject to landowner/stakeholder engagement and therefore use of this area of land may not be possible. If the East Pier is able to be used, then it is assumed that there would be no requirement to have HGVs moving material via the public highway and all operations could take potentially place in a single secure compound. Double handling aspects could be removed if an infill method such as rainbowing or direct pumping is utilised, but this would now allow material to be dewatered or treated before placement.	There would be no double handling of the dredged material. Transportation to the disposal site would be by dredging vessel without the need to bring the material on to land. The closest disposal site is approximately 38km away by sea.

Criteria	Land Reclamation	Sea Disposal
Availability of suitable sites/facilities	Current proposals for the wider marina redevelopment project are to utilise dredged material to reclaim an area of land adjacent to the dredge site. Given the volume of material required for the infill, against the total dredge volume, this route would be unable to accommodate all of the dredge arisings.	Marine disposal sites nearby have been designed to accommodate the quantities of material typically generated by dredging operations. The chemical analysis of the sediments from the proposed dredge sites would indicate that the material is likely to be acceptable for testing pending further risk assessment for contaminants present at levels between Action Level 1 and Action Level 2. Sediments with concentrations in exceedance of Action Level will require further consideration.
General Public /Local acceptability	The wider Stranraer Harbour and Marina redevelopment project is likely to have a positive local perception, as it may be seen as a way of regenerating an area that has generally been in decline since the closure of the Stena Line ferry terminal that previously dominated the area. The land reclamation project may be looked upon favourably by association to the wider marina redevelopment and seen as a sustainable way of managing dredge arisings. The development masterplan has been subject to local consultation undertaken by Dumfries and Galloway Council[2].	Traditionally accepted disposal route for dredged material with limited public impact.
Legislative Implications	This option may have licencing requirements over and above the routine dredge and disposal licencing. This may add additional programme/timescale pressures which make this option less favourable or practical. However, the beneficial re-use of material reduces the amount of material being disposed of.	This is an accepted disposal route as long as a Marine Licence is obtained.

[2] https://www.dumfriesandgalloway.gov.uk/council-elections/have-your-say/consultations-engagements/consultation-stranraer-marina-expansion-project

5.1.2 BPEO Environmental Assessment

Table 5-3 details the environmental assessment for each option taken forward for detailed BPEO assessment.

Table 5-3: BPEO Environmental Assessment

Criteria	Land Reclamation	Sea Disposal
Safety Implications	There may be an increase in HGV and heavy plant movements in the vicinity. However, it is possible that the adjacent disused ferry terminal would offer a large area of land to store material and enable dredge and re-use works to be completed in a single secure compound, however use of this area of land may not be possible. Work would be undertaken in accordance with H&S legislation.	Low amount of material handling required as it is directly placed at the disposal site. Work would be undertaken in accordance with H&S legislation.
Public Health	Limited potential for human contact assuming that the public are excluded from the active work area. Some potential for dust release during sediment placement works and from storage (only if the sediment dries out). Further geochemical testing/risk assessment of the sediment may be required to ensure it is suitable for use.	Low potential for human contact during dredging and disposal operations. Once deposited at disposal site, pathways for human contact are greatly reduced.
Pollution/ contamination	HGVs and heavy plant operating on site would have implication on carbon footprint and potential for localised impact on air quality. Potential also for temporary noise impacts and dust release during profiling works (if sediment dries out).	Pollutant concentrations in dredged material to be disposed are limited to acceptable levels through regulatory licensing processes. Information with regards to the type of disposal site and its effects on sediments has not been provided. Correspondence with the Marine Directorate has previously concluded that disposal sites in Scotland are dispersive. Transport by sea to disposal site would increase the project carbon footprint, particularly given the relatively long distance to the nearest sea disposal site (~38km outside Loch Ryan).

Criteria	Land Reclamation	Sea Disposal
General Ecological Implications	Significant ecological implications are unlikely as a result of reclamation of land within Loch Ryan. Sediment arisings will be placed behind a rock armour bund where it is unlikely to be mobilised into the marine environment. No designated ecological features are present within the vicinity. The use of an eco-friendly drying agent is proposed in order to dry out the high moisture material, which is an alternative to the use of Quicklime. This allows pH levels to be managed effectively, and there is a significantly lover embodied carbon impact to that of methods associated with Quicklime. This ensures an enhanced subgrade layer stiffness and enables optimum compaction and fill reuse.	North Channel Scotland (MA010) is a licensed disposal site for dredged material.
Interference with other legitimate activities	Significant interference or disruption with other operations would not be anticipated. The landside area where works are anticipated is currently largely disused, though there may be a loss of existing car parking spaces. Shoreside works are to take place far enough away from the existing harbour whereby it is anticipated that it would function normally during the works.	The North Channel disposal site is licensed by the Marine Directorate for the disposal of dredging spoil. It is likely that interference with other activities (such as commercial vessels or fishing) will have been considered as part of the licencing process. Therefore, the likelihood of significant disruption is considered to be low.
Amenity / Aesthetic Implications	Temporary visual impacts during sediment storage, treatment and placement works but no long-term impacts. Some potential for odour emissions and noise impact although these impacts will be short term. The closest sensitive receptors are residential properties and a hotel, which are both within 100m of the proposed works area.	Some potential for temporary visual / odour / noise effects while marine plant is in the harbour. However, no significant additional visual / odour / noise effects following disposal as this occurs at sea.

5.1.3 BPEO Cost Assessment

Costs were assessed for each of the options taken forward for detailed BPEO assessment. The BPEO assessment considered the typical costs associated with dredging, transportation to the disposal site, construction of treatment facilities (where applicable) and methods employed to protect the environment for each of the identified options. As costs are generally “commercially sensitive” the rates are based on best estimates and experience within industry, as opposed to formal quotations.

Table 5-4 provides details on the cost assessment for each option taken forward for detailed BPEO assessment:

Table 5-4: BPEO Estimated Cost Analysis

Activity	**Land Reclamation (£)**	**Sea Disposal to North Channel MA010 (£)**
Dredging	£2 – 4 /m^3	£2 – 4 / m^3
Transport by vessel to disposal site	-	£7 – 9 / m^3
Transportation Cost to Land Storage Area	£1.50 – 2.50 / m^3	-
Treatment and Dewatering	£5 – 7 / m^3	
Transportation Cost to Land Reclamation Area	£1.50 – 2.50 / m^3	-
Total	**£10 – 16 / m^3**	**£9 – 13 / m^3**

Note that the above cost estimates do not take into account the cost of additional environmental assessments, or cost associated with gaining planning or licensing consents or potentially to purchase land (where applicable). They also do not take account of the influence volumes will have on costs (economies of scale).

5.1.4 BPEO Assessment Discussion

For each of the above assessment criteria, the options were qualitatively and semi-quantitatively (for costs) assessed against feasibility/preference and awarded a ranking ranging from 1 to 4; 1 being the most acceptable and 4 being the least acceptable option. The assignment of rank was on the basis of professional judgement.

The individual assessment criteria rankings for each option were added up to give an overall hierarchy of preference. Table 5-5 provides a summary of the BPEO assessment.

Table 5-5: BPEO Summary

Criteria	Land Reclamation	Sea Disposal
Environment	2	2
Strategic	1	2
Costs	3	2
TOTAL SCORE	**6**	**6**

Deposition of the dredged material at a licensed marine disposal site has traditionally been deemed acceptable. The nearby licensed marine disposal site has been designed to allow easy access as well as being capable of accommodating the quantities of material typically generated by dredging activities. Pollutant concentrations within sediments are also limited to acceptable levels through regulatory requirements. It is anticipated that this route will offer a disposal solution for surplus material, or material which is considered to be unsuitable for the land reclamation operation.

A site has been identified adjacent to the dredge area whereby land would be reclaimed using dredged materials. This is part of the wider project to expand and improve Stranraer Harbour and Marina. This would enable a proportion of dredged material to be beneficially re-used in the immediate vicinity of the dredge area, subject to geotechnical and practical considerations. While it is noted that this is likely to be more expensive per cubic metre when compared to sea disposal, there is likely to be an overall cost saving to the project compared with importing material from elsewhere for the purpose of land reclamation. There is also a clear sustainability benefit to re-using dredged material for this purpose as opposed to transporting material from elsewhere. However, the re-use route would be unable to accommodate all of the dredge arisings.

5.2 Conclusions

The Best Practicable Environmental Option for disposal of the dredged material from the Stranraer Harbour and Marina site has been assessed as a combination of re-use of sediment for land reclamation where possible and sea disposal as per Table 5-5.

The specific detail of the methodology and geotechnical requirements of material required for the land reclamation operation are not yet clear. The use of the East Pier for receiving and dewatering sediment may not be possible, depending on the outcome of any landowner/stakeholder engagement. If this area of land is unable to be used, then the re-use of sediment may be logistically challenging. It is understood that discussions are ongoing between the Client and a specialist contractor with regards to treatment requirements for dredged material. It is anticipated that up to ~65,000 m^3 of material will be required in total for the land reclamation exercise. This total volume includes material like sub-base and finished surfaces, therefore this route would only accommodate a relatively small proportion of the total anticipated dredge volume of 132,616 m^3, if the re-use route is realised. It is anticipated that any surplus material, or material that is deemed geotechnically unsuitable for land reclamation is subject to

sea disposal. Moreover, if it is determined that the land reclamation exercise is not viable for whatever reason, then the dredged material would be subject to sea disposal.

As identified in the sediment chemical quality section, further assessment is deemed necessary to confirm the suitability of the sediment for disposal within the disposal site and consider potential impacts to the receiving environment. The following section details this assessment.

6 FURTHER ASSESSMENT

As detailed in Section 1.3, on the basis of the exceedances of Action Levels 1 and 2, further assessment to determine the suitability of the material for sea disposal is deemed a requirement.

The approach for this further assessment is outlined as follows:

- Provide an overview of the proposed dredge works and the identified disposal site including existing chemical monitoring data for the site; and
- Compare existing chemical data with other recognised sediment assessment criteria including those listed below. Summary tables are provided in Appendix D.

Background Assessment Concentration (BAC) - BACs were developed by the OSPAR Commission (OSPAR) for testing whether concentrations are near background levels. Mean concentrations significantly below the BAC are said to be near background. However, it should be noted that river catchments have their own unique geochemical fingerprints and are also governed by the geology within the catchment, so in theory one set of background level values is not applicable to all situations;

Effects Range Low (ERL) - ERLs were developed by the United States Environmental Protection Agency (USEPA) for assessing the ecological significance of sediment concentrations. Concentrations below the ERL rarely cause adverse effects in marine organisms. Concentrations above the ERL will often cause adverse effects in some marine organisms;

Probable Effects Level (PEL) – PELs (Marine) have been adopted from the Canadian Environmental Quality Guidelines http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/) If a concentration is recorded above the PEL this is the probable effect range within which adverse effects frequently occur. The Threshold Effect levels (TELs), which are related to the PELs have been not been included in the summary table in Appendix D or used as part of the further assessment as they typically fall below the RAL1.

Review of potential risks to the list of receptors identified in “Water Framework Directive Assessment: estuarine and coastal waters (https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters) to draw conclusions from available information and provide recommendation for proposed disposal routes.

6.1 Dredge and Disposal Site

The dredge is to be undertaken between the East and West Piers of Stranraer Harbour, as shown on Drawing No. 181539-GIS002 in Appendix A.

It is proposed that material to be disposed of at sea is deposited at the North Channel Scotland disposal site (MA010). The material to be used to facilitate a land reclamation exercise will be deposited behind a new rock armour bund in an area immediately to the south-east of the dredge area. The proposed design drawings of the area to be infilled are included in Appendix A.

6.2 Analytical Data Review

Analytical data from the January 2025 sampling campaign for the proposed dredge site is provided in Summary Table A in Appendix D. This data has been summarised against RAL 1 & 2, the BAC, ERL

and PEL. As detailed previously, the data has not been reviewed against the Canadian TEL as these numbers are typically lower than RAL1. A summary of the exceedances is detailed below:

6.2.1 Action Level 1

Exceedances of RAL1 can be summarised as follows:

- Chromium – 9 of 22 samples recorded chromium above RAL1;
- Copper – 5 of 22 samples recorded copper above RAL1;
- Nickel – 18 of 22 samples recorded nickel above RAL1;
- THC – 8 of 22 samples recorded total hydrocarbons above RAL1; and
- PAHs – 9 of 22 samples recorded at least one PAH species above RAL 1.

6.2.2 Action Level 2

Exceedances of RAL2 can be summarised as follows:

- Nickel – 1 of 22 samples recorded nickel above RAL 2.

6.2.3 BAC Review

Exceedances of the BAC can be summarised as follows:

- Chromium – 2 of 22 samples recorded chromium above the BAC;
- Copper – 5 of 22 samples recorded copper above the BAC;
- Mercury – 5 of 22 samples recorded mercury above the BAC;
- Nickel – 16 of 22 samples recorded nickel above the BAC; and
- PAHs – 17 of 22 samples recorded at least one PAH species above the BAC.

6.2.4 ERL & PEL Review

Exceedances of the ERL can be summarised as follows:

- Chromium – 2 of 22 samples recorded chromium above the ERL;
- Copper – 1 of 22 samples recorded copper above the ERL; and
- PAHs – 6 of 22 samples recorded at least one PAH species above the ERL.

There were no exceedances of the PEL, where one is available for review.

6.3 Averages

A review of the averaged data for all the samples has been undertaken *i.e.* considering the material as a single volume for disposal. The averaged data is presented in Summary Table B in Appendix D. The review of average data against the available adopted assessment criteria can be summarised as follows:

- Averaged concentrations exceeded RAL1 nickel and various PAH species;
- Averaged concentrations exceeded the BAC for nickel and various PAH species;
- All samples recorded averaged concentrations below the ERL where one is available for comparison;

- All samples recorded averaged concentrations below the PEL where one is available for comparison; and
- All samples recorded averaged concentrations below RAL2.

6.4 Review of Previous Investigation

Fairhurst Group LLP have provided a report summarising a comprehensive onshore and offshore ground investigation to EnviroCentre for review (*Stranraer Marina, Stranraer – Geo-Environmental and Geotechnical Interpretative Report*, Document No, 161378-FRH-XX-00-RP-G-000001, December 2024).

As part of the package of works, 12 No. sonic drilled boreholes and 11 No. vibrocores were progressed over two phases of works carried out in 2021 and 2024.

Seabed conditions encountered were in line with what was encountered during the April 2025 works undertaken by EnviroCentre – specifically granular surface deposits of sand and gravel at varying depths and at some locations. Cohesive marine deposits of silt and/or soft clay were encountered at all locations, underlying the granular deposits. Cohesive glacial deposits were also encountered at all but two locations, chiefly comprising firm to stiff sandy silty clay.

A summary of the chemical analysis results from the Fairhurst investigation is given in Table 6-1.

Table 6-1: Summary of Results from Fairhurst Ground Investigation (2021 and 2024)

Parameter	**Maximum Concentration (mg/kg)**	**No. of RAL1 exceedances** (of 11 samples)	**No. of RAL2 exceedances** (of 11 samples)
Arsenic	11.7	0	0
Cadmium	0.5	1	0
Chromium	78.6	6	0
Copper	35	3	0
Lead	35	0	0
Mercury	0.11	0	0
Nickel	110	11	0
Zinc	149	1	0
TBT	0.009	0	0
PCBs	3.06	0	0
PAHs	0.296 (Benzo(a)pyrene)	5	-
THC	234	2	-

The maximum concentrations for samples collected from the April 2025 vibrocoring campaign undertaken by EnviroCentre are given in Table 3-1. Reviewing both datasets, the maximum concentrations are considered to be broadly in a similar range to one another. Most exceedances of RAL1 occurred for nickel during both investigations, with concentrations recorded in excess of 100 mg/kg in several samples.

The results of the 2021 and 2024 investigation have been reviewed to give additional context on the 2025 results only, and are not considered any further with regards to marine licencing requirements.

6.5 Further Review of Nickel Results

On the basis of elevated nickel concentrations, including one exceedance of RAL2, further consideration of this is given in the section to follow.

The nickel results from the most recent vibrocoring campaign, along with those from the previous two rounds of ground investigations are presented in Table 6-2, grouped by sediment horizon.

Table 6-2: Nickel Results by Horizon (2025, 2024 and 2021 samples)

Horizon	Sample ID and Depth (m)	Nickel (mg/kg)	Average (mg/kg)	Maximum (mg/kg)
Surface (silt or sand)	SS1 (0.0-0.15)	37.6	33.3	46.2
	SS2 (0.0-0.15)	40.4		
	SS3 (0.0-0.15)	25.9		
	SS4 (0.0-0.15)	27.8		
	SS5 (0.0-0.15)	40.5		
	SS6 (0.0-0.15)	19.4		
	SS7 (0.0-0.15)	28.6		
	SS8 (0.0-0.15)	46.2		
Granular (sand and gravel)	SS3 (1.25 – 1.75)	43.9	50.1	82.9
	SS7 (0.15 – 0.5)	31.7		
	VCA05 (0.5)	50.3		
	VCA06 (0.5)	50.5		
	VCA09 (0.5)	41.4		
	VCA10 (2.4)	82.9		
Cohesive Marine (silt or soft clay)	SS1 (0.6 – 1.1)	43.6	49.1	59.7
	SS1 (0.1 – 1.6)	48.4		
	SS2 (0.15 – 0.6)	51.1		
	SS2 (0.6 – 1.1)	50.2		
	SS5 (0.3 – 0.8)	36.0		
	SS8 (0.5 – 1.0)	46.6		
	VCA01 (0.5)	51		
	VC08 (0.0-1.5)	55.2		
	VC09 (0.0-1.5)	59.7		
Cohesive Glacial (firm/dense/stiff clay)	SS3A (0.9-1.4)	79.7	94.9	161
	SS4 (0.9-1.4)	86.8		
	SS4A (0.8-1.3)	111		
	SS6 (0.2 – 0.7)	103		
	SS6 (0.7 – 1.2)	161		
	VCA02 (2.5)	78.9		
	VCA03 (2.5)	54.9		
	VCA04 (1.85)	69.1		
	VC06 (0.0-1.2)	110		

Table notes:

1. Locations in blue are from the 2024 sampling campaign and locations in green are from the 2021 sampling campaign, both undertaken by Causeway Geotech.
2. Where sub-sample depth straddle two horizons, the sample has been classified in the table above by the horizon that covers the greatest length in the sub-length of core. Sub-sample SS8 1.0 – 1.5 (from 2025) has been excluded from the table above as the core comprised interbedded horizons of silt, sand, soft clay and stiff clay. This sample recorded a result of 55.5 mg/kg - *i.e.* above RAL1 but below RAL2.

No anthropogenic inputs were noted in the samples collected from the cohesive glacial deposits (i.e. boulder clay) in the 2025 samples, nor are anthropogenic inclusions noted in the logs of the 2024 and 2021 cores. All of the samples collected from this horizon recorded results showing a similar geochemistry to one another (i.e. exceedances of RAL1 for both chromium and copper in addition to nickel). Moreover, none of the samples collected from the cohesive glacial horizon in the 2025 sampling campaign recorded exceedances above RAL1 for any PAHs, hydrocarbons or xenobiotics (TBT, PCBs).

The consistent results in the boulder clay horizon, combined with the fact that the deposits were formed during a glacial period (as opposed to from marine processes) indicates that the elevations of nickel in this horizon are naturally occurring and as a result of geological influences.

6.6 Chemical Assessment Conclusions

A number of samples recorded exceedances of RAL1 for various metals, several PAH species and THC. Averaged concentrations (which consider the dredge as a single volume for disposal) exceeded RAL1 for nickel and several PAH species.

One individual sample recorded an exceedance of RAL2 (SS6, 0.7-1.2m). This sample was collected from a horizon of stiff glacial boulder clay. Other samples collected from this horizon recorded the highest results of the sampling campaign, when compared to those collected from other horizons. The presence of nickel in the stiff glacial clay deposits is considered to be naturally occurring.

A number of individual samples recorded exceedances above the ERL for chromium, copper and at least one PAH species. No individual samples recorded exceedances above the PEL. No averaged concentrations exceeded the ERL, PEL or RAL2.

A request was made to MD-LOT for background chemical analysis data for the proposed sea disposal site, however, MD-LOT was unable to supply any information. Therefore, a comparison between sediment sample results and the disposal site data cannot be made.

Further consideration of the potential risks associated with the proposed disposal is considered in the following sections.

6.7 Water Framework Directive Assessment

As outlined in the Water Framework Directive Assessment: estuarine and coastal waters guidance (Environment Agency, 2017), there are several key receptors which can be impacted upon including the following:

- Hydromorphology;
- Biology – habitats;
- Biology – fish;
- Water quality; and
- Protected areas.

Each of these points are considered in Table 6-3 below, in the context of disposing of sediment by disposal at sea and for land reclamation.

Table 6-3: Receptor Risk Assessment

Key Receptor[3]	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Hydromorphology (Source Area and Disposal Site)	Morphological conditions, for example depth variation, the seabed and intertidal zone structure tidal patterns, for example dominant currents, freshwater flow and wave exposure	No	Despite continued maintenance dredging in the vicinity of the existing harbour and construction of several man-made piers and quays, SEPA do not consider Loch Ryan (water body ID: 200011) to be a Heavily Modified Water Body (HMWB)[4]. The coastal body has a classification of "High" for hydromorphology. This classification will take into account the presence of the existing harbour and the impacts of previous dredging and disposal. The classification of "high" has been in place since 2007. The adjacent Stena Line ferry terminal was in use until 2011 which would likely have required dredging on a larger scale than what is undertaken currently and it would appear that this had no impact on classification. The sea disposal site (North Channel Scotland MA010) is located in the open sea between Scotland and Northern Ireland and is not within a SEPA classified water body. The proposed alternate site Girvan (MA025) for disposal in bad weather/sea state is located within a named water body. information from the NMPI viewer was not available at the time of writing. Given that material will be suitable for sea deposit under licence, the site is an active deposit site, and the potential effects will be both localised and temporary, there is not envisaged to be a change in classification status.

[3] https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters
[4] https://marinescotland.atkinsgeospatial.com/nmpi/

Key Receptor[3]	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Biology - habitats	Included to assess potential impacts to sensitive/high value habitats.	No	The WFD classification for the Loch Ryan water body for biological elements is “good” and for benthic invertebrates is “high”. The classification will take into account the presence of the existing harbour and now disused ferry terminal, so no further assessment with regard to dredging activity is considered to be required. Any effects are considered to be both localised and temporary. Similarly, the deposition of sediment as part of a land reclamation project is unlikely to cause significant adverse impacts on habitats, as sediment will be disposed behind a new rock armour wall and unlikely to be mobilised into Loch Ryan following placement. The sea disposal site (North Channel Scotland MA010) is located in the open sea between Scotland and Northern Ireland and is not within a SEPA classified water body.

Biology – fish	Consideration of fish both within the estuary and also potential effects on migratory fish in transit through the estuary	No	Loch Ryan does not have a WFD classification for fish. In addition, there is no estuary in close proximity to the site in which migratory fish would be travelling towards. Loch Ryan is designated by a SEPA as a Shellfish Water Protected Area (SWPA). According to Cefas, the loch is predominantly a native oyster fishery[5]. The Cefas Sanitary Survey Report[4] (2013) notes that the navigation channel towards Stranraer was previously subject to maintenance dredging to allow ferries to access the former ferry terminal. The report also notes that sediment suspension is likely to have reduced in the area since routine dredging of the channel has ceased. Information from the Scotland's Aquaculture website[6] suggests that the SWPA has been in place in Loch Ryan since at least 2006. The ferry terminal in Stranraer closed in 2011 therefore the designation of the SWPA would have taken into account the routine maintenance dredging works on the main navigation channel. Dredging of the channel no longer takes place, though maintenance dredging of the harbour itself continues. The proposed capital dredging works are likely to be smaller in scale and footprint than previous maintenance dredging of the channel, which would have covered a much larger area of the SWPA. Any impacts are considered to be localised and temporary and further assessment is not considered necessary. Based on current draft proposals, the deposition of sediment as part of a land reclamation project is unlikely to cause significant adverse impacts on fish, as sediment will be disposed behind a new rock armour wall supplemented by a geotextile and unlikely to be mobilised into Loch Ryan following placement. It is noted that the design has not yet been finalised. The sea disposal sites are located in the open sea and not in immediate proximity to estuaries therefore will have limited potential to impact on th

[5] https://www.cefas.co.uk/media/4pmha53m/ss-loch-ryan-v10.pdf

Key Receptor[3]	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
			emigration of fish. The Girvan site is c. 2.6Km from the point where ethe Water of Girvan enters the sea.
Water Quality	Consideration must be given to water quality when contaminants are present in exceedance of CEFAS RAL1.	Yes	The Loch Ryan water body is classified as "pass" for specific pollutants. No classification is provided for "priority substances". The classification for water quality is "high" and "good" for overall status. Contaminants are noted to exceed CEFAS RAL1 within sediment samples, with one exceedance of RAL2 recorded. Potential effects are considered to be both localised and temporary. Further consideration of potential effects is discussed in section 6.8 for completeness.
Protected Areas	If your activity is within 2km of any WFD protected area, include each identified area in your impact assessment. • special areas of conservation (SAC) • special protection areas (SPA) • shellfish waters • bathing waters • nutrient sensitive areas	No	Loch Ryan is designated as a Shellfish Water Protected Area (SWPA). Further discussion on this is given under the "fish" receptor above. No other designated WFD protected areas are present within, or within 2km of either the proposed dredge, reclamation or sea disposal sites. Further assessment is therefore not considered necessary.

[6] https://aquaculture.scotland.gov.uk/data/shellfish_species_area_classification.aspx?production_area_id=191

6.8 Potential Risk to Water Quality

The potential risks to water quality at the dredge and disposal sites are further considered as all other receptors have been screened out of the assessment.

SEPA classified the Loch Ryan coastal water body as “high” for overall water quality and “pass” for specific pollutants. No classification is provided for priority substances.

Although there are contaminants of concern above the RAL1 (with one exceedance of RAL2 recorded within the glacial till horizon) within the sediment for disposal, it is considered that these levels will not contribute to an overall degradation of water quality at the sea disposal site(s). While any effects are considered to be both localised and temporary, the potential for both dilution and natural attenuation in the open waters around the disposal sites are considerable.

When the sediment results are reviewed as an average to assess all of the dredged sediment as a single unit for disposal, RAL1 is exceeded for nickel and three PAH species. The dredge average for nickel exceeded RAL1 (average concentration of 55.2 mg/kg vs. RAL1 of 30 mg/kg). The maximum average PAH concentration recorded was 0.14 mg/kg (Pyrene) vs. RAL1 of 0.1 mg/kg.

Averaged concentrations of nickel and several PAHs also exceeded the BAC, however it should be noted that the BAC is intended to be used to determine if concentrations are near to background concentrations, rather than qualify any potential environmental impact. While the BACs are useful, they do not account for local geological variance in terms of mineral composition. In addition, the BACs for PAHs and metals are generally lower than the Marine Directorate RAL1, therefore it is considered to be a very conservative assessment criteria. There were no exceedances recorded of the ERL, PEL or RAL2 in averaged concentrations.

The key contaminants for impacting water quality are considered to be metals as these have the potential to dissolve or desorb from sorption sites within the sediment. However, natural geochemical processes will limit their solubility along with the large dilution potential it is not expected that this would have a long-term impact on water quality.

PAHs are hydrophobic with low aqueous solubility and will naturally remain associated with organic sediment fractions, rather than become dissolved within the water column. On this basis, the risks associated with impact to water quality from chemical contaminants in sediment are considered to be low, with the associated dilution potential providing further mitigation.

The key risk to water quality is considered to be an increase in turbidity/suspended solids during the sea disposal activity. Although this is likely to cause a localised increase in suspended solids, it is considered that this will be both local and temporary in nature and has been factored into the selection and location of the agreed sea disposal ground.

Table 6-4 summarises the average physical sediment type for all samples collected during the April 2025 sampling campaign. Estimated volumes are given for physical sediment type based upon the average PSA data and total anticipated dredge volume (132,616 m^3). Where circumstances allow, it is currently proposed that a proportion of the dredged material is used for a land reclamation exercise. However, the summary below has been compiled on the ‘worst-case’ basis that all of the material would be subject to sea disposal (for example if the material was deemed geotechnically unsuitable or the land reclamation exercise was deemed unfeasible for whatever reason). If the land reclamation exercise does progress using re-used dredged material, then the quantities destined for sea disposal would be reduced.

Table 6-4: Summary of Average PSA Data

Gravel (>2mm)	Sand (0.063mm<Sand<2mm)	Silt & Clay (<0.063mm)	Estimated to be dredged m^3
2.45%	38.45%	59.11%	132,616
3,245 m^3	50,986 m^3	78,385 m^3	

The dominant grain size within the material to be dredged is silt and clay sized particles, with a significant proportion of sand and negligible proportion of gravel. Sand and gravel particles will generally fall out of suspension quickly with minimal lateral spread. The silt particles, making up to 60% of the material (which includes clay particles), can be suspended in the water column for a longer period of time. However, it is known that the fine particles contains a significant proportion of cohesive marine and glacial clays in addition to silt. Therefore this material is considered more likely to fall into the sea in clumps and will sink much faster than if in a slurry.

The North Channel Scotland sea disposal site does not lie within a SEPA/WFD classification body, therefore the water quality status of the disposal site is not known. However, it is considered that any impact on water quality as a result of suspended solids/turbidity will be localised and temporary and unlikely to cause a long-term change in water quality at the sea disposal site.

With regard to any material that may be re-used for land reclamation purposes, according to draft designs, this material will be deposited behind a new rock armour wall supplemented by a geotextile down the landward side. Therefore the material is unlikely to be mobilised into Loch Ryan after placement. In addition, it is likely that a proportion of this material would be deposited above Mean High Water Springs (MHWS), in which case SEPA would become the regulatory authority.

7 BPEO CONCLUSIONS AND RECOMMENDATIONS

Fairhurst Group LLP (Fairhurst), working on behalf of Balfour Beatty Civil Engineering Limited (BBCEL) has appointed EnviroCentre Ltd to complete a Best Practicable Environmental Option (BPEO) assessment to inform proposed capital dredging at Stranraer Marina. The assessment has been informed using sediment quality results from sampling undertaken in April 2025.

A review of the available information has highlighted that although several contaminants of concern exceed RAL1, with a single exceedance recorded of RAL2, assessment of key receptors identified from the Water Framework Directive assessment for estuarine and coastal waters concluded that there is a low risk of the sediments impacting upon the overall ecological or chemical status.

Sediment results recorded exceedances of RAL1 in individual samples for various metals, several PAH species and THC. One sample recorded an exceedance of above RAL2 for nickel. The exceedance was recorded in a horizon of glacial till (stiff clay). Other results from the glacial till horizon indicate that nickel appears to be naturally elevated in these deposits and is considered to represent the natural geochemical conditions of the area. As such, the elevated nickel is considered unlikely to have arisen from anthropogenic activities. Averaged concentrations (which consider the dredge as a single volume for disposal) exceeded RAL1 for nickel and various PAH species. No averaged concentrations were recorded in exceedance of RAL2. The most recent sample results are at similar levels to those recorded during previous rounds of investigation undertaken in 2021 and 2024, as reported by Fairhurst (2024).

Overall, based on the multiple lines of evidence approach adopted to further assess the exceedances identified in the sediment assessment, the recommendation for sea disposal, complemented by beneficial re-use of sediment for a land reclamation exercise (where deemed feasible) is considered to be the preferred option.

The sea disposal option is considered to have no significant long-term impact on the marine environment and the disposal site is readily accessible from the harbour. The identified land reclamation project is located adjacent to the dredge area and means that a portion of the dredged material may be subject to a beneficial re-use, subject to geotechnical suitability, availability of receiving and processing areas on land and other circumstances.

REFERENCES

Environment Agency (2017). *Water Framework Directive assessment: estuarine and coastal waters.* https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

Fairhurst (2024). *Stranraer Marina, Stranraer – Geo-Environmental and Geotechnical Interpretative Report*, Document No, 161378-FRH-XX-00-RP-G-000001.

Marine Scotland (2017). *Pre-Dredge Sampling Guidance Version 2*: Scottish Government.

Marine Scotland (2015). *Guidance for Marine Licence Applicants Version 2*: Scottish Government.

APPENDICES

A FIGURES

205800 205900 206000 206100 206200

561400 561300 561200 561100

N

Stranraer

SS1
SS2
SS3A
SS3
SS8
SS4A
SS4
SS7 (#3)
SS5
SS6

Tourist Info

Stranraer

Legend

- Sample Station Locations
- Dredge Area

Do not scale this map

Client
Fairhurst

Project
Stranraer Marina

Title
Sediment Sample Stations (as sampled)

Status
FINAL

Drawing No.	Revision	Date
181539-GIS002	-	07 May 2025
Drawn	**Checked**	**Approved**
FR	MMF	CCAS

Scale
1:1,500 @A3
0 5 10 20 30 Metres

Rev	Date	Amendment	Initials
A	05/08/25	Rev dredge area	FR

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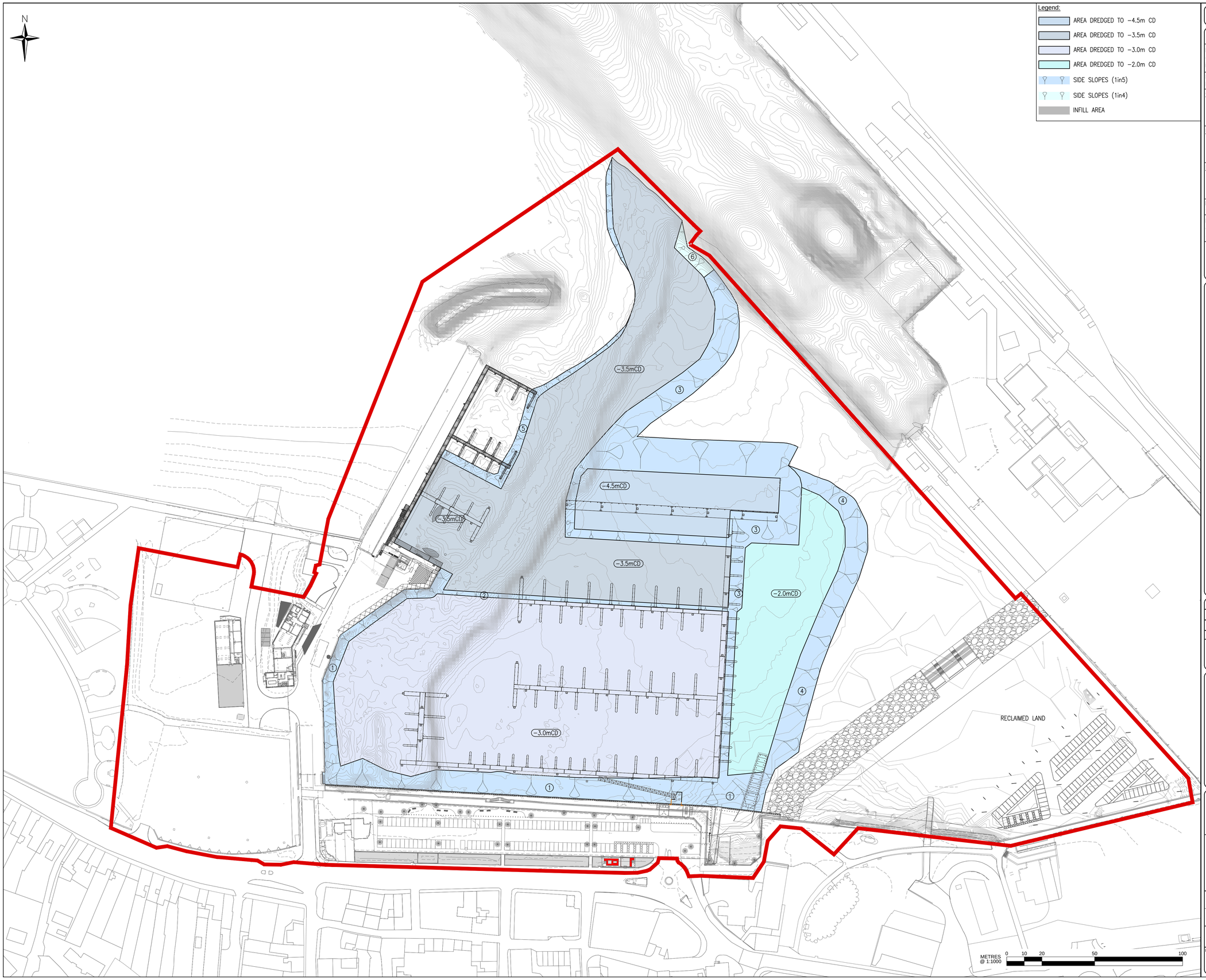


DO NOT SCALE FROM THIS DRAWING

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazard/risks normally associated with the types of work detailed on this drawing, note the following risks and information.

Risks listed here are not exhaustive.
Refer to

CONSTRUCTION

MAINTENANCE AND INSPECTION

RESIDUAL DESIGN RISKS

For information relating to use, cleaning and maintenance refer to the Health and Safety file.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

VOLUMES:

DREDGING

TO −4.5mCD	16916m³
TO −3.5mCD	30023m³
TO −3.0mCD	52980m³
TO −2.0mCD	13629m³
SLOPE AREA ①	4955m³
SLOPE AREA ②	1055m³
SLOPE AREA ③	2673m³
SLOPE AREA ④	9789m³
SLOPE AREA ⑤	322m³
SLOPE AREA ⑥	274m³

RECLAIMED LAND INFILL

65414m³ FILL TO FORMATION LEVEL

Rev	Date	Description	Drawn	Chkd	Appd
C02	23/07/25	CONSTRUCTION ISSUE	KAB	SRB	SJGS
C01	02/07/25	CONSTRUCTION ISSUE	KAB	SRB	SJGS

Drawing Status

Authorised and Accepted

Dumfries & Galloway COUNCIL

Balfour Beatty FAIRHURST

SCAPE SCOTLAND CIVIL ENGINEERING

Project Title

Stranraer Marina Expansion

Drawing Title

Estimated Dredging Layout

Drawn	Date	Designed	Date
CFPG	21/03/25	FRH	21/03/25
Checked	Date	Approved	Date
SRB	21/03/25	SJGS	19/06/25

Size	Scale	Fairhurst Ref
A1	1:1000	

Drawing Number	Status	Revision
161378-FRH-00-00-DG-W-000100	A1	C02

B SAMPLE LOGS

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Stranraer Marina	**Location ID**
	Project No.	181539	**SS1**
	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	29/04/2025	**Latitude/Longitude:**	54° 54.538736175, -5° 01.644510186
Dredge Area:	3.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.8m

Remarks:

Grab:
0.0 – 0.15m Soft dark grey/black/brown silt. Faint H_2S odour.

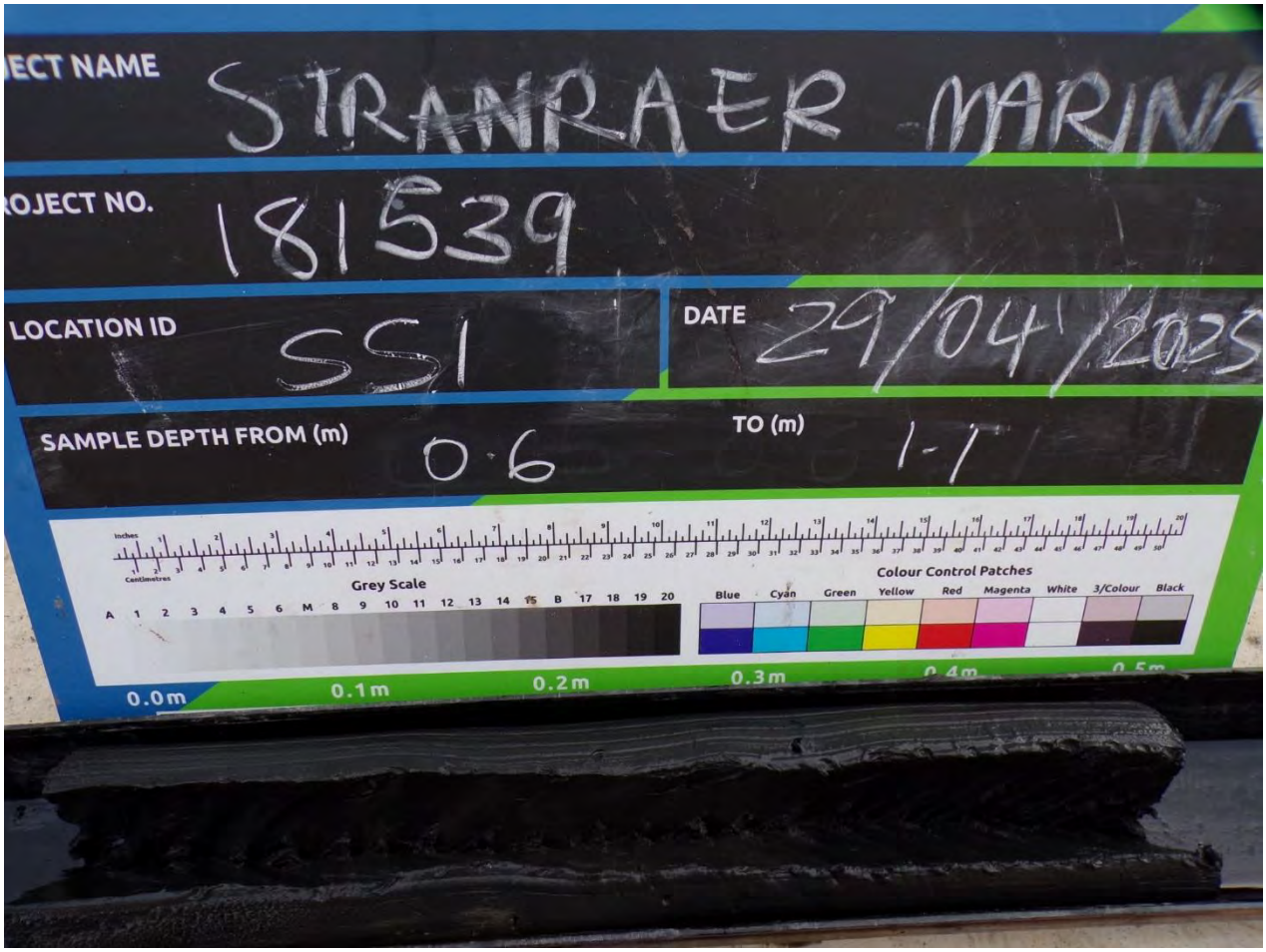
Vibrocore:
0.6 – 1.6m Dark grey clayey slightly sandy silt. Very Faint H_2S odour.

Biota: None noted.

Odours: Faint to very faint H_2S odour.

Anthropogenic Inputs: None noted.

Notes: 0.0 – 0.6m and 1.6 – 1.8m retained.



envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Stranraer Marina	**Location ID**
	Project No.	181539	**SS2**
	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	29/04/2025	**Latitude/Longitude:**	54° 54.501124148, -5° 01.678637093
Dredge Area:	3.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.7m

Remarks:

Grab:
0.0 – 0.15m Very soft black silt with occasional twigs and vegetation. Net retrieved in grab. No odour.

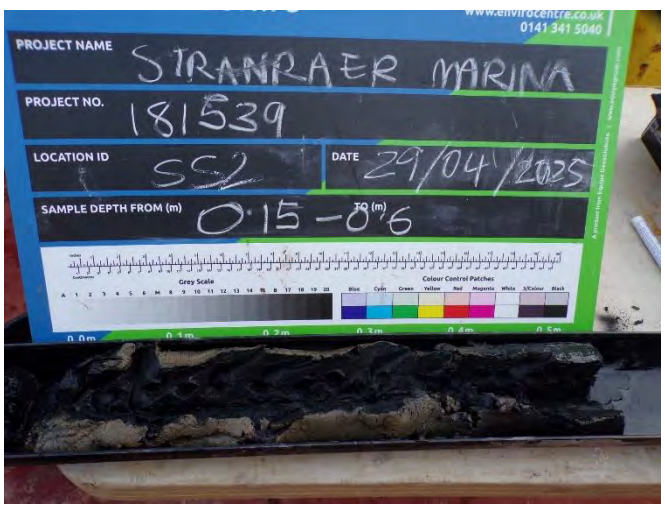
Vibrocore:
0.15 – 0.75m Soft dark grey clayey silt with moderate H_2S odour.
0.75 – 1.1m Soft dark grey clayey silt interbedded with dark greyish-brown fine to medium sand. Faint H_2S odour.

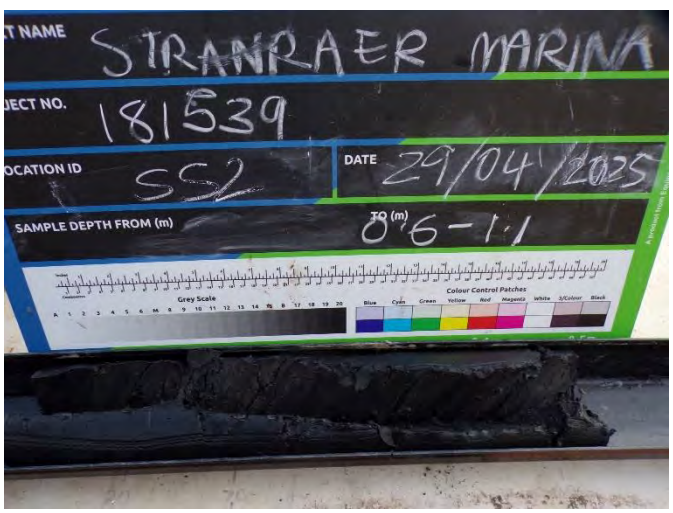
Biota: None noted.

Odours: Faint to moderate H_2S odour.

Anthropogenic Inputs: Net retrieved in grab.

Notes: 1.1 – 1.7m retained.





envirocentre	Project Name	Stranraer Marina	Location ID
	Project No.	181539	SS3 Attempt #2
8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	28/04/2025	**Latitude/Longitude:**	54° 54.464986251, -5° 01.662084861
Dredge Area:	4.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.75m

Remarks:

Grab:
0.0 – 0.15m Greyish brown slight silty fine to medium sand. A few sandworms (~2cm) and shells. No odour.

Vibrocore:
1.25 – 1.75m Greyish brown slightly silty gravelly fine to coarse sand. Gravel is fine and subangular. Occasional shells. Frequent gravel at base.

Biota: A few sandworms (~2cm) and shells in grab.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: 0.7 – 1.25m retained.
Attempt #1 Barrel was bent, 1m recovery of core. Coarse sand and shells at base.

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Stranraer Marina	**Location ID**
	Project No.	181539	**SS3A**
	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	28/04/2025	**Latitude/Longitude:**	54° 54.468752026, -5° 01.706397355
Dredge Area:	4.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore	**Core Length (m):**	1.6m

Remarks: **Vibrocore:**
0.9 – 1.4m Dense light brown slightly silty clay. Frequent fine sand between 1.0m and 1.2m

Biota: Shells at surface.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: 0.0 – 0.9m retained - Dark grey/black silty sand and shells at surface (0.0m)

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Stranraer Marina	**Location ID**
	Project No.	181539	**SS4**
	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	28/04/2025	**Latitude/Longitude:**	54° 54.441884918, -5° 01.682995823
Dredge Area:	3.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.4m

Remarks:

Grab:
0.0 – 0.15m Soft dark grey/brown/black slightly sandy silt, sand is fine with rare shells. No odour.

Vibrocore:
0.9 – 1.4m Stiff light brown (with rare dark grey mottling) clay.

Biota: None noted.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: 0.0 – 0.9m retained.

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Stranraer Marina	**Location ID**
	Project No.	181539	**SS4A**
	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	28/04/2025	**Latitude/Longitude:**	54° 54.442074346, -5° 01.719952183
Dredge Area:	3.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore	**Core Length (m):**	1.4m

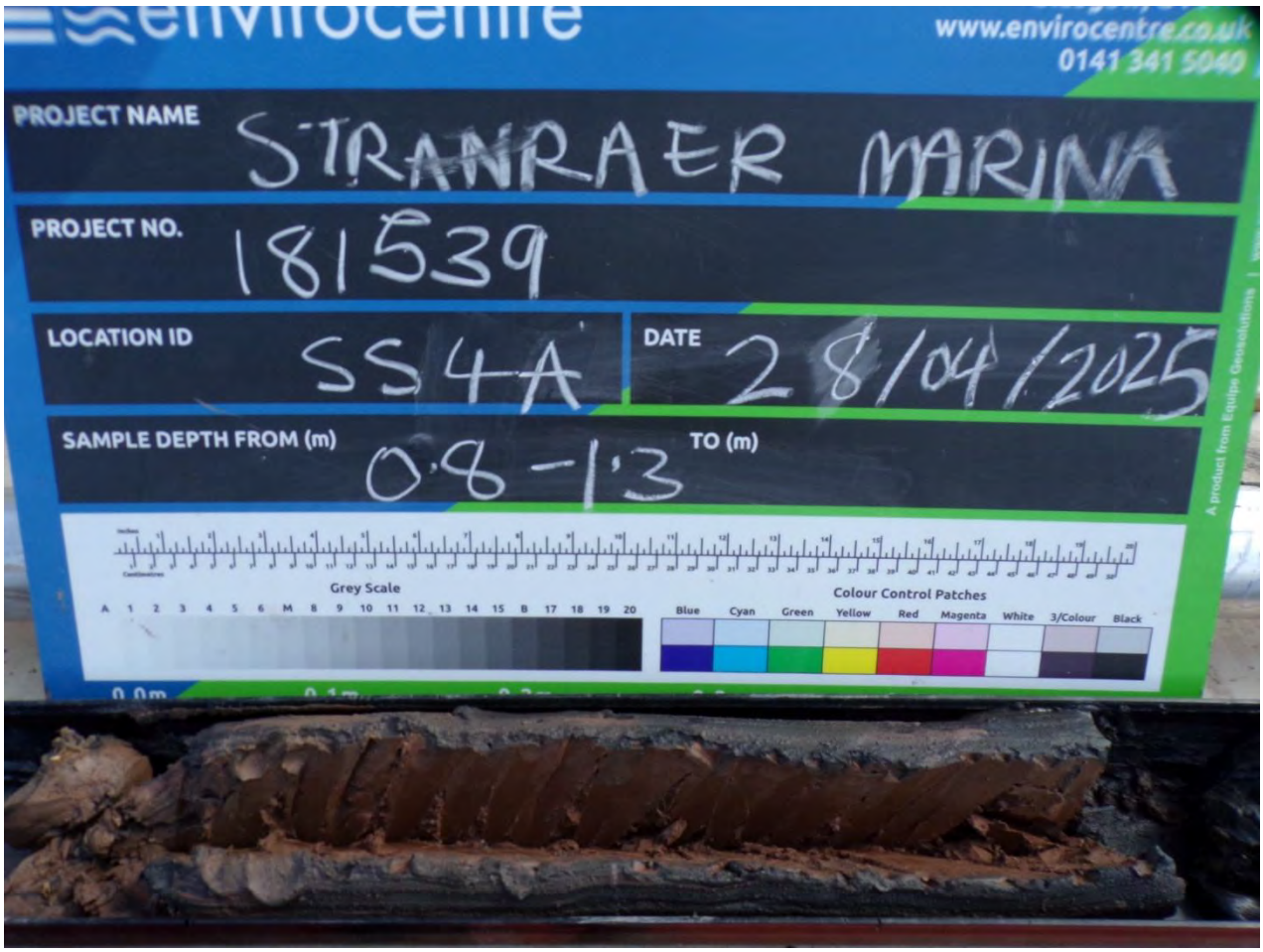
Remarks: **Vibrocore:**
At 0.8m (End of retained section) Soft black silt.
0.8– 1.3m Stiff light brown clay.

Biota: None noted.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: 0.0 – 0.8m retained.



envirocentre
8 Eagle Street,
Craighall Business Park,
Glasgow, G4 9XA

Project Name	Stranraer Marina	**Location ID**
Project No.	181539	**SS5**
Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	30/04/2025	**Latitude/Longitude:**	54° 54.413522747, -5° 01.765158596
Dredge Area:	3.0m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.55m

Remarks:

Grab:
0.0 – 0.15m Very soft, very dark grey/black silt with rare seaweed and vegetation and rare coarse gravel. Slight fish like odour.

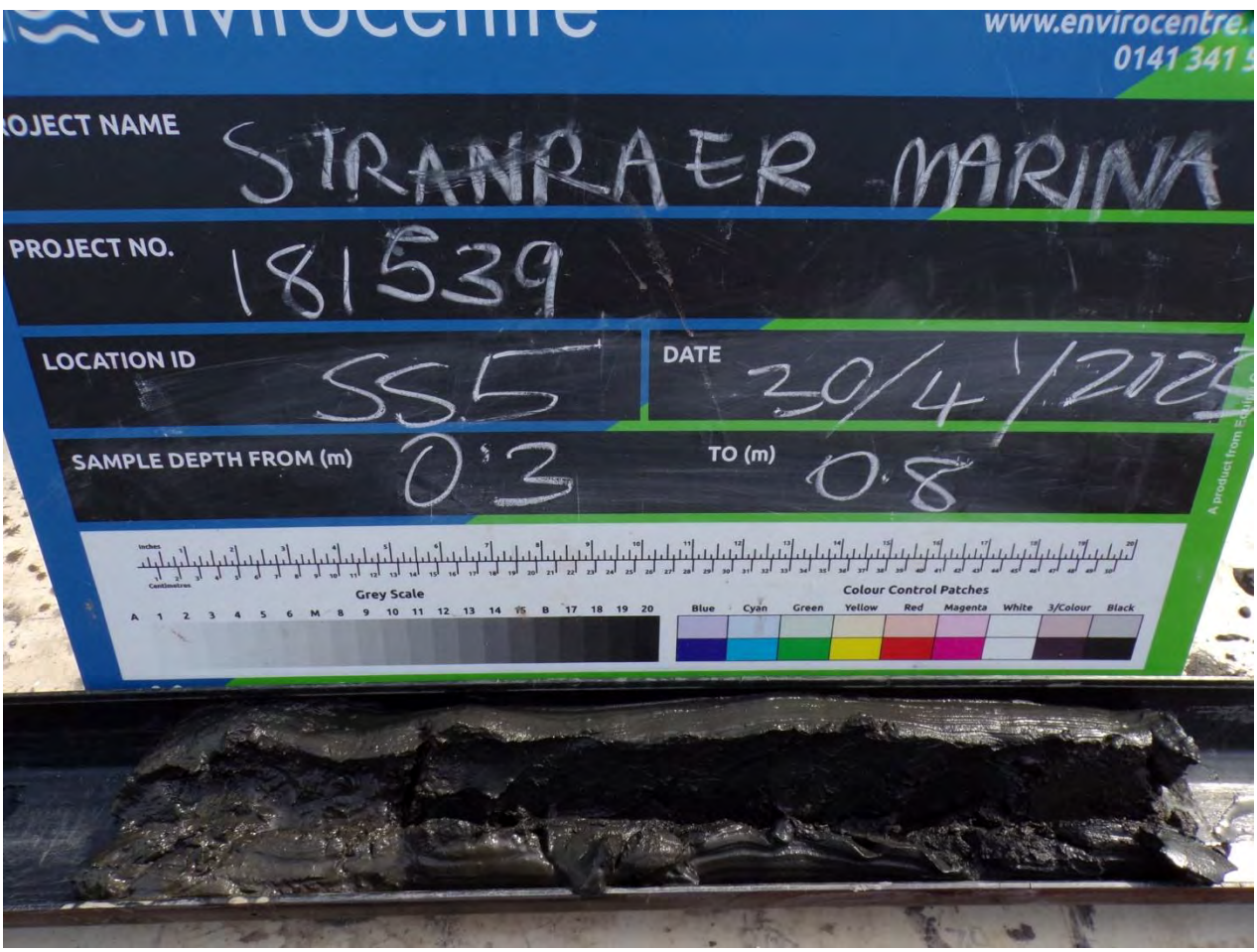
Vibrocore:
0.3 – 0.45m Very soft, very dark grey/black silt with rare shells.
0.45 – 0.75m Soft very dark grey/black silt.
0.75 – 0.8m Dark grey sandy silt, sand is fine. Dark grey silty sand at 0.8m

Biota: Rare seaweed and vegetation in grab and rare shells in sub-sample.

Odours: Slight fish like odour in grab.

Anthropogenic Inputs: None noted.

Notes: 0.0 – 0.3 & 0.8 – 1.55m retained. Stiff light brown clay at 1.55m.



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Glasgow, G4 9XA

Project Name	Stranraer Marina	**Location ID**
Project No.	181539	**SS6**
Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	29/04/2025	**Latitude/Longitude:**	54° 54.416730815, -5° 01.664011226
Dredge Area:	3.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.2m

Remarks:

Grab:
0.0 – 0.15m Greyish brown silty fine to medium sand with very frequent shells and shell fragments.

Vibrocore:
0.2 – 0.3m Dark greyish brown silty fine to medium sand.
0.3 – 1.2m Very stiff light brown clay interbedded with fine sand between 0.8 – 0.9m.

Biota: None noted.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: 5 attempts required with grab sampler to obtain enough sample.
Only one attempt using the vibrocorer was possible due to falling tide.
0.0- 0.2m retained.

envirocentre

8 Eagle Street,
Craighall Business Park,
Glasgow, G4 9XA

Project Name	Stranraer Marina	**Location ID**
Project No.	181539	**SS7 – Attempt #3**
Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	29/04/2025	**Latitude/Longitude:**	54° 54.444939219, -5° 01.602469333
Dredge Area:	2.0m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	0.5m

Remarks:

Grab:
0.0 – 0.15m Greyish brown silty fine to medium sand with frequent shells and shell fragments. One sandworm noted.

Vibrocore:
0.0 – 0.2m Greyish brown silty fine to medium sand with frequent shells and shell fragments.
0.2 – 0.45m Grey silty fine to coarse `sand. Singular piece of coarse subrounded gravel at 0.45m.
0.45 – 0.5m Very stiff grey clay with singular piece of coarse subrounded gravel.

Biota: Sandworm in Att. #3 grab and small crab in Att. #2 grab.

Odours: None noted.

Anthropogenic Inputs: None noted.

Notes: **Attempt #1 (on proposed station**) Only gravel, cobbles and shells in grab after 8 attempts. No core recovery.
Attempt #2 (moved northwards) No recovery in either core or grab, other than a few bits of gravel, cobbles and a small crabs after 6 attempts. No core recovery.
Attempt #3 (moved northwards) – as above.

envirocentre 8 Eagle Street, Craighall Business Park, Glasgow, G4 9XA	**Project Name**	Stranraer Marina	**Location ID**
	Project No.	181539	**SS8**
	Client	WA Fairhurst & Partners	

SEDIMENT CORE LOG

Date:	29/04/2025	**Latitude/Longitude:**	54° 54.452127512, -5° 01.711795098
Dredge Area:	4.5m bCD	**Sampled/logged by:**	FR/IC/AK
Method:	Vibrocore / 0.045m² Van Veen Grab Sampler	**Core Length (m):**	1.5m

Remarks:

Grab:
0.0 – 0.15m Very soft black silt. Strong H_2S odour.

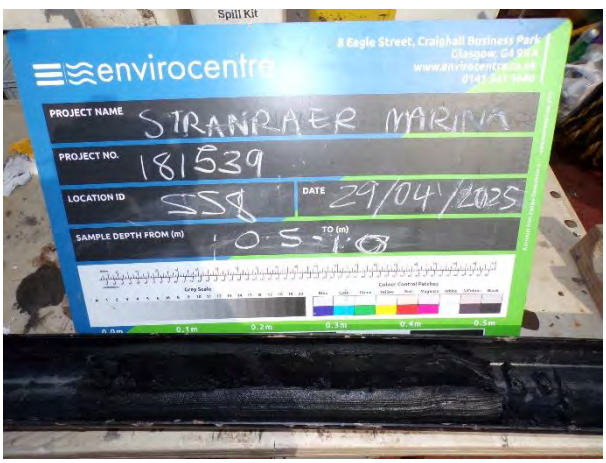
Vibrocore:
0.5 – 1.1m Soft black silt. No odour.
1.1 – 1.15m Stiff dark grey clay.
1.15 – 1.20m Soft black silt.
1.2 – 1.3m Dark grey silty fine sand.
1.3 – 1.4m Soft brown and black silty clay.
1.4 – 1.5m Very stiff grey clay.

Biota: None noted.

Odours: Strong H_2S odour in grab.

Anthropogenic Inputs: None noted.

Notes: 0.0 – 0.5m retained.



C LABORATORY CERTIFICATES

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 MAR02649

Issue Version: 1

Customer: EnviroCentre Ltd, Craighall Business Park, 8 Eagle Street, Glasgow, G4 9XA

Customer Reference: 181539 - Stranraer Marina

Date Sampled: 28-29-Apr-25

Date Samples Received: 02-May-25

Test Report Date: 06-Jun-25

Condition of samples: Ambient Deviating

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

Glass jars for sample SS3 (0.0-0.15) were damaged in transit

[Redacted]

Authorised by: Jane Colbourne

Position: Customer Service Specialist

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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		Units	%	%	%	%	%	N/A
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SUB_02*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Asbestos**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	39.9	60.1	0.33	53.37	46.30	NAIIS
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	32.5	67.5	0.00	29.24	70.76	NAIIS
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	25.1	74.9	0.00	25.73	74.27	NAIIS
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	59.7	40.3	0.43	46.97	52.60	NAIIS
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	40.5	59.5	0.00	21.93	78.07	NAIIS
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	27.7	72.3	0.00	25.59	74.41	NAIIS
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	18.4	81.6	2.99	87.61	9.40	NAIIS
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	15.8	84.2	21.20	72.81	5.99	NAIIS
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	22.4	77.6	0.00	15.27	84.73	NAIIS
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	30.7	69.3	0.40	64.53	35.07	NAIIS
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	22.5	77.5	0.70	0.07	99.23	NAIIS
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	29.9	70.1	0.00	0.54	99.46	NAIIS
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	48.2	51.8	0.00	43.73	56.27	NAIIS
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	35.1	64.9	1.36	41.89	56.76	NAIIS
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	26.0	74.0	7.05	80.79	12.16	NAIIS
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	35.2	64.8	0.00	8.52	91.48	NAIIS
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	25.4	74.6	0.00	7.41	92.59	NAIIS
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	28.4	71.6	1.05	71.07	27.88	NAIIS
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	17.4	82.6	15.12	66.47	18.41	NAIIS
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	61.7	38.3	0.25	32.95	66.79	NAIIS
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	42.7	57.3	0.00	23.69	76.31	NAIIS
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	30.5	69.5	2.95	25.64	71.41	NAIIS
		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

* 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	MAR02649
Issue Version	1
Customer Reference	181539 - Stranraer Marina

		Units	% M/M
		Method No	WSLM59*
		Limit of Detection	0.02
		Accreditation	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	0.65
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	0.64
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	0.65
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	1.94
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	1.11
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	0.75
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	0.12
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	0.14
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	0.25
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	0.24
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	0.42
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	0.44
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	1.30
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	0.88
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	0.26
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	0.36
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	0.37
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	0.21
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	0.62
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	2.12
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	1.39
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	0.65
		Reference Material (% Recovery)	93
		QC Blank	<0.02

* 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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		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**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	5.7	0.12	38.6	14.6	0.03	37.6	15.2	61.9
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	7.0	0.17	46.4	19.0	0.03	43.6	17.1	69.1
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	7.2	0.17	51.7	21.0	0.02	48.4	19.0	77.6
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	5.3	0.17	42.8	18.6	0.02	40.4	19.0	76.0
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	8.4	0.22	53.2	24.8	0.04	51.1	24.7	95.9
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	8.4	0.17	50.6	22.4	0.02	50.2	20.8	83.3
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	3.2	0.07	26.6	7.4	0.02	25.9	7.4	38.3
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	7.6	0.10	43.5	12.1	<0.01	43.9	7.0	47.6
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	7.3	0.17	72.8	31.2	<0.01	79.7	13.2	80.6
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	3.3	0.10	30.3	14.0	<0.01	27.8	13.0	49.6
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	9.7	0.23	72.7	31.7	0.07	86.8	17.4	91.6
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	12.9	0.29	84.6	33.6	0.06	111	17.0	89.8
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	7.6	0.22	37.5	18.7	0.09	40.5	21.1	84.6
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	5.9	0.24	33.0	18.6	0.12	36.0	22.3	80.9
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	2.5	0.09	19.0	13.1	0.05	19.4	7.2	35.4
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	11.3	0.22	79.1	31.0	0.06	103	17.0	85.3
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	15.5	0.24	106	37.4	0.07	161	16.6	93.0
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	3.6	0.21	25.8	10.6	0.05	28.6	8.7	42.9
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	5.8	0.20	27.2	12.3	0.11	31.7	29.2	64.7
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	8.7	0.24	46.8	24.0	0.09	46.2	25.8	103
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	7.4	0.24	46.7	26.1	0.11	46.6	25.2	105
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	9.4	0.24	50.8	22.4	0.07	55.5	16.2	77.5
Certified Reference Material SETOC 768 (% Recovery)			96	103	105	115	114	95	105	101
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	MAR02649
Issue Version	1
Customer Reference	181539 - Stranraer Marina

		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)**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	<5	<5
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	11.3	<5
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	<5	<5
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	<5	<5
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	<5	<5
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	<5	<5
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	<5	<5
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	<5	<5
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	<5	<5
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	<5	<5
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	<5	<5
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	<5	<5
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	20.4	17.9
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	<5	<5
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	<5	<5
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	<5	<5
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	<5	<5
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	<5	<5
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	<5	<5
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	<5	<5
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	<5	<5
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	<5	<5
Certified Reference Material BCR-646 (% Recovery)			90	89
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	MAR02649
Issue Version	1
Customer Reference	181539 - Stranraer Marina

		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**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	10.8	5.93	7.09	30.5	35.1	41.0
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	9.86	12.4	25.8	53.7	65.6	69.4
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	10.4	6.14	14.7	41.6	42.0	47.6
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	20.1	41.8	52.6	116	137	119
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	12.6	21.0	45.9	98.6	115	109
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	11.2	12.2	28.6	56.3	70.2	69.3
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	<1	<1	<1	2.82	4.42	4.62
Certified Reference Material Nist 1941b (% Recovery)			75	110	72	70	65	93
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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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	MAR02649
Issue Version	1
Customer Reference	181539 - Stranraer Marina

		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**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	36.1	33.4	35.3	7.81	60.3	7.68
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	63.5	60.3	61.6	13.2	101	20.9
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	37.9	40.6	46.9	8.03	72.2	13.3
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	107	129	125	22.8	236	29.4
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	93.9	101	101	18.3	201	22.6
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	65.1	63.7	64.9	13.2	117	23.4
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	3.89	4.20	3.45	<1	4.14	<1
Certified Reference Material Nist 1941b (% Recovery)			67	83	95	98	89	55
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries

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*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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		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**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	35.7	9.64	33.5	62.1	86500
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	57.5	16.2	49.3	95.4	175000
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	40.5	11.7	36.6	71.6	134000
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	103	38.0	103	220	167000
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	98.6	18.7	91.0	197	167000
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	65.2	16.4	66.2	112	160000
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	4.02	1.46	2.03	7.31	40800
Certified Reference Material Nist 1941b (% Recovery)			83	63	86	78	95~
QC Blank			<1	<1	<1	<1	<100

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*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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		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**
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	<1	3.30	5.73	14.8	23.1	19.3
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	<1	<1	1.74	5.35	7.69	9.79
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	<5	<5	7.81	19.1	26.6	24.9
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	<1	<1	2.53	11.7	17.1	19.1
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	2.17	<1	2.24	8.09	11.5	14.8
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	23.1	68.1	75.9	165	302	229
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	17.2	60.3	79.1	292	351	265
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	1.98	9.63	11.1	49.3	71.3	52.3
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	2.57	3.24	6.89	26.1	38.0	38.3
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	<1	<1	<1	4.00	6.00	10.0
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	<5	12.2	10.6	22.7	53.7	63.9
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	<1	<1	1.75	3.72	7.64	7.13
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	14.3	54.6	94.6	205	242	201
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	47.4	44.3	78.8	190	178	140
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	6.42	19.8	52.5	59.6	76.0	58.5
Certified Reference Material Nist 1941b (% Recovery)			70	115	67	66	61	89
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
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*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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		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**
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	15.1	20.8	15.0	3.13	29.4	2.17
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	19.7	6.51	10.4	1.92	8.03	3.46
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	22.4	25.8	21.0	5.09	30.5	<5
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	24.9	14.1	16.2	3.32	19.1	2.04
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	29.1	8.24	14.6	2.63	15.2	6.79
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	217	240	172	49.5	321	52.7
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	217	287	268	45.3	512	42.4
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	47.2	54.7	49.6	10.1	83.8	4.25
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	45.3	28.2	34.2	6.09	40.2	6.49
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	19.2	3.63	9.42	1.62	6.16	1.69
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	48.5	49.6	33.0	8.63	33.3	<5
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	5.65	7.16	4.85	<1	6.79	<1
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	179	205	225	38.6	470	50.2
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	105	164	195	23.5	442	59.3
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	53.2	57.5	80.0	10.7	107	14.8
Certified Reference Material Nist 1941b (% Recovery)			77	77	90	118	78	53
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
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*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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		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**
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	16.1	1.56	11.9	42.0	10900
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	6.09	2.67	14.4	13.1	9310
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	20.5	9.38	10.9	34.4	37900
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	13.5	2.08	13.8	25.4	9930
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	8.97	6.18	30.0	19.7	12300
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	207	34.3	156	327	138000
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	234	43.1	165	625	163000
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	54.3	2.92	23.8	77.1	24300
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	25.4	4.52	31.3	62.6	20600
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	4.60	1.59	9.82	8.50	6470
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	41.3	12.9	20.1	67.8	85700
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	4.79	1.21	3.59	15.2	6540
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	166	67.1	156	460	224000
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	96.4	24.2	199	394	81500
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	48.0	8.34	64.0	102	47500
Certified Reference Material Nist 1941b (% Recovery)			85	61	76	69	113~
QC Blank			<1	<1	<1	<1	<100

For full analyte name see method summaries
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*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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

		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**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
SS1 (0.0 – 0.15)	MAR02649.001	Sediment	<0.08	<0.08	<0.08	0.09	<0.08	0.11	<0.08
SS1 (0.6 - 1.1)	MAR02649.002	Sediment	<0.08	<0.08	0.12	0.12	0.09	0.22	0.11
SS1 (1.1 – 1.6)	MAR02649.003	Sediment	0.09	0.12	0.21	0.18	0.33	0.36	<0.08
SS2 (0.0 – 0.15)	MAR02649.004	Sediment	<0.08	<0.08	0.14	0.16	<0.08	0.17	0.05
SS2 (0.15 - 0.6)	MAR02649.005	Sediment	0.08	0.10	0.17	0.16	0.26	0.30	0.12
SS2 (0.6 – 1.1)	MAR02649.006	Sediment	<0.08	0.12	0.19	0.27	0.41	0.36	0.10
SS3 (0.0 – 0.15)	MAR02649.007	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS3 (1.25 – 1.75)	MAR02649.008	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS3A (0.9 – 1.4)	MAR02649.009	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS4 (0.0 – 0.15)	MAR02649.010	Sediment	<0.08	<0.08	<0.08	<0.08	0.16	<0.08	<0.08
SS4 (0.9 – 1.4)	MAR02649.011	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS4A (0.8 – 1.3)	MAR02649.012	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS5 (0.0 – 0.15)	MAR02649.013	Sediment	0.10	0.12	0.18	0.13	0.37	0.25	<0.08
SS5 (0.3 – 0.8)	MAR02649.014	Sediment	0.10	0.17	0.29	0.30	0.39	0.48	0.13
Certified Reference Material Nist 1941b (% Recovery)			77	99	90	88	92	93	90
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	MAR02649
Issue Version	1
Customer Reference	181539 - Stranraer Marina

		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**	**PCB28**	**PCB52**	**PCB101**	**PCB118**	**PCB138**	**PCB153**	**PCB180**
SS6 (0.0 – 0.15)	MAR02649.015	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS6 (0.2 – 0.7)	MAR02649.016	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS6 (0.7 – 1.2)	MAR02649.017	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
SS7 (0.0 – 0.15)	MAR02649.018	Sediment	<0.08	<0.08	<0.08	0.08	0.10	<0.08	<0.08
SS7 (0.15 – 0.5)	MAR02649.019	Sediment	1.54	5.21	2.67	2.02	2.12	2.12	0.66
SS8 (0.0 – 0.15)	MAR02649.020	Sediment	0.22	0.33	0.25	0.33	0.48	0.43	0.15
SS8 (0.5 – 1.0)	MAR02649.021	Sediment	0.06	0.12	0.15	0.22	0.33	0.29	0.11
SS8 (1.0 – 1.5)	MAR02649.022	Sediment	0.05	0.09	0.14	0.09	0.24	0.22	0.12
Certified Reference Material Nist 1941b (% Recovery)			74	96	85	92	105	99	87
QC Blank			<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

For full analyte name see method summaries

~ Indicates result is for an In-house Reference Material as no Certified Reference Materials are avaliable.

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 MAR02649
Issue Version 1
Customer Reference 181539 - Stranraer Marina

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM59*	MAR002649.001-022	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
ICPMSS*	MAR002649.001-022	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SUB_01*	MAR002649.001-022	Analysis was conducted by an approved subcontracted laboratory.
SUB_02*	MAR002649.001-022	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR002649.001-.012, -.014-022	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	MAR002649.010, .018	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	MAR002649.001-022	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	MAR002649.001-022	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.

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	MAR02649.007	Glass jars were damaged during transit. Samples transferred to suitable containers on arrival.
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	MAR02649
Issue Version	1
Customer Reference	181539 - Stranraer Marina

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.

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		

D DATA SUMMARY TABLES

Summary Table A

Sampling Results Incorporated with BPEO Assessment (mg/kg)

Source	AL1	AL2	BAC CSEMP	ERL CSEMP	PEL Canada	SS1 (0.0 – 0.15)	SS1 (0.6 - 1.1)	SS1 (1.1 – 1.6)	SS2 (0.0 – 0.15)	SS2 (0.15 - 0.6)	SS2 (0.6 – 1.1)	SS3 (0.0 – 0.15)	SS3 (1.25 – 1.75)	SS3A (0.9 – 1.4)	SS4 (0.0 – 0.15)	SS4 (0.9 – 1.4)	SS4A (0.8 – 1.3)	SS5 (0.0 – 0.15)	SS5 (0.3 – 0.8)	SS6 (0.0 – 0.15)	SS6 (0.2 – 0.7)	SS6 (0.7 – 1.2)	SS7 (0.0 – 0.15)	SS7 (0.15 – 0.5)	SS8 (0.0 – 0.15)	SS8 (0.5 – 1.0)	SS8 (1.0 – 1.5)	AVERAGE	No. Exceed RAL 1	No. Exceed RAL 2	No.Exceed BAC?	No. Exceed ERL	No. Exceed PEL?
Arsenic	20	70	25		41.6	5.7	7.0	7.2	5.3	8.4	8.4	3.2	7.6	7.3	3.3	9.7	12.9	7.6	5.9	2.5	11.3	15.5	3.6	5.8	8.7	7.4	9.4	7.44	0	0	0	-	0
Cadmium	0.4	4	0.31	1.2	4.2	0.12	0.17	0.17	0.17	0.22	0.17	0.07	0.10	0.17	0.10	0.23	0.29	0.22	0.24	0.09	0.22	0.24	0.21	0.20	0.24	0.24	0.24	0.19	0	0	0	0	0
Chromium	50	370	81	81	160	38.6	46.4	51.7	42.8	53.2	50.6	26.6	43.5	72.8	30.3	72.7	84.6	37.5	33.0	19.0	79.1	106	25.8	27.2	46.8	46.7	50.8	49.35	9	0	2	2	0
Copper	30	300	27	34	108	14.6	19.0	21.0	18.6	24.8	22.4	7.4	12.1	31.2	14.0	31.7	33.6	18.7	18.6	13.1	31.0	37.4	10.6	12.3	24.0	26.1	22.4	21.12	5	0	5	1	0
Mercury	0.25	1.5	0.07	0.15	0.7	0.03	0.03	0.02	0.02	0.04	0.02	0.02	0.01	0.01	0.01	0.07	0.06	0.09	0.12	0.05	0.06	0.07	0.05	0.11	0.09	0.11	0.07	0.05	0	0	5	0	0
Nickel	30	150	36	-	-	37.6	43.6	48.4	40.4	51.1	50.2	25.9	43.9	79.7	27.8	86.8	111	40.5	36.0	19.4	103	161	28.6	31.7	46.2	46.6	55.5	55.22	18	1	16	N/A	N/A
Lead	50	400	38	47	112	15.2	17.1	19.0	19.0	24.7	20.8	7.4	7.0	13.2	13.0	17.4	17.0	21.1	22.3	7.2	17.0	16.6	8.7	29.2	25.8	25.2	16.2	17.28	0	0	0	0	0
Zinc	130	600	122	150	271	61.9	69.1	77.6	76.0	95.9	83.3	38.3	47.6	80.6	49.6	91.6	89.8	84.6	80.9	35.4	85.3	93.0	42.9	64.7	103	105	77.5	74.25	0	0	0	0	0
Napthalene	0.1		0.08	0.16	0.391	0.010	0.016	0.012	0.038	0.019	0.016	0.001	0.002	0.003	0.009	0.002	0.006	0.034	0.043	0.003	0.005	0.002	0.013	0.001	0.067	0.024	0.008	0.02	0	-	0	0	0
Acenaphthylene	0.1				0.128	0.006	0.012	0.006	0.042	0.021	0.012	0.001	0.003	0.001	0.005	0.001	0.001	0.068	0.060	0.010	0.003	0.001	0.012	0.001	0.055	0.044	0.020	0.02	0	-	N/A	N/A	0
Acenaphthene	0.1				0.0889	0.011	0.010	0.010	0.020	0.013	0.011	0.001	0.001	0.001	0.005	0.001	0.002	0.023	0.017	0.002	0.003	0.001	0.005	0.001	0.014	0.047	0.006	0.01	0	-	N/A	N/A	0
Fluorene	0.1				0.144	0.008	0.021	0.013	0.029	0.023	0.023	0.001	0.002	0.003	0.005	0.002	0.007	0.053	0.042	0.004	0.006	0.002	0.005	0.001	0.050	0.059	0.015	0.02	0	-	N/A	N/A	0
Phenanthrene	0.1		0.032	0.24	0.544	0.034	0.049	0.037	0.103	0.091	0.066	0.002	0.012	0.014	0.011	0.014	0.030	0.158	0.165	0.024	0.031	0.010	0.020	0.004	0.156	0.199	0.064	0.06	5	-	11	0	0
Anthracene	0.1		0.05	0.085	0.245	0.007	0.026	0.015	0.053	0.046	0.029	0.001	0.006	0.002	0.008	0.003	0.002	0.076	0.079	0.011	0.007	0.001	0.011	0.002	0.095	0.079	0.053	0.03	0	-	6	1	0
Fluoranthene	0.1		0.039	0.6	1.494	0.060	0.101	0.072	0.236	0.201	0.117	0.004	0.029	0.008	0.031	0.019	0.015	0.321	0.512	0.084	0.040	0.006	0.033	0.007	0.470	0.442	0.107	0.13	9	-	13	0	0
Pyrene	0.1		0.024	0.665	1.398	0.062	0.095	0.072	0.220	0.197	0.112	0.007	0.042	0.013	0.034	0.025	0.020	0.327	0.625	0.077	0.063	0.009	0.068	0.015	0.460	0.394	0.102	0.14	8	-	17	0	0
Benzo(a)anthracene	0.1		0.016	0.261	0.693	0.031	0.054	0.042	0.116	0.099	0.056	0.003	0.015	0.005	0.019	0.012	0.008	0.165	0.292	0.049	0.026	0.004	0.023	0.004	0.205	0.190	0.060	0.07	5	-	15	1	0
Chrysene	0.1		0.02	0.384	0.846	0.035	0.062	0.047	0.125	0.101	0.065	0.003	0.015	0.010	0.021	0.016	0.015	0.172	0.288	0.050	0.034	0.009	0.033	0.005	0.225	0.195	0.080	0.07	6	-	15	0	0
Benzo(b)fluoranthene	0.1	-	-	-	-	0.041	0.069	0.048	0.119	0.109	0.069	0.005	0.019	0.010	0.025	0.019	0.015	0.229	0.265	0.052	0.038	0.010	0.064	0.007	0.201	0.140	0.059	0.07	6	-	N/A	N/A	N/A
Benzo(k)fluoranthene	0.1	-	-	-	-	0.033	0.060	0.041	0.129	0.101	0.064	0.004	0.021	0.007	0.026	0.014	0.008	0.240	0.287	0.055	0.028	0.004	0.050	0.007	0.205	0.164	0.058	0.06	6	-	N/A	N/A	N/A
Benzo(a)pyrene	0.1		0.03	0.384	0.763	0.035	0.066	0.042	0.137	0.115	0.070	0.004	0.023	0.008	0.027	0.017	0.012	0.302	0.351	0.071	0.038	0.006	0.054	0.008	0.242	0.178	0.076	0.09	6	-	14	0	0
Indeno(1,2,3cd)pyrene	0.1		0.103	0.24	-	0.036	0.058	0.041	0.103	0.099	0.065	0.004	0.016	0.006	0.021	0.014	0.009	0.207	0.234	0.054	0.025	0.005	0.041	0.005	0.166	0.096	0.048	0.06	4	-	3	0	N/A
Benzo(ghi)perylene	0.1		0.08	0.085	-	0.036	0.064	0.038	0.107	0.094	0.065	0.004	0.015	0.020	0.022	0.025	0.029	0.217	0.217	0.047	0.045	0.019	0.049	0.006	0.179	0.105	0.053	0.07	5	-	6	6	N/A
Dibenzo(a,h)anthracene	0.01		-	-	0.135	0.008	0.013	0.008	0.023	0.018	0.013	0.001	0.003	0.002	0.005	0.003	0.003	0.050	0.045	0.010	0.006	0.002	0.009	0.001	0.039	0.024	0.011	0.01	0	-	N/A	N/A	0
THC	100		-	-	-	86.5	175.0	134.0	167.0	167.0	160.0	40.8	10.9	9.3	37.9	9.9	12.3	138.0	163.0	24.3	20.6	6.5	85.7	6.5	224.0	81.5	47.5	82.19	8	-	N/A	N/A	N/A
PCBs	0.02	0.18	-	-	0.189	0.00060	0.00082	0.00137	0.00060	0.00082	0.00137	0.00076	0.00119	0.00153	0.00056	0.00056	0.00056	0.00064	0.00056	0.00056	0.00123	0.00186	0.00056	0.00056	0.00056	0.00058	0.01634	0.0022	0	0	N/A	N/A	0
TBT	0.1	0.5	-	-	-	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.018	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.0056	0	0	N/A	N/A	N/A

Note: Underlined Values are < LOD

PEL Data Source: http://ceqg-rcqe.ccme.ca/en/index.html#void

Summary Table B

Stranraer Harbour Average Concentrations

All units in mg/kg

	AL1	AL2	BAC	<ERL	PEL	Dredge Average	Exceed AL1?	Exceed AL2?	Exceed BAC?	Exceed ERL ?	Exceed PEL?
Source			CSEMP	CSEMP	Canada						
Arsenic	20	70	25	-	41.6	7.4	No	No	No	N/A	No
Cadmium	0.4	4	0.31	1.2	4.2	0.2	No	No	No	No	No
Chromium	50	370	81	81	160	49.4	No	No	No	No	No
Copper	30	300	27	34	108	21.1	No	No	No	No	No
Mercury	0.25	1.5	0.07	0.15	0.7	0.1	No	No	No	No	No
Nickel	30	150	36	-	-	55.2	**Yes**	No	**Yes**	N/A	N/A
Lead	50	400	38	47	112	17.3	No	No	No	No	No
Zinc	130	600	122	150	271	74.3	No	No	No	No	No
					-						
Napthalene	0.1	-	0.08	0.16	0.319	0.02	No	N/A	No	No	No
Acenaphthylene	0.1	-	-	-	0.128	0.02	No	N/A	N/A	N/A	No
Acenaphthene	0.1	-	-	-	0.0889	0.01	No	N/A	N/A	N/A	No
Fluorene	0.1	-	-	-	0.144	0.02	No	N/A	N/A	N/A	No
Phenanthrene	0.1	-	0.032	0.24	0.544	0.06	No	N/A	**Yes**	No	No
Anthracene	0.1	-	0.05	0.085	0.245	0.03	No	N/A	No	No	No
Fluoranthene	0.1	-	0.039	0.6	1.494	0.13	**Yes**	N/A	**Yes**	No	No
Pyrene	0.1	-	0.024	0.665	1.398	0.14	**Yes**	N/A	**Yes**	No	No
Benzo(a)anthracene	0.1	-	0.016	0.261	0.693	0.07	No	N/A	**Yes**	No	No
Chrysene	0.1	-	0.02	0.384	0.846	0.07	No	N/A	**Yes**	No	No
Benzo(b)fluoranthene	0.1	-	-	-	-	0.07	No	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	0.1	-	-	-	-	0.06	No	N/A	N/A	N/A	N/A
Benzo(a)pyrene	0.1	-	0.03	0.384	0.763	0.09	No	N/A	**Yes**	No	No
Indeno(1,2,3cd)pyrene	0.1	-	0.103	0.24	-	0.06	No	N/A	No	No	N/A
Benzo(ghi)perylene	0.1	-	0.08	0.085	-	0.07	No	N/A	No	No	N/A
Dibenzo(a,h)anthracene	0.01	-	-	-	0.135	0.01	**Yes**	N/A	N/A	N/A	No
Total Hydrocarbons (THC)	100	-	-	-	-	82.19	No	N/A	N/A	N/A	N/A
PCBs	0.02	0.18	-	-	0.189	0.002	No	No	N/A	N/A	No
TBT	0.1	0.5	-	-	-	0.0056	No	No	N/A	N/A	N/A