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Collection of Sediment Samples (Marine Environment Assessment Group)	Issued By	[Redacted]
	Date of this Issue:	19/02/2024

1. Introduction and Scope

This procedure describes the collection of sediment samples for environmental analysis by the Marine Environmental Assessment Group (MEA).

- 2. Principle of the Method** Sediment samples are collected using a suitable sampling device, dependent on water depth and type of sampling platform. Sediment samples are divided according to determinand type, frozen as soon as possible and returned to the laboratory for analysis.

3. Reference Materials

Not Relevant

4. Reagents

Dichloromethane

5. Equipment

Sampling device such as Day Grab or corer (see 8.1)

Tube for siphoning water

Inorganics: Metals, Particle Size analysis (PSA) and CHN Analysis

Plastic Beakers

Plastic Scoops

Plastic Spatulas

Plastic Bags (metals & CHN)/plastic tub (particle size)

Organic Contaminants: Polybrominated Diphenyl ethers (PBDEs) / Polycyclic aromatic hydrocarbons (PAHs) / polychlorinated biphenyls (PCBs) / Organotins / Microplastics

Metal Beaker

Metal Scoops

Metal Spoons

Aluminium cans

Glass jars

6. Environmental Control

Ensure no scientific staff or crew smoke in the vicinity of the sampling device or when sub-sampling.

7. Interferences

Possible sources of contamination include contamination from surface contact with oil on sampling gear or on hands or gloves of personnel handling samples (hydrocarbon samples), and samples coming into contact with metal, other than the metal of the grab (metals samples). Personnel should wear clean gloves. For microplastics sampling staff should avoid wearing fleeces/synthetic clothes and wear cotton coveralls if possible.

8. Sampling and Sample Preparation

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8.1. Collection of sediment samples

A suitable sampling device must be employed, as defined by the group requesting / collecting the sample, or to meet the requirements of specific projects, e.g. the Clean Seas Environment Monitoring Programme (CSEMP).

The device used will depend on the water depth and the type of sampling platform available. Types of sampling devices include:

- Hand held Van Veen style grab or corer - for inshore shallow waters where a winch cannot be operated.
- Day grab, Craib corer (single) or multi-corer – for winch deployment in deeper inshore and offshore waters.

Note: Requirements of CSEMP are located in the [Green Book](#) along with the relevant ICES/MERMAN codes.

8.2. Documentation

One nominated person should take responsibility for ensuring the paperwork is completed correctly while in the field, including LIMS paperwork and sediment sampling information record sheet (B 016.1). If the sample data is to be included in LIMS, complete the Sediment Sampling Template as per SOP LIMS CS050. On return B 021 client request form should be returned to Quality Management for retention. All other paperwork (B 016.1 sediment sampling information sheets) are scanned and saved in the relevant cruise folder located in Chem_Dat (**G:\DATA\Clean and Safe Seas\Chem_Dat\CSEMP\CSEMP cruises SIC**)

8.3. Sampling by Grab

The crew of each ship is in charge to set up the grab, deploy and retrieve safely.

The grab should return to the surface filled to two-thirds to three-quarters full of sediment. If the grab is less than half full, it has possibly not sampled properly. There must be a depth of 7 cm or more at the centre of the grab. A marked ruler is available to check the depth of the grab sample. If the depth of the sample is less than 7 cm, it is considered as a fail and needs to be repeated.

Overlying water should be carefully siphoned off (using the provided tube) before sampling the sediment. This can be done by filling the tube with tap water and closing both ends to prevent the water to run off. One end of the tube can then be placed in the overlying water, while positioning the other end lower than the grab. Opening both ends will then create a flow of water through the tube allowing the overlying water to be siphoned off.

If grabbing fails, empty and repeat. Attempt grabbing 3 times and if after the third attempt the sampling has still failed, refer to scientist in charge for advice.

A separate grab sample is collected at each site for microplastics sample only.

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All grab samples, including fails attempts, are recorded in the [B061.1](#) record sheet. Ensure latitudes and longitudes of sampling positions are recorded for every sample. Please also note if any smell of hydrocarbon is detected in the sediment. The initials of all samplers involved in the collection process are to be added to the record sheet.

A description of acceptable sediment type for CSEMP sampling can be found below (with a full description of various sediment type detailed in the Folk classification – see APPENDIX 1):

- Mud
- Sandy mud
- Slightly gravelly mud
- Slightly gravelly sandy mud
- Gravelly mud
- Muddy sand
- Slightly gravelly muddy sand

8.4. Sub-sampling for chemical and microplastic analysis

Sub-sampling requirements are dependent on the type of analysis (Table 1). Large stones (>2mm), complete shells and animals should be removed before sampling.

The sub-sample is taken from the top approximately 2 cm of sediment, avoiding material at edges of grab, using the plastic or metal scoop as detailed in Table 1.

Plastic bags and the aluminium cans and lids **must** be labelled with the LIMS numbers, field identification numbers, cruise code and analysis group in indelible ink before freezing. Note the LIMS numbers **must** include the year code.

Samples for microplastics are stored in the large (75*120mm) aluminium cans.

All samples are frozen at sea and stored frozen (between -40°C and -10°C) until return to the laboratory.

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Table 1. Sub-sampling requirements for sediment collection				
Analysis type	Scoop / spatula	Beaker	Storage container	Required amount
<i>Metals/TOC¹</i>	Plastic	Plastic	Plastic bag 9 x 13 cm	1/3 filled
<i>PSA²</i>	Plastic	Plastic	Plastic tub (PSA)	1/3 filled
<i>Microplastics</i>	Metal	Metal	Aluminium can ³ or glass jar	3/4 filled
<i>Hydrocarbons (including PAHs)</i>	Metal	Metal	Solvent washed Aluminium can or glass jar	3/4 filled
<i>CBs/PBDEs</i>	Metal	Metal	Solvent washed Aluminium can or glass jar	3/4 filled
<i>Organotins</i>	Metal	Metal	Solvent washed Aluminium can or glass jar	3/4 filled
<i>Asbestos</i>	Plastic	Plastic	Plastic bag 6 x 6 cm	1/2 filled

¹ Total Organic Carbon

² Particle Size Analysis

³ Large 75* 120 mm can

8.4.1. Metals / Particle Size Analysis (PSA) / Total Organic Carbon (TOC, also referred to as CHN)

Take a sub-sample from the top approximately 2 cm of sediment using a plastic scoop / spatula and transfer to a plastic beaker. Sub-samples should be taken maintaining a distance of least 1 cm of undisturbed sediment between the sampled area and the sides of the grab. A single sub-sample is taken and mixed; an aliquot (approximately 3 spatulas full) is transferred into a pre-labelled plastic bag for metals/CHN analysis, and a similar amount transferred to a small plastic tub for PSA. Plastic bags are frozen flat on a tray. The scoops and beaker are washed between sub-sample collections with water from the area (non-toxic water supply if possible) and excess water removed by shaking. See SOP 0120 for sample storage and preparation on return to the laboratory.

8.4.2. Organotins / PBDEs / CBs

Take a sub-sample from the top approximately 2 cm of sediment using a metal scoop / spatula and transfer to a metal beaker. The sediment is thoroughly mixed and an aliquot (see Table 1) transferred to solvent-washed pre-labelled aluminium can for PBDEs / CBs. If a sub-sample is required for organotins, a separate aliquote is taken and transferred to a second solvent-washed pre-labelled aluminium can or glass jar. The sediment sub-samples are stored frozen. The scoops and beaker are washed between sample collections with water from the area (non-toxic water supply if possible) and excess water removed by shaking. Upon return to the lab, the sample should be freeze-dried (SOP 0120) and disaggregated prior to sub-sampling.

8.4.3. Hydrocarbons

Take a sub-sample from the top approximately 2 cm of sediment using a metal scoop / spatula and transfer to a metal beaker and mix well using a metal

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spatula. The sediment is thoroughly mixed and an aliquot (see Table 1) transferred to a solvent-washed pre-labelled aluminium can or glass jar. The sediment sub-sample is subsequently frozen.

The scoop / spatula and beaker are washed between sample collection with water from the area (non-toxic supply if possible) and excess water removed by shaking. If the sediment appears to be contaminated with oil or contained black specks then the metal scoop, spatula and beaker should also be rinsed with Dichloromethane (DCM).

8.4.4. Core samples

The amount of sediment available from cored samples will depend on the diameter of the coring device and its length. A suitable sized core tube for general-purpose sediment sampling is 5.5 cm diameter. When sectioned into 2 cm portions, this will provide approximately 20 g of sediment per 2 cm section.

The core tube should be carefully removed from the corer ensuring no sediment is lost from the tube.

The core is split into 2 cm sections with a knife plastic/metal, depending upon the determinand. Care must be taken not to include the smeared edges of cores in the sections.

The section is transferred to a beaker, mixed well using a spatula and aliquoted into appropriately labelled containers (see 8.4). The containers are subsequently stored frozen.

To prevent confusion when submitting data to MERMAN/ICES only one LIMS ID number is issued per core tube. The field identifiers must clearly identify the core section e.g. "MAR/2017/12345 0-2 cm".

8.4.5. Microplastics

Take a sub-sample from the top approximately 2 cm of sediment using a metal scoop / spatula and transfer to a metal beaker and mix well using a metal spatula. The sediment is thoroughly mixed and the whole sample (see Table 1) transferred to a solvent-washed pre-labelled aluminium can (75*120 mm size) or glass jar. The sediment sub-sample is subsequently frozen.

The scoop / spatula and beaker are washed between sample collection with water from the area (non-toxic supply if possible) and excess water removed by shaking. If the sediment appears to be contaminated with oil or contained black specks then the metal scoop, spatula and beaker should also be rinsed with Dichloromethane (DCM).

8.4.6 Asbestos

Sediment samples from either harbours (e.g dredged spoils), dredge spoil disposal sites or from within the Firth of Cromarty, Clyde and Forth are considered to be at higher risk of containing asbestos. Sediment samples from these locations must be analysed for asbestos and only those that have been found to be negative can be processed further.

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Take a sub-sample from the top approximately 2 cm of sediment using a plastic scoop / spatula and transfer to a plastic beaker. Sub-samples should be taken maintaining a distance of least 1 cm of undisturbed sediment between the sampled area and the sides of the grab. A single sub-sample is taken and mixed; an aliquot is transferred into a pre-labelled plastic bag for asbestos. Plastic bags are frozen flat on a tray. The scoop and beaker are washed between sub-sample collections with water from the area (non-toxic water supply if possible) and excess water removed by shaking. See SOP 0120 for procedure of sending sample for asbestos analysis. Note: sample could also be taken using metal sampling equipment or obtained back at the lab from any of the sub-samples.

9. Analytical Procedures

Not Relevant

10. Calculation of Results

Not Relevant

11. Precision, Bias and Limit of Detection

Not Relevant

12. Reports

At sea, the LIMS sediment login template (LIMS LOG030) is completed according to LIMS CS050. Upon return to the laboratory, samples are logged into LIMS according to LIMS CS060.

Analyses are assigned (LIMS CS060), batched and reported (LIMS CS070) through LIMS on the "MAIN" subsample.

For research vessel collected samples, a cruise report is produced at the end of the cruise which summarises where samples were collected and for what purpose.

13. Safety

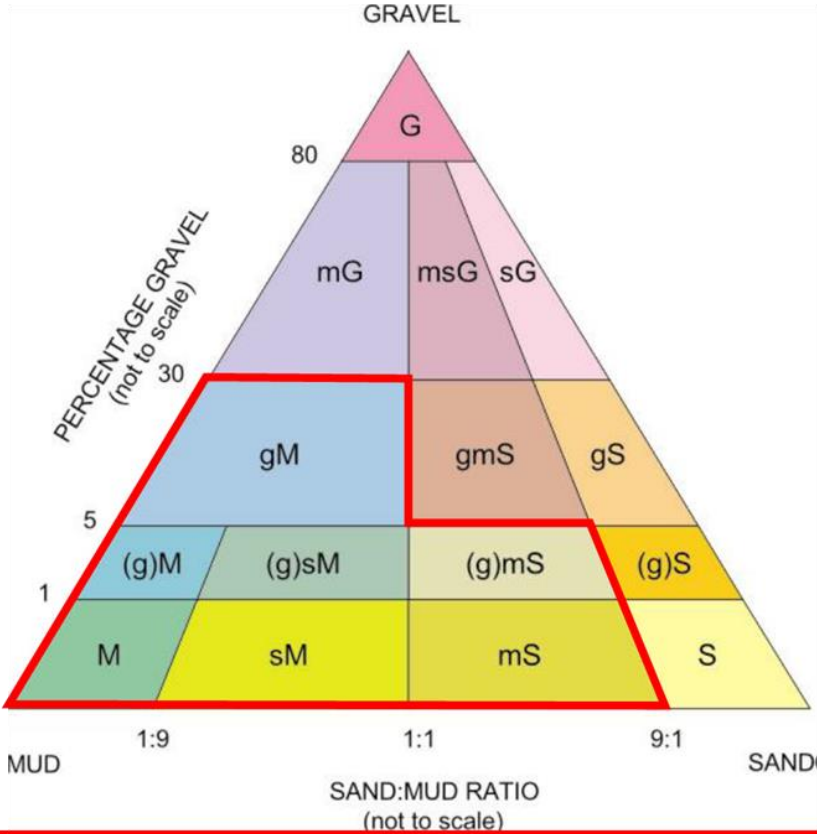
Risk assessment MSS GEN RA005 for sampling and processing sediment, including aboard research vessels.

14. Literature References

Not Relevant

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APPENDIX 1: Folk classification for sediment type (acceptable type in red)



- M _____ Mud
- sM _____ Sandy mud
- (g)M _____ Slightly gravelly mud
- (g)sM _____ Slightly gravelly sandy mud
- gM _____ Gravelly mud
- S _____ Sand
- mS _____ Muddy sand
- (g)S _____ Slightly gravelly sand
- (g)mS _____ Slightly gravelly muddy sand
- gmS _____ Gravelly muddy sand
- gS _____ Gravelly sand
- G _____ Gravel
- mG _____ Muddy gravel
- msG _____ Muddy sandy gravel
- sG _____ Sandy gravel