Technical Note

Project title	Buncrana Harbour Dredging	Job number	21106
To	Cathal Sweeney, Donegal County Council	File reference	21106-TN01-rev 00
Prepared by	Diarmuid O'Loan	Date	02/08/2021
Checked by	Sarah Gibson		
Approved by	William Brown		
Subject	Buncrana Harbour Sediment Testing 2021 - Compliance with Schedule C2 of Dumping at Sea Permit Reg. Nr. S0011-03		

1 Introduction

Gavin and Doherty Geosolutions Ltd (GDG) were successful in a tender to undertake seabed sampling and lab testing of seabed samples from Buncrana Harbour. The tender required that the sampling be in accordance with the Dumping at Sea Permit issued by the Environmental Protection Agency (EPA) as registered number S0011-03 dated 6th July 2018. This permit covers an 8 year period from 2018-2026 with specified testing of seabed sediments. The Permit is for:

> *"….the dumping at sea of dredged material arising from maintenance dredging at Buncrana Harbour by Donegal County Council over an eight-year timeframe. Under this permit a maximum of 8,000 tonnes of dredged material may be dumped at sea by plough dredging annually, up to a maximum of 64,000 tonnes. The material consists of clean sand which has recently deposited in the berthing area on the south face of Buncrana Pier and the approach channel to the harbour. This material shall be dredged out to a large area of deep channel located beyond the -2mCD contour. The permit holder is required to manage the permitted activity to ensure the protection of the marine environment and to submit reports on the dumping activity and monitoring results to the Agency".*

2 Dumping at Sea Permit Requirements

The EPA Dumping at Sea Permit S0011-03 issued to Donegal County Council specifies requirements for control and monitoring of sediment chemistry and grain size analysis at condition 4.5 as follows:

> 4.5 Sediment chemistry and grain size analysis
>
> 4.5.1 The permit holder shall carry out chemical and granulometric analysis of sediments within the Plough Dredging Sites in 2021 and 2024 in accordance with *Schedule C.2: Sediment Monitoring*, of this permit. A report on this analysis shall be submitted to the Agency within 1 month of completion of the analysis.
>
> 4.5.2 Following submission of the results of the monitoring specified in Condition 4.5.1, plough dredging may not proceed without the agreement of the Agency.

Schedule C.2 of the same permit is referenced at condition 4.5.1 and is as follows:

C.2 Sediment Monitoring

Parameters	Monitoring Frequency/Time	Monitoring Locations	Analysis Method/Technique
Visual inspection (to include colour, texture, odour, presence of animals etc.)	• 2021 • 2024	Dumping Site	Grab sampling of surface sediments and analysis by Standard Method Note 2
Water content & sediment density	• 2021 • 2024	Dumping Site	
Sediment grain size: Note 1 % gravel (> 2mm fraction) % sand (< 2mm fraction) % mud/silt (< 63µm fraction)	• 2021 • 2024	Dumping Site	
Total organic carbon; Carbonate; Mercury; Arsenic; Cadmium; Copper; Lead; Zinc; Chromium; Nickel; Lithium; Aluminium; TBT; DBT; HCB; γ-HCH (Lindane); Total extractable hydrocarbons;	• 2021 • 2024	Dumping Site	
Individual congeners of PCB 28, 52, 101, 118, 138, 153, 180; Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenzo(ah)anthracene, Benzo(ghi)perylene, Indeno(123-cd)pyrene.			

Note 1: Monitoring of granulometry shall include but not be limited to the following fractions: >2 mm, <2 mm, >63 µm and <63 µm.

Note 2: Sampling and analyses shall be conducted in accordance with the analytical and quality requirements set out in: M. Cronin et al. 2006. Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters. Marine Environment & Health Series, No. 24. Marine Institute.

3 Location of Dumping Site

This report covers the seabed sampling on 25th May 2021 and subsequent test results in compliance with the requirements of Schedule C.2

The location of the monitoring stations were required to be within the Dumping Site as defined by Schedule A.2 as per extract below.

A.2 Location of Dumping Site

Dumping Site:

	Latitude	Longitude
(a)	55°07.502	7°27.698
(b)	55°07.359	7°28.044
(c)	55°07.501	7°28.202
(d)	55°07.692	7°28.262
(e)	55°07.739	7°27.828

These 5 locations were plotted on Google Earth and the boundary below was identified.

4 Seabed sampling 25th May 2021

The number of sampling sites was assessed as 3 to be in compliance with OSPAR guidelines for management of dredged material as well as in compliance with the "Guidelines for the assessment of dredge material for disposal in Irish waters", April 2006, M.Cronin et al. An extract from the Marine Institute guide as follows:

2.1 Sampling protocol

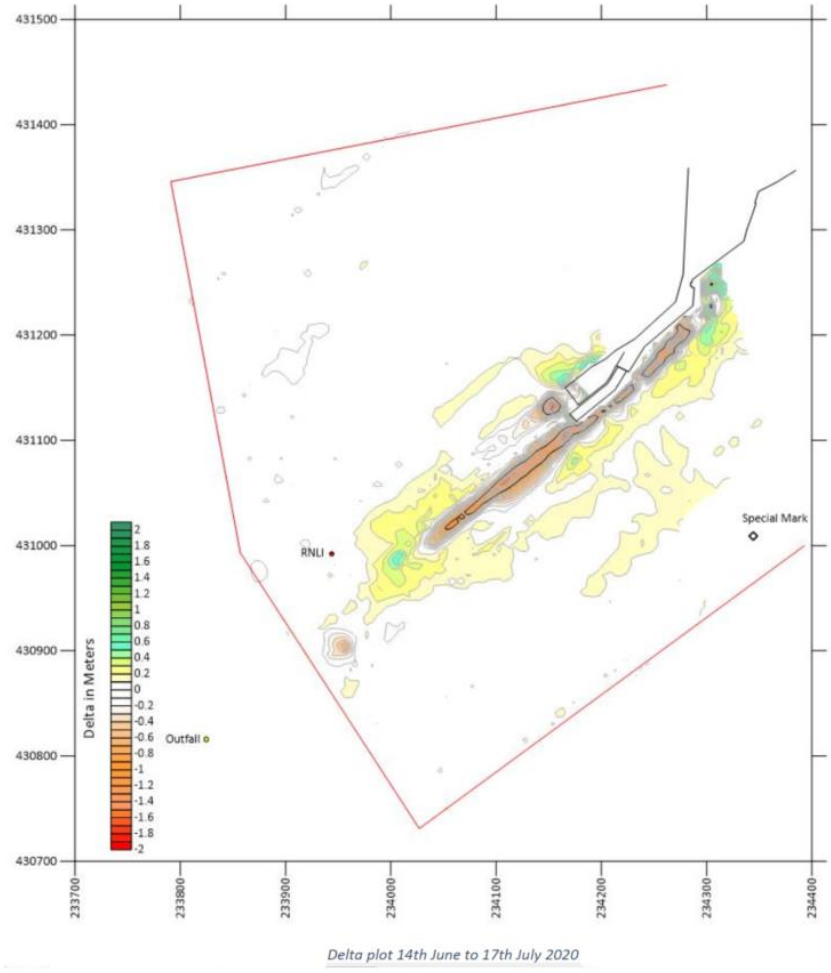
Samples are to be taken under the direction of the analysing laboratory at locations selected by MI. Numbers of samples will at least meet the OSPAR guidelines for management of dredged material, which recommends the following:

Volume to be dredged (m^3)	No. of samples
Up to 25 000	3
25 000 – 100 000	4 - 6
100 000 - 500 000	7 - 15
500 000 - 2 000 000	16 - 30
>2 000 000	Extra 10 per million m^3

The requisite 3 samples were chosen based on the stated dredged volume of <25,000m^3 annually (or <25,000m^3 in the 3 years between sampling in this case).

It was an obvious requirement that the location of the 3 sites should be chosen to be representative of the material being ploughed. A survey of the ploughed areas from the previous year was assessed to determine the extent of works and where deposited material would be most representative.

The extract below was taken from a report by Inishowen Technologies Ltd as it shows the differences in measured depths between the pre-dredge survey of 14th June 2020 and the post-dredge survey of 17th July 2020. The channel alignment is clearly visible where the ploughing has moved and removed material along the southern side of the pier & approach channel and has pulled it typically both seawards in a south-westerly direction as well as dispersing it outwards towards the sides of the channel. The yellow colours highlight where depths have increased slightly in the pre to post-dredge comparison. However, it was noted that ploughing tends to leave a trail of sediment along both sides as the plough moves forwards and thus even the (brown coloured) material within the approach channel is also considered to be representative of the general material ploughed and deposited under the Dumping at Sea permit.

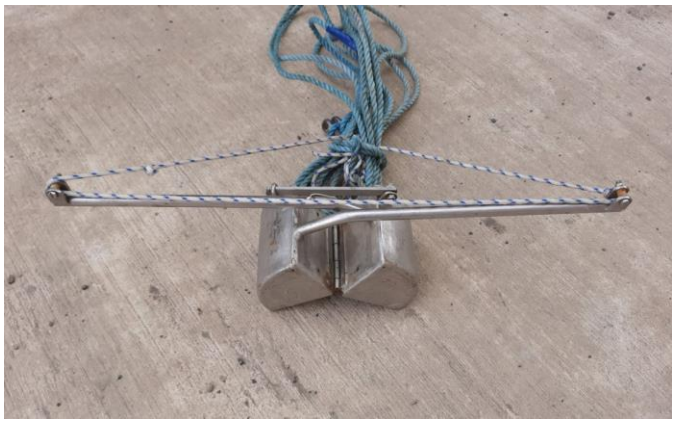


Delta plot 14th June to 17th July 2020

The 3 locations chosen were thus as indicated below and marked with suffix labels 001, 002, 003.

5 Sampling method

The samples were gathered by means of a Van Veen grab from an inflatable rib, kindly provided by the local RNLI. The grab is as shown below. It was operated by being lowered to the seabed in an open position (as per left photo) and once contact was made with the seabed, the temporary latch automatically releases allowing the sides of the grab to be closed together when the rope pulls upwards (as per right photo). The grab's mating faces overlap slightly when closed so that fine sediment, sand and water are trapped within. The grab was hoisted into the boat, tipped into a waiting bucket and the grabbing repeated several times until sufficient material was captured to allow filling of the 3 sample jars for each location.



The samples were labelled and surrounded with frozen ice packs for the immediate journey back from site on 25th May 2021. They were stored in a freezer overnight and whilst frozen, repacked into an insulated cool-box and couriered to the testing lab on the following day (26th May 2021).

6 Sample locations

The co-ordinates of the 3 sample stations were recorded by GPS and are as follows:

Sample Location	Latitude	Longitude
001	55° 07' 30.065" N	7° 27' 59.479" W
002	55° 07' 33.110" N	7° 27' 55.160" W
003	55° 07' 35.272" N	7° 27' 51.080" W

7 Results

The samples were tested by SOCOTEC

Marine Department, Special Chemistry,
Etwall House,
Bretby Business Park,
Ashby Road,
Bretby,
Burton-upon-Trent
DE15 0YZ

The results of the chemical testing are tabulated in a spreadsheet in Appendix A to allow easy comparison against the proposed guidance values for sediment quality taken from the "Guidelines for the assessment of dredge material for disposal in Irish waters", April 2006, M.Cronin et al.

A full record of the laboratory test results including granulometry are included in Appendix B.

Appendix A

Tabulated comparison of chemistry results against guidelines values (1 page)

GDG
GAVIN & DOHERTY
GEOSOLUTIONS

Seabed sediment sampling - Contamination Test Results						
				Buncrana Harbour		
Testing Lab Sample ID				MAR01011.001	MAR01011.002	MAR01011.003
Donegal Co Co Ref:		S0011-03_Buncrana_Harbour_May21-....		001	002	003
Sample Date				25/05/21	25/05/21	25/05/21
	Units (dry wt)	Guidelines for the assessment of dredge material for disposal in Irish waters, April 2006, M.Cronin et al.				
		Lower Level	**Upper Level**			
Metals						
Arsenic	mg/kg	9	70	6.6	< 1.0	< 1.0
Cadmium	mg/kg	0.7	4.2	0.2	< 0.1	0.2
Chromium	mg/kg	120	370	6.70	4.20	7.00
Copper	mg/kg	40	110	5.3	3.1	40.1
Lead	mg/kg	60	218	3.7	3.4	23.1
Mercury	mg/kg	0.2	0.7	0.01	< 0.01	< 0.01
Nickel	mg/kg	21	60	5.6	4.0	6.0
Zinc	mg/kg	160	410	23	15.7	192
Aluminium	mg/kg			13,400	11,800	16,100
Lithium	mg/kg			6.4	6.7	7.3
Manganese	mg/kg					
Organotins						
Dibutyltin (DBT)	ug/kg	100	500	< 5	< 5	< 5
Tributyltin (TBT)	ug/kg			< 5	< 5	<5
Polycyclic Aromatic Hydrocarbons (PAH16)						
Acenaphthene	ug/kg			< 1	< 1	< 1
Acenaphthylene	ug/kg			< 1	< 1	< 1
Anthracene	ug/kg			1.15	< 1	< 1
Benzo[a]anthracene	ug/kg			7.20	< 1	< 1
Benzo[a]pyrene	ug/kg			7.18	< 1	< 1
Benzo[b]fluoranthene	ug/kg			7.72	< 1	1.74
Benzo[ghi]perylene	ug/kg			5.69	< 1	1.45
Benzo[k]fluoranthene	ug/kg			4.26	< 1	< 1
Chrysene	ug/kg			7.01	< 1	1.22
Dibenzo [a,h] anthracene	ug/kg			1.08	< 1	< 1
Fluoranthene	ug/kg			7.64	< 1	1.78
Fluorene	ug/kg			< 1	< 1	< 1
Indeno [1,2,3–cd] pyrene	ug/kg			5.37	< 1	1.46
Naphthalene	ug/kg			1.27	< 1	< 1
Phenanthrene	ug/kg			3.35	< 1	1.72
Pyrene	ug/kg			8.14	< 1	1.59
PAH 16 Total	ug/kg	4,000	-	< 70.06	< 16	< 19.96
Total Hydrocarbon Content (THC)						
Total extractable hydrocarbons	ug/kg	1,000,000	-	15,600	5,850	10,500
Organochlorine pesticides (OCP)						
alpha-Hexachlorcyclohexane (α-HCH)	ug/kg			< 0.1	< 0.1	< 0.1
beta-Hexachlorcyclohexane (β-HCH)	ug/kg			< 0.1	< 0.1	< 0.1
gamma-Hexachlorcyclohexane (γ-HCH)	ug/kg	0.3	1	< 0.1	< 0.1	< 0.1
Dieldrin	ug/kg			< 0.1	< 0.1	< 0.1
Hexachlorobenzene (HCB)	ug/kg	0.3	1	< 0.1	< 0.1	< 0.1
p,p'-Dichorodiphenyldichloroethylene (DDE)	ug/kg			< 0.1	< 0.1	< 0.1
p,p'-Dichorodiphenyltrichloroethane (DDT)	ug/kg			< 0.1	< 0.1	< 0.1
p,p'-Dichorodiphenyldichloroethane (DDD)	ug/kg			< 0.1	< 0.1	< 0.1
Polychlorinated biphenyls (PCB)						
PCB28	ug/kg	1	180	0.04	< 0.08	< 0.08
PCB52	ug/kg	1	180	0.03	< 0.08	< 0.08
PCB101	ug/kg	1	180	0.01	< 0.08	< 0.08
PCB118	ug/kg	1	180	< 0.08	< 0.08	< 0.08
PCB138	ug/kg	1	180	< 0.08	< 0.08	< 0.08
PCB153	ug/kg	1	180	< 0.08	< 0.08	< 0.08
PCB180	ug/kg	1	180	< 0.08	< 0.08	< 0.08
PCB (Σ ICES 7)	ug/kg	7	1260	< 0.40	< 0.56	< 0.56

Key

- Below Lower Level
- Between Lower and Upper Levels
- Above Upper Level
- No guidance value

Appendix B

Laboratory test results (14 pages)

Certificate of Analysis

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

Test Report ID	**MAR01011**
Issue Version	1
Customer	Gavin & Doherty Geosolutions, Scottish Provident Building, 7 Donegall Square West, Belfast, BT1 6JH
Customer Reference	Buncrana Harbour Marine Institute Analysis
Date Sampled	25-May-21
Date Received	28-May-21
Date Reported	29-Jun-21
Condition of samples	Ambient Satisfactory

Authorised by:	Marya Hubbard
Position:	Laboratory Manager

Any additional opinions or interpretations found in this report, are outside the scope of UKAS accreditation.

Certificate of Analysis

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

Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		Method No	SOCOTEC Doncaster*
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Visual Description**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	Brown SAND
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	Light brown slightly gravelly SAND
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	Brown slightly gravelly SAND

* See Report Notes

Certificate of Analysis

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

Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		Units	%	%	%	%	%	Mg/m3
		Method No	ASC/SOP/303	ASC/SOP/303	SUB_01*	SUB_01*	SUB_01*	SOCOTEC Doncaster*
		Limit of Detection	0.2	0.2	N/A	N/A	N/A	N/A
		Accreditation	UKAS	UKAS	N	N	N	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Total Moisture @ 120°C**	**Total Solids**	**Gravel (>2mm)**	**Sand (63-2000 µm)**	**Silt (<63 µm)**	**Particle Density**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	33.8	66.2	0.0	87.3	12.7	2.68
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	32.1	67.9	0.4	96.5	3.1	2.73
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	34.2	65.8	4.7	82.3	13.0	2.68
		Reference Material (% Recovery)	NA	NA	NA	NA	NA	NA
		QC Blank	NA	NA	NA	NA	NA	NA

* See Report Notes

Certificate of Analysis

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Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		Units	% M/M	% M/M
		Method No	SOCOTEC Env Chem*	SOCOTEC Env Chem*
		Limit of Detection	0.02	0.12
		Accreditation	UKAS	No
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**TOC**	**Carbonate Equivalent (%CO3)**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	0.36	16.6
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	0.19	14.6
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	0.32	10.8
		Reference Material (% Recovery)	100	99
		QC Blank	<0.02	<0.12

* See Report Notes

Certificate of Analysis

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Test Report ID MAR01011
Issue Version 1
Customer Reference Buncrana Harbour Marine Institute Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	SOCOTEC Env Chem*	SOCOTEC Env Chem*	SOCOTEC Env Chem*	SOCOTEC Env Chem*	SOCOTEC Env Chem*	SOCOTEC Env Chem*	SOCOTEC Env Chem*
		Limit of Detection	1	0.1	0.5	2	2	0.5	3
		Accreditation	UKAS	No	No	UKAS	UKAS	No	No
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Arsenic as As**	**Cadmium as Cd**	**Total Chromium as Cr**	**Copper as Cu**	**Lead as Pb**	**Nickel as Ni**	**Zinc as Zn**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	6.6	0.2	6.7	5.3	3.7	5.6	23.0
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<1.0	<0.1	4.2	3.1	3.4	4.0	15.7
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	<1.0	0.2	7.0	40.1	23.1	6.0	192
Certified Reference Material 2702 (Measured Value)			48.01	2.92	296.75	88.89	116.59	64.31	444.1
Certified Reference Material 2702 (Certified Value)			45.3	0.817	352	117.7	132.8	75.4	485.3
Certified Reference Material 2702 (% Recovery)			121	99	102	101	97	100	101
QC Blank			<1	<0.1	<0.5	<2	<2	<0.5	<3

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

Certificate of Analysis

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Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		Units	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)	mg/Kg (Dry Weight)
		Method No	SOCOTEC Env Chem*	SOCOTEC Env Chem*	SOCOTEC Env Chem*
		Limit of Detection	0.01	10	0.5
		Accreditation	No	UKAS	No
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**Mercury as Hg**	**Aluminium as Al**	**Lithium as Li**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	0.01	13400	6.4
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<0.01	11800	6.7
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	<0.01	16100	7.3
Certified Reference Material 2702 (Measured Value)			0.25	78108	73.96
Certified Reference Material 2702 (Certified Value)			0.4474	84100	78.2
Certified Reference Material 2702 (% Recovery)			105~	96	104
QC Blank			<0.01	<10	<0.5

* See Report Notes

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Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		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)**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	<5	<5
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<5	<5
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	<5	<5
Certified Reference Material BCR-646 (Measured Value)			726	355
Certified Reference Material BCR-646 (Certified Value)			770	480
Certified Reference Material BCR-646 (% Recovery)			94	74
QC Blank			<1	<1

* See Report Notes

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Test Report ID MAR01011
Issue Version 1
Customer Reference Buncrana Harbour Marine Institute Analysis

		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**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	<1	<1	1.15	7.20	7.18	7.72
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<1	<1	<1	<1	<1	<1
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	<1	<1	<1	<1	<1	1.74
Certified Reference Material QPH099MS (Measured Value)			3.64	2.79	3.64	26.1	36.0	49.6
Certified Reference Material QPH099MS (Certified Value)			3.83	3.51	7.98	25.2	33.7	35.0
Certified Reference Material QPH099MS (% Recovery)			105	126	105	97	94	71
QC Blank			<1	<1	<1	<1	<1	<1

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

Certificate of Analysis

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Test Report ID MAR01011
Issue Version 1
Customer Reference Buncrana Harbour Marine Institute Analysis

		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**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	5.69	4.26	7.01	1.08	7.64	<1
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<1	<1	<1	<1	<1	<1
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	1.45	<1	1.22	<1	1.78	<1
Certified Reference Material QPH099MS (Measured Value)			39.9	21.4	38.0	7.86	51.6	6.27
Certified Reference Material QPH099MS (Certified Value)			40.7	23.0	35.6	6.19	48.9	6.69
Certified Reference Material QPH099MS (% Recovery)			102	107	94	79	95	107
QC Blank			<1	<1	<1	<1	<1	<1

For full analyte name see method summaries
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Test Report ID MAR01011
Issue Version 1
Customer Reference Buncrana Harbour Marine Institute Analysis

		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	N*	UKAS	N
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**INDPYR**	**NAPTH**	**PHENANT**	**PYRENE**	**THC**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	5.37	1.27	3.35	8.14	15600
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<1	<1	<1	<1	5850
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	1.46	<1	1.72	1.59	10500
Certified Reference Material QPH099MS (Measured Value)			38.6	17.0	42.8	47.9	NA
Certified Reference Material QPH099MS (Certified Value)			17.8	17.0	52.4	50.6	NA
Certified Reference Material QPH099MS (% Recovery)			89	100	122	106	97~
QC Blank			<1	<1	<1	<1	<1

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

Certificate of Analysis

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

Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		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**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	0.04	0.03	0.01	<0.08	<0.08	<0.08	<0.08
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Certified Reference Material QOR142 MS (Measured Value)			0.19	0.96	1.50	1.08	1.15	1.35	0.44
Certified Reference Material QOR142 MS (Certified Value)			0.22	0.98	1.55	1.10	1.23	1.39	0.76
Certified Reference Material QOR142 MS (% Recovery)			87	98	97	99	94	97	58
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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Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

		Units	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)	µg/Kg (Dry Weight)
		Method No	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302	ASC/SOP/302
		Limit of Detection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		Accreditation	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS	UKAS
Client Reference:	**SOCOTEC Ref:**	**Matrix**	**AHCH**	**BHCH**	**GHCH**	**DIELDRIN**	**HCB**	**DDE**	**DDT**	**DDD**
S0011-03_Buncrana_Harbour_May21-001	MAR01011.001	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
S0011-03_Buncrana_Harbour_May21-002	MAR01011.002	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
S0011-03_Buncrana_Harbour_May21-003	MAR01011.003	Sediment	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Certified Reference Material QOR142 MS (Measured Value)			NA	NA	NA	NA	0.17	0.30	0.09	0.43
Certified Reference Material QOR142 MS (Certified Value)			NA	NA	NA	NA	0.15	0.31	0.17	0.48
Certified Reference Material QOR142 MS (% Recovery)			105~	89~	92~	99~	109	95	57	90
QC Blank			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

For full analyte name see method summaries

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

Certificate of Analysis

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

Test Report ID MAR01011
Issue Version 1
Customer Reference Buncrana Harbour Marine Institute Analysis

REPORT NOTES

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
SOCOTEC Env Chem*	MAR01011.001-003	Analysis was conducted by an internal SOCOTEC laboratory. UKAS accredited analysis by this laboratory is under UKAS number 1252.
SOCOTEC Doncaster*	MAR01011.001-003	Analysis was conducted by an internal SOCOTEC laboratory.
SUB_01*	MAR01011.001-003	Analysis was conducted by an approved subcontracted laboratory.
ASC/SOP/301	MAR01011.001-003	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	MAR01011.001-003	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. The remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected.However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (PHENANT). These circumstances should be taken into consideration when utilising the data.
ASC/SOP/303/304	MAR01011.001, 003	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	Handling Time Exceeded	N/A	N/A
D3	Sample Contaminated through Damaged Packaging	N/A	N/A
D4	Sample Contaminated through Sampling	N/A	N/A
D5	Inappropriate Container/Packaging	N/A	N/A
D6	Damaged in Transit	N/A	N/A
D7	Insufficient Quantity of Sample	N/A	N/A
D8	Inappropriate Headspace	N/A	N/A
D9	Retained at Incorrect Temperature	N/A	N/A
D10	Lack of Date & Time of Sampling	N/A	N/A
D11	Insufficient Sample Details	N/A	N/A
D12	Sample integrity compromised or not suitable for analysis	N/A	N/A

Certificate of Analysis

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Test Report ID	MAR01011
Issue Version	1
Customer Reference	Buncrana Harbour Marine Institute Analysis

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 seived to <2mm	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Carbonate	Air dried and seived to <2mm	Quantitative digestion with Hydrochloric Acid back titration with 1M Sodium Hydroxide to pH 7
Metals	Air dried and seived to <2mm	HF/Boric extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Total Hydrocarbon Content (THC)	Wet Sediment	Solvent extraction and clean up followed by GC-FID analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.

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'-Dichorodiphenyldichloroethane
BENZGHIP	Benzo[ghi]perylene	NAPTH	Naphthalene	DDE	p,p'-Dichorodiphenyldicloroethylene
BKF	Benzo[k]fluoranthene	PERYLENE	Perylene	DDT	p,p'-Dichorodiphenyltrichloroethane
C1N	C1-naphthalenes	PHENANT	Phenanthrene		
C1PHEN	C1-phenanthrene	PYRENE	Pyrene		