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MRV *Sir John Murray*

Survey 0119SJM

PROGRAMME

11-19 November 2019

Ports

Loading: Troon, 08 November 2019

Sailing: Troon, 11 November 2019

Scientific crew change over: Troon or Greenock, 14 November (TBC)

Unloading: Troon, 19 November 2019

In setting the survey programme and specific objectives, etc. the Scientist-in-Charge needs to be aware of the restrictions on working hours and the need to build in adequate rest days and rest breaks as set out in Marine Scotland's Working Time Policy (Lab Notice 34/03). In addition, the Scientist-in-Charge must formally review the risk assessments for the survey with staff on-board before work is commenced.

In the interest of efficient data management it is now mandatory to return the Survey Report, to I. Gibb and the Survey Summary Report (old ROSCOP form) to M. Geldart, within four weeks of a survey ending. In the case of the Survey Summary Report a nil return is required, if appropriate.

Sampling Gear

SEPA - 2 m beam trawl with 50 mm cod-end

SEPA - Demersal trawl with 50 mm cod-end

SEPA - Day grab and table

MSS - Catamaran and neuston net

MSS - Nisken water bottle

Objectives

1. To undertake flatfish, sediment and water sampling in the Clyde and Solway in support of the Clean Seas Environment Monitoring Programme (OSPAR and MSFD D8).
2. To undertake fish sample preparation for subsequent eco-toxicological analyses (biological effects).
3. To undertake survey of seabed litter and sea-surface litter in the Firth of Clyde and Solway Firth (MSFD D10).
4. To undertake fish, shellfish, water and sediment sampling in support of the microplastics ROAME (ST014).

Estimated Days per Project: 7 days ST04a (CSEMP, OSPAR and MSFD D8); 1 days ST04c (MSFD D10), 1 day ST014

Procedure

Scientific gear will be loaded on to the *Sir John Murray* in Troon on 08 November. Scientific crew will board the vessel and sail on Monday 11 November after all relevant safety drills have been completed.

Sediment sampling will be carried out in three water bodies in the Firth of Clyde and one in

the Solway Firth (Table 1 and Figure 1). At each water body, there are five or six locations for sampling. At each location two surface (0-2 cm) sediment samples will be collected by Day grab, one for contaminant analysis and one for microplastic analysis.

Water sampling will take place at each of the six fishing sites (Table 2, Figure 2) before fishing has commenced. The ship's sea water pump will be used to collect the water samples. At the first two stations, Nisken bottle water sampling will be taken in addition for data comparison. Water samples will be taken for nutrients and salinity. It is important that nutrient samples are not contaminated with fish and, therefore, require separate freezer (MSS will provide freezer). A single ten litre water sample will also be taken from the inner firth for RGU.

Flatfish (dab, plaice or flounder) will be collected for determination of disease status, contaminant concentrations and contaminant-induced biological effects from the Solway, Bowling, Holy Loch, Hunterston, Garroch Head and Pladda fishing stations (Table 2 and Figure 2). Fish sample preparation for subsequent analysis will also take place on board (Table 3). In addition, extra samples will be taken for preparation of EROD laboratory reference material. Bycatch (Nephrops, crabs, whiting and haddock) from the fishing trawls will be sampled adventitiously for determination of microplastics in gill and stomach contents. Benthic macrolitter collected during trawling will also be identified, quantified and recorded.

The catamaran neuston net will be towed at five knots in order to survey and sample sea-surface litter from various locations (see Table 4). Priority areas for sampling include Loch Long and the Solway. If time allows, microplastic analysis may be carried out on board.

There will be a change of two scientific staff midway through the survey, port and time TBC.

On completion of the survey, passage will be made to Troon where MSS scientific gear and staff will be unloaded on 19 November 2019.

Rest Day Provision

Rest days are allocated for survey in compliance with SG WTD guidelines.

General Arrangements

Liquid nitrogen, formalin and methanol will be carried for the preservation and storage of biological materials.

Normal contacts will be maintained with the Laboratory.

Submitted:
H Anderson
18 October 2019

Approved:
I Gibb
06 November 2019

Table 1: Intended sediment sampling locations.

Region	Area	Site	Lat	Long	Lat	Long
Clyde	Inner Firth of Clyde	Off Cloch Point	55.948	-4.894	55 56.88N	004 53.64W
Clyde	Inner Firth of Clyde	East of Strone Point	55.984	-4.881	55 59.04N	004 52.86W
Clyde	Inner Firth of Clyde	Lunderston Bay	55.923	-4.911	55 55.38N	004 54.66W
Clyde	Inner Firth of Clyde	Weymss Point	55.897	-4.926	55 53.82N	004 55.56W
Clyde	Inner Firth of Clyde	E of Toward (UIFM 2)	55.868	-4.945	55 52.08N	004 56.70W
Clyde	Inner Firth of Clyde	Holy Loch - FRS	55.971	-4.892	55 58.26N	004 53.52W
Clyde	Largs Channel	Hunterston - FRS	55.764	-4.885	55 45.84N	004 53.10W
Clyde	Largs Channel	Hunterston2	55.777	-4.890	55 46.62N	004 53.40W
Clyde	Largs Channel	Hunterston3	55.786	-4.891	55 47.16N	004 53.46W
Clyde	Largs Channel	Hunterston4	55.792	-4.889	55 47.52N	004 53.34W
Clyde	Largs Channel	Hunterston5	55.741	-4.904	55 44.46N	004 54.24W
Clyde	Middle Offshore	East of Brodick	55.586	-4.955	55 35.16N	004 57.30W
Clyde	Middle Offshore	Middle Offshore South	55.434	-4.968	55 26.04N	004 58.08W
Clyde	Middle Offshore	Middle Offshore	55.506	-4.899	55 30.36N	004 53.94W
Clyde	Middle Offshore	5 km SW of Lady Isle	55.508	-4.814	55 30.48N	004 48.84W
Clyde	Middle Offshore	7 km off Whiting Bay	55.477	-4.988	55 28.62N	004 59.28W
Clyde	Middle Offshore	Garroch Head - FRS	55.660	-4.986	55 39.60N	004 59.16W
Solway	Solway	Solway Firth @ NMMP25	54.750	-4.000	54 45.00N	003 60.00W
Solway	Solway	Solway Firth BP1	54.767	-3.835	54 46.02N	003 50.10W
Solway	Solway	Solway Firth BP2	54.757	-3.863	54 45.42N	003 51.78W
Solway	Solway	Solway Firth BP3	54.750	-3.916	54 45.00N	003 54.96W
Solway	Solway	Solway Firth BP4	54.727	-3.960	54 43.62N	003 57.60W

Figure 1: Location of intended sediment sampling locations

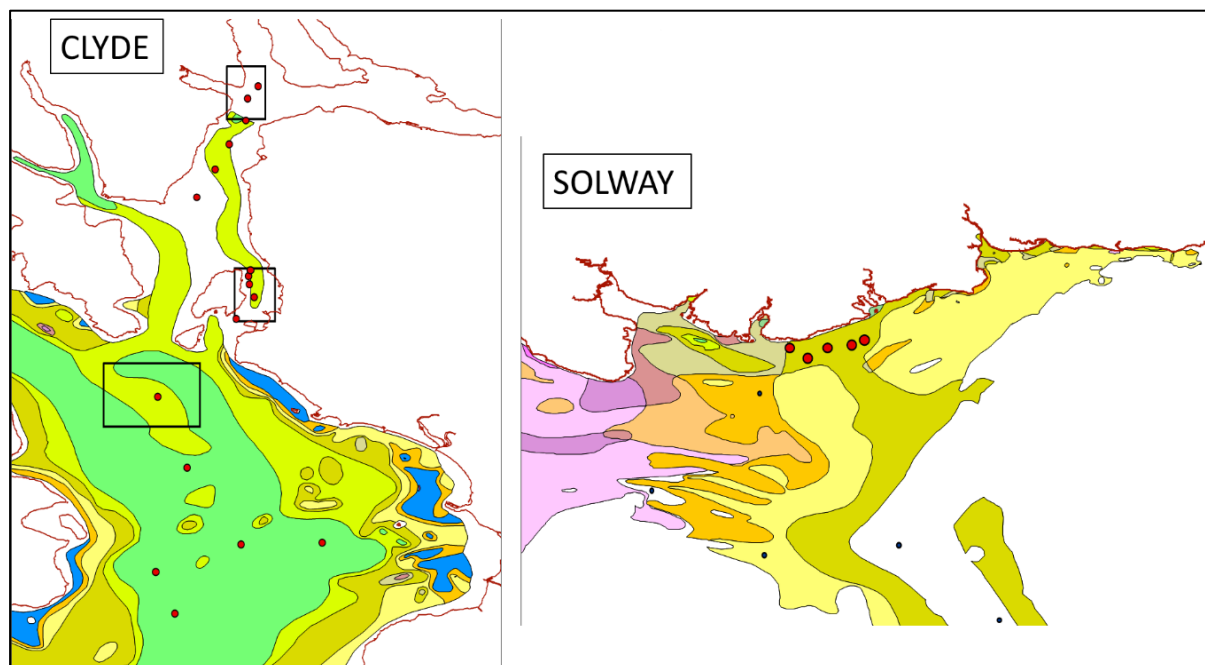


Table 2: Intended fishing locations and fish requirements.

Region - Area	Site	Lat Long	Lat Long (DMS)	Species	No.
Solway - Solway	Solway Firth	54.750 -4.000	54 45.00N 003 60.00W	Dab	50 ²
Clyde - Outer estuary	Bowling	55.925 -4.480	55 55.50N 004 28.80W	Flounder	50 ^{1,2}
Clyde - Inner Firth	Holy Loch	55.971 -4.892	55 58.26N 004 53.52W	Dab	50 ²
Clyde - Largs Channel	Hunterston	55.764 -4.885	55 45.84N 004 53.10W	Plaice	20
Clyde - Middle Offshore	Garroch Head	55.660 -4.986	55 39.60N 004 59.16W	Plaice	25 ¹
Clyde - Outer Offshore	Pladda	55.420 -5.215	55 25.20N 005 12.90W	Dab	50 ¹

¹ If additional males are caught at Bowling, Garroch Head or Pladda, take extra EROD for LRM.

² Additional samples for RGU will be collected from Solway Firth, Bowling and Holy Loch.

Figure 2: Location of intended fishing locations in the Clyde.

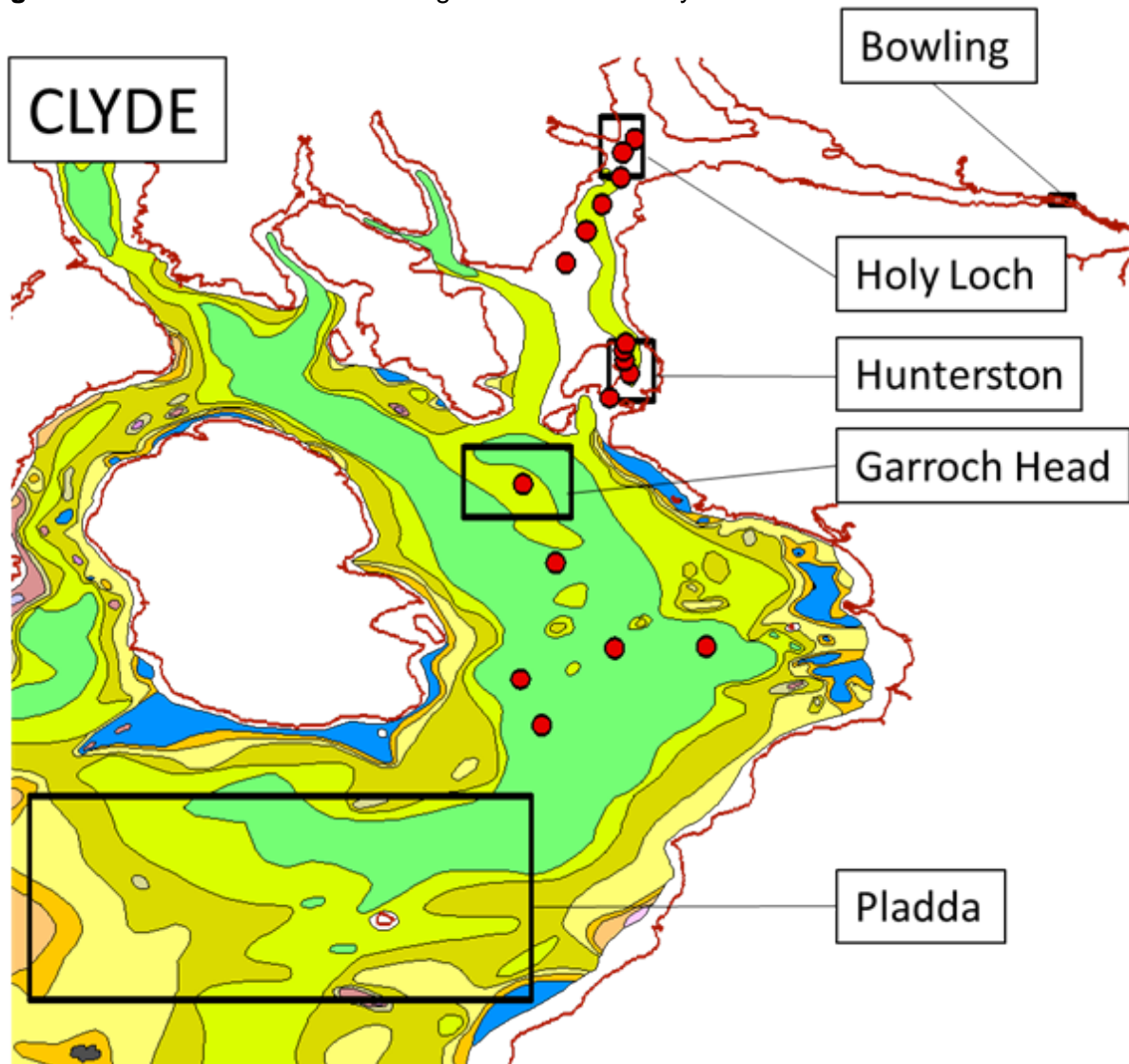


Table 3: Fish sample preparation requirements.

Full sampling details in SOP 0820 and SOP 0830.

At Hunterston site, only chemistry samples are taken. There is no time series here for biological effects, only contaminants.

	Flounder	Dab	Plaice
Total number of fish required	50	50	25
Size range of fish required	20 – 35 cm	20 – 30 cm	20 – 30 cm
Disease	50	50	N/A
Blood	25	25	25
Gills (microplastics)	5	5	5
Bile	25	25	25
Liver (S9 fraction EROD)	15 MALES	15 MALES	15 MALES
Liver (histology)	50	50	N/A
Liver (metals) (~ 2g)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Liver (chemistry) (> 4g)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Liver (RGU)	10	10	NA
Gut (Microplastics)	25	25	25
Gonad (histology)	All MALES only	All MALES only	N/A
Otolith	50	50	N/A
White muscle*	N/A	25	N/A
Flesh (metals) (> 10g)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Flesh (chemistry) (> 30g)	25 (5 pools)	25 (5 pools)	25 (5 pools)
Flesh (RGU)#	10	10	NA

*Muscle sampling new for 2019 - a sample of white muscle should be taken as soon as possible, care being taken to avoid contamination of the tissue by excess blood or bile, and placed in a labelled cryovial and snap frozen.

An additional 10 fish are required from Solway Firth, Bowling and Holy Loch only for RGU.

Table 4: Possible catamaran neuston trawl locations with priority areas. Further details in attached map. Cat tows are at 5 kn for 30 min unless otherwise stated.

Region	Details	Priority
Solway	3 tows around fishing / sediment sites 1 tow en route (if possible)	Priority
Loch Long	3 tows right at the top (15 min) 1 near Ardentinnny 1 at mouth of Loch Long	Priority
Holy Loch	1 tow	
Gare Loch	1 tow	
Bowling	1 tow	
Inner Clyde	3 tows	
Mid – Outer Clyde	3 tows	

Table 5: Latitude and longitude limits for sediment and fishing sites (extracted from Station dictionary Oct 2017) (decimal)

Matrix	Region	Area	Site	Station dictionary	Nominal Station Latitude	Nominal Station Longitude	Longitude East Limit	Longitude West Limit	Latitude North Limit	Latitude South Limit
SE	Clyde	Inner Firth of Clyde	Off Cloch Point	Clyde_FirthCInnerDunoon_se01	55.948	-4.894	-4.8139	-4.9745	55.9924	55.9026
SE	Clyde	Inner Firth of Clyde	East of Strone Point	Clyde_FirthCInnerDunoon_se02	55.984	-4.881	-4.8491	-4.9134	56.002	55.966
SE	Clyde	Inner Firth of Clyde	Lunderston Bay	Clyde_FirthCInnerDunoon_se03	55.923	-4.911	-4.8788	-4.943	55.9413	55.9054
SE	Clyde	Inner Firth of Clyde	Weymss Point	Clyde_FirthCInnerDunoon_se04	55.897	-4.926	-4.8941	-4.9582	55.9145	55.8786
SE	Clyde	Inner Firth of Clyde	E of Toward (UIFM 2)	Clyde_FirthCInnerDunoon_se05	55.868	-4.945	-4.9128	-4.977	55.8859	55.8499
SE	Clyde	Inner Firth of Clyde	Holy Loch - FRS	Clyde_FirthCInnerDunoon_se06	55.971	-4.892	-4.874	-4.914	56.005	55.95
SE	Clyde	Middle Offshore	East of Brodick	Clyde_FirthCMiddleOffshor_se01	55.586	-4.955	-4.9234	-4.987	55.6042	55.5682
SE	Clyde	Middle Offshore	Middle Offshore South	Clyde_FirthCMiddleOffshor_se02	55.434	-4.968	-4.9367	-5.0001	55.452	55.416
SE	Clyde	Middle Offshore	Middle Offshore	Clyde_FirthCMiddleOffshor_se03	55.506	-4.899	-4.8673	-4.9309	55.5242	55.4882
SE	Clyde	Middle Offshore	5 km SW of Lady Isle	Clyde_FirthCMiddleOffshor_se04	55.508	-4.814	-4.7819	-4.8455	55.5257	55.4897
SE	Clyde	Middle Offshore	7 km off Whiting Bay	Clyde_FirthCMiddleOffshor_se05	55.477	-4.988	-4.956	-5.0194	55.4946	55.4586
SE	Clyde	Middle Offshore	Garroch Head - FRS	Clyde_FirthCMiddleOffshor_se06	55.660	-4.986	-4.942	-5.043	55.695	55.629
SE	Clyde	Largs Channel	Hunterston - FRS	Clyde_LargsChannel_se01	55.764	-4.885	-4.864	-4.906	55.794	55.739
SE	Clyde	Largs Channel	Hunterston2	Clyde_LargsChannel_se02	55.777	-4.890	-4.8840	-4.8940	55.7860	55.7730
SE	Clyde	Largs Channel	Hunterston3	Clyde_LargsChannel_se03	55.786	-4.891	-4.8860	-4.8960	55.7900	55.7840
SE	Clyde	Largs Channel	Hunterston4	Clyde_LargsChannel_se04	55.792	-4.889	-4.8850	-4.8970	55.7960	55.7880
SE	Clyde	Largs Channel	Hunterston5	Clyde_LargsChannel_se05	55.741	-4.904	-4.8990	-4.9090	55.7450	55.7350
SE	Solway	Solway	Solway Firth @ NMMP25	IrishSea_BalcaryPoint_se01	54.750	-4.000	-3.9688	-4.0312	54.768	54.732
SE	Solway	Solway	Solway Firth BP1	IrishSea_BalcaryPoint_se06	54.767	-3.835	-3.8260	-3.8480	54.7750	54.7600
SE	Solway	Solway	Solway Firth BP2	IrishSea_BalcaryPoint_se07	54.757	-3.863	-3.8500	-3.8780	54.7740	54.7550
SE	Solway	Solway	Solway Firth BP3	IrishSea_BalcaryPoint_se08	54.750	-3.916	-3.9050	-3.9270	54.7580	54.7430
SE	Solway	Solway	Solway Firth BP4	IrishSea_BalcaryPoint_se09	54.727	-3.960	-3.9490	-3.9720	54.7370	54.7200
FI	Solway	Solway	Solway Firth	IrishSea_BalcaryPoint_fi01	54.750	-4.000	-3.9221	-4.0779	54.7949	54.673
FI	Clyde	Outer estuary	Bowling	Clyde_ClydeEstuaryOuter_fi02	55.925	-4.480	-4.469	-4.492	55.932	55.923
FI	Clyde	Inner Firth	Holy Loch	Clyde_FirthCInnerDunoon_fi01	55.971	-4.892	-4.874	-4.914	56.005	55.95
FI	Clyde	Largs Channel	Hunterston	Clyde_LargsChannel_fi01	55.764	-4.885	-4.864	-4.906	55.794	55.739
FI	Clyde	Middle Offshore	Garroch Head	Clyde_FirthCMiddleOffshor_fi01	55.660	-4.986	-4.942	-5.043	55.695	55.629
FI	Clyde	Outer Offshore	Pladda	Clyde_SouthArran_fi01	55.420	-5.215	-5.169	-5.271	55.431	55.412

Table 5: Latitude and longitude limits for sediment and fishing sites (extracted from Station dictionary Oct 2017) (DMS)

Matrix	Region	Area	Site	Nominal Station Latitude	Nominal Station Longitude	Longitude East Limit	Longitude West Limit	Latitude North Limit	Latitude South Limit
SE	Clyde	Inner Firth of Clyde	Off Cloch Point	55 56.88N	004 53.64W	004 48.83W	004 58.47W	55 59.54N	55 54.16N
SE	Clyde	Inner Firth of Clyde	East of Strone Point	55 59.04N	004 52.86W	004 50.95W	004 54.80W	56 0.12N	55 57.96N
SE	Clyde	Inner Firth of Clyde	Lunderston Bay	55 55.38N	004 54.66W	004 52.73W	004 56.58W	55 56.48N	55 54.32N
SE	Clyde	Inner Firth of Clyde	Weymss Point	55 53.82N	004 55.56W	004 53.65W	004 57.49W	55 54.87N	55 52.72N
SE	Clyde	Inner Firth of Clyde	E of Toward (UIFM 2)	55 52.08N	004 56.70W	004 54.77W	004 58.62W	55 53.15N	55 50.99N
SE	Clyde	Inner Firth of Clyde	Holy Loch - FRS	55 58.26N	004 53.52W	004 52.44W	004 54.84W	56 0.30N	55 57.00N
SE	Clyde	Middle Offshore	East of Brodick	55 35.16N	004 57.30W	004 55.40W	004 59.22W	55 36.25N	55 34.09N
SE	Clyde	Middle Offshore	Middle Offshore South	55 26.04N	004 58.08W	004 56.20W	005 0.01W	55 27.12N	55 24.96N
SE	Clyde	Middle Offshore	Middle Offshore	55 30.36N	004 53.94W	004 52.04W	004 55.85W	55 31.45N	55 29.29N
SE	Clyde	Middle Offshore	5 km SW of Lady Isle	55 30.48N	004 48.84W	004 46.91W	004 50.73W	55 31.54N	55 29.38N
SE	Clyde	Middle Offshore	7 km off Whiting Bay	55 28.62N	004 59.28W	004 57.36W	005 1.16W	55 29.68N	55 27.52N
SE	Clyde	Middle Offshore	Garroch Head - FRS	55 39.60N	004 59.16W	004 56.52W	005 2.58W	55 41.70N	55 37.74N
SE	Clyde	Largs Channel	Hunterston - FRS	55 45.84N	004 53.10W	004 51.84W	004 54.36W	55 47.64N	55 44.34N
SE	Clyde	Largs Channel	Hunterston2	55 46.62N	004 53.40W	004 53.04W	004 53.64W	55 47.16N	55 46.38N
SE	Clyde	Largs Channel	Hunterston3	55 47.16N	004 53.46W	004 53.16W	004 53.76W	55 47.40N	55 47.04N
SE	Clyde	Largs Channel	Hunterston4	55 47.52N	004 53.34W	004 53.10W	004 53.82W	55 47.76N	55 47.28N
SE	Clyde	Largs Channel	Hunterston5	55 44.46N	004 54.24W	004 53.94W	004 54.54W	55 44.70N	55 44.10N
SE	Solway	Solway	Solway Firth @ NMMP25	54 45.00N	003 60.00W	003 58.13W	004 1.87W	54 46.08N	54 43.92N
SE	Solway	Solway	Solway Firth BP1	54 46.02N	003 50.10W	003 49.56W	003 50.88W	54 46.50N	54 45.60N
SE	Solway	Solway	Solway Firth BP2	54 45.42N	003 51.78W	003 51.00W	003 52.68W	54 46.44N	54 45.30N
SE	Solway	Solway	Solway Firth BP3	54 45.00N	003 54.96W	003 54.30W	003 55.62W	54 45.48N	54 44.58N
SE	Solway	Solway	Solway Firth BP4	54 43.62N	003 57.60W	003 56.94W	003 58.32W	54 44.22N	54 43.20N
FI	Solway	Solway	Solway Firth	54 45.00N	003 60.00W	003 55.33W	004 4.67W	54 47.69N	54 40.38N
FI	Clyde	Outer estuary	Bowling	55 55.50N	004 28.80W	004 28.14W	004 29.52W	55 55.92N	55 55.38N
FI	Clyde	Inner Firth	Holy Loch	55 58.26N	004 53.52W	004 52.44W	004 54.84W	56 0.30N	55 57.00N
FI	Clyde	Largs Channel	Hunterston	55 45.84N	004 53.10W	004 51.84W	004 54.36W	55 47.64N	55 44.34N
FI	Clyde	Middle Offshore	Garroch Head	55 39.60N	004 59.16W	004 56.52W	005 2.58W	55 41.70N	55 37.74N
FI	Clyde	Outer Offshore	Pladda	55 25.20N	005 12.90W	005 10.14W	005 16.26W	55 25.86N	55 24.72N

Appendix 1 – Summary

Water sampling at Bowling

Fishing at Bowling (+ EROD LRM & RGU)

1 cat tow at Bowling

1 cat tow in Gare Loch

5 cat tows in Loch Long

1 cat tow in Holy Loch

Water sampling at Holy Loch

Fishing at Holy Loch (+ RGU)

Sediment sampling Inner Firth

2 cat tows inner Clyde en route to Hunterston

1 cat tow at Hunterston

Water sample at Hunterston

Fishing at Hunterston

Sediment sampling in Largs Channel

Water sample at Garroch Head

Fishing at Garroch Head (+ EROD LRM)

Sediment sampling in Middle Offshore

2 cat tows in Middle Offshore / Garroch head area

Water sample at Pladda

Fishing at Pladda (+ EROD LRM) (+ RGU if Solway off the programme)

Travel to Solway

2 cat tows en route to Solway if possible

Water sample at Solway

Fishing at Solway (+ RGU)

Sediment sampling at Solway

Cat tows at Solway

Return from Solway