



TR189 Sizewell Marine Water Quality Monitoring Final Summary Report

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Please note that the red line boundary was amended after this document was finalised, therefore figures in this document do not reflect the boundaries in respect of which development consent has been sought in this application. However, amendments to the red line boundary does not have any impact on the findings set out in this document and all other information remains correct.

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Executive summary

A marine water quality monitoring programme was established off the Suffolk coast in the vicinity of Sizewell B power station to assess the concentrations of a large number of elements and compounds and their variation over a range of time scales. The programme ran from February 2010 to February 2011, and the programme's results are presented in this report. On 17 March 2010 Sizewell B had an outage which continued until 30 September 2010. Cefas does not know what effect the outage has had on the discharge of chemicals into the reduced cooling water flow from the station.

A spatial survey was conducted at twelve sampling stations (see chart below). The sampling was centred upon the existing cooling water outfall for the Sizewell B, at station 5. A tidal-cycle survey was carried out during which water samples were acquired at hourly intervals at station 5 over an ebb/flood tidal cycle during spring tide conditions. A seasonal survey was also carried out by acquiring water samples near slack water at stations 5 and 11 on 21 occasions throughout the programme.

Conductivity, temperature and depth sensor (CTD) profiles showed that the waters sampled were well mixed with regard to salinity. The temperature profiles indicated the presence of a thermally buoyant plume of water at the sea surface. Many of the chemical analyses gave negative results, indicating that the analytes were either absent or present at concentrations below the limits of detection. Few differences between results from inshore of Sizewell Bank (stations 1 to 9) and offshore (stations 10 to 12) were noted.

Concentrations of dissolved copper, arsenic, zinc, mercury and cadmium exceeded EQS levels on occasions. Some exceedance of the Environmental Quality Standard (EQS) concentrations for these metal and metalloid substances was detected at all stations except for stations 2 and 6. A small number of samples with concentrations in excess of their EQS were recorded for some polycyclic aromatic hydrocarbons (PAHs), biphenyl and bis (2-ethylhexyl) phthalate (DEHP), though the majority of analyses for these compounds were negative. Exceedances of EQS concentrations for these organic compounds were detected at stations 1, 5, 9 and 12. All of these exceedances of organic EQSs were observed in samples acquired on three sampling dates: 7th and 8th April and the 19th May 2010.

Total residual oxidant (TRO) concentrations varied between 0.01 and 0.16 mg.l⁻¹. The EQS for TRO is 10 µg.l⁻¹ (0.01 mg.l⁻¹). The mean of all TRO measurements (n = 725) was 0.04 mg.l⁻¹, with a value of 0.01 mg.l⁻¹ (half the limit of detection) used to represent negative results. Slight localised elevation of TRO was observed near the cooling water outfall, and was below the level of detection within 2.4 km to the north and 500 m to the south. Elevated TRO was observed at the southern extremity of the survey area (at stations 9 and 12) but there was no spatial pattern to indicate that this elevation was connected to the power station outfall.

A wide range of hydrazine concentrations were initially measured. Doubts about the validity of the ultraviolet-visible spectrophotometry results, based on the limits of quantification of the technique and potential interference, led to the use of an alternative analytical method. For the final three months of the programme a gas chromatography mass spectrometry (GC-MS) technique was used on water samples to measure hydrazine concentrations in addition to the spectrophotometric technique. The GC-MS technique was far more sensitive and indicated that hydrazine concentrations were generally below the limit of detection (0.01 µg.l⁻¹). Prior hydrazine results are therefore not considered valid.

Three positive results were obtained from morpholine analyses conducted on water samples from stations 5 and 11. Morpholine is not used by Sizewell power station as a conditioning product. No concentrations of environmental concern were measured in the analyses carried out on sediment samples acquired at stations 5 and 11. All radionuclide concentrations measured in seawater samples were very low and were consistent with routine local radionuclide monitoring by the Environment Agency.

The results of this programme show that the concentrations of many elements and compounds are relatively uniform in the programme area. A small percentage of the samples acquired indicated that EQSs may occasionally be exceeded, though there is no indication that this is caused by Sizewell B power station.

1 Introduction and Objectives

During 2009, EDF requested that Cefas design a monitoring programme to assess marine water quality off the Suffolk coast near the Sizewell B power station. The programme's purpose was to establish the environmental concentrations of certain chemical additives and their derivatives that are discharged from the existing cooling water outfall at Sizewell B, as well as establishing the local baseline environmental concentrations of numerous substances. Sampling was designed to assess the variation in water quality over the following spatial and temporal ranges:

- Spatially, over an area of approximately 80 km² at 12 sampling stations
- Temporally, over a tidal cycle during spring tide conditions
- Temporally, over an annual seasonal cycle

This report presents the results of sampling conducted between 25 February 2010 and 14 February 2011.

Measurements of a wide range of chemical concentrations and water quality parameters were undertaken to provide information likely to be useful to potential future engineering projects associated with the power station infrastructure at Sizewell. During the design of the survey a seawater desalination plant at the proposed Sizewell C power station was under consideration, so samples were acquired and analysed for silt density and modified foiling indices (SDI and MFI respectively). It is no longer considered that a desalination plant is required. In addition to water sampling a limited program of benthic sediment samples were acquired and chemically analysed and a small number of water samples were acquired and subjected to radionuclide analysis.

1.1 The physical environment near Sizewell

The coastline near Sizewell B consists of a coarse beach of sand and gravel. The shore slopes down to a depth of 7 to 11 m below chart datum. A subtidal sand bank exists approximately 1.5 km offshore. This feature is charted as two separate entities, Sizewell Bank and Dunwich Bank, though in reality it is a single, continuous feature aligned parallel to the shore and with minimum depths of less than 3 m at its southern end. The whole bank extends for approximately 8 km from north to south and isolates the shallow coastal channel from deeper water offshore of the bank where depths fall to below 15 m.

The tides in the area are rectilinear and flood-dominated, with the flood tide currents travelling to the south and the ebb tide currents travelling to the north. Tidal ranges are approximately 3 m during spring tides and 1.5 m during neap tides. Mean tidal current speeds of 0.5 ms⁻¹ are experienced and the maximum current speeds are approximately 1.5 ms⁻¹.

Waves at Sizewell come predominantly from the ENE and the SSE. The mean significant wave height is between 0.5 and 1 m with an annual expected maximum wave height of around 4 m. The maximum expected significant wave height during a 100-year period is approximately 5.5 m, rising to approximately 6.5 m in 1,000 years.

1.2 Data location

The data presented in this report are available on the BEEMS shared drive. The location of the data is summarised in **Table 1**.

Table 1 The location of data presented in this report

Data	File name	Location
Total residual oxidant (TRO) on-board analyses conducted by Cefas	BEEMS WP7a SZ Marine water quality monitoring TRO and on-board results Feb2010 to Feb2011.xls	beems_data\$\10 BEEMS DATA CENTRE - SITES\SIZEWELL\ SZ_WP7a_ Marine water quality monitoring data Feb2010 to Feb 2011
Chemical analyses conducted by Scientifics Ltd on water samples	BEEMS WP7a SZ Marine water quality monitoring Scientifics Ltd results Feb2010 to Feb2011.xls	
Chemical analyses conducted by Scientifics Ltd on sediment samples	BEEMS WP7a SZ Marine water quality monitoring Scientifics Ltd sediment analysis results.xls	
Conductivity, temperature and depth (CTD) data	BEEMS WP7a SZ Marine water quality monitoring CTD results Feb2010 to Feb 2011.xls	

2 Methods

2.1 Sampling strategy

Water sampling was conducted at 12 stations to investigate the temporal and spatial variation of environmental levels of the analytes of interest. A comprehensive suite of analytes was selected in order to satisfy likely future licensing and engineering requirements. It is Cefas' understanding that chlorination of cooling water takes place year-round at Sizewell and that dosing is controlled to achieve a total residual oxidant (TRO) concentration at the condenser of 0.3 mg.l⁻¹ maximum.

Sampling was organised to establish the variability in analyte concentrations over a number of different spatial and temporal scales:

- ▶ A spatial survey acquired surface and near-bed water samples from 12 stations (**Table 2**) extending approximately 12 km to the north and south of the cooling water outfall and 3 km offshore. Maximum concentrations of compounds from the cooling water were expected to be found in surface waters due to the thermally buoyant nature of the outfall plume. Surface waters were therefore intensively sampled. In order to ensure that the full water column was investigated, certain stations were selected for the acquisition of near-bed samples in addition to surface water samples.
- ▶ A tidal cycle survey acquired hourly surface water samples from a vessel anchored as close as possible to the cooling water outfall (Station 5) during an ebb/flood cycle on spring tide conditions (**Table 3**).
- ▶ A seasonal survey acquired surface water samples at the cooling water outfall (Station 5) and a reference site (Station 11) at intervals of approximately two weeks from February 2010 to February 2011.

Details of the water sampling conducted are shown in **Table 4**

For the spatial survey, the samples were acquired from the stations shown in **Figure 1**. Sampling took place during both neap and spring tidal conditions, though neap tidal conditions were favoured as the environmental concentrations of analytes were likely to be at their highest; increased mixing and dispersion is likely to result in lower concentrations during spring tidal conditions. The closest potential sources (other than the power station itself) of the analytes identified were Lowestoft to the north and Felixstowe and Harwich to the south. These potential sources are all distant from Sizewell by multiples of the spring tidal excursion distance and many multiples of the residual current drift distance associated with a tidal cycle. Modelling work conducted during the survey period indicated that the combined Sizewell B and Sizewell C thermal plume may extend further south than the most southerly survey station. Extra survey stations were, however, considered unnecessary as the plume area and the area beyond the plume were well sampled.

Temporal variation during an ebb/flood tidal cycle was assessed by acquiring surface water samples from a vessel anchored in the outfall plume at Station 5 (**Figure 1**), as close to the outfall as practicable. Care was taken to ensure that the vessel was positioned downstream of the outfall with regard to the direction of tidal flow. This procedure was followed during a tidal cycle in spring tide conditions during the 2nd March 2010.

Seasonal variation in the concentrations of interest was assessed by acquiring surface water samples at Station 5 (at the cooling water outfall) and Station 11 (used here as a reference site). Sampling was carried out at approximately fortnightly intervals from February 2010 to February 2011. The exact timing and intervals between sampling was influenced by the requirement for suitable weather conditions.

In addition to water sampling a limited program of benthic sediment samples were acquired and chemically analysed. Triplicate benthic samples were acquired from Stations 5 and 11. A small number of water samples were acquired from Stations 5 and 11 and subjected to radionuclide analysis.

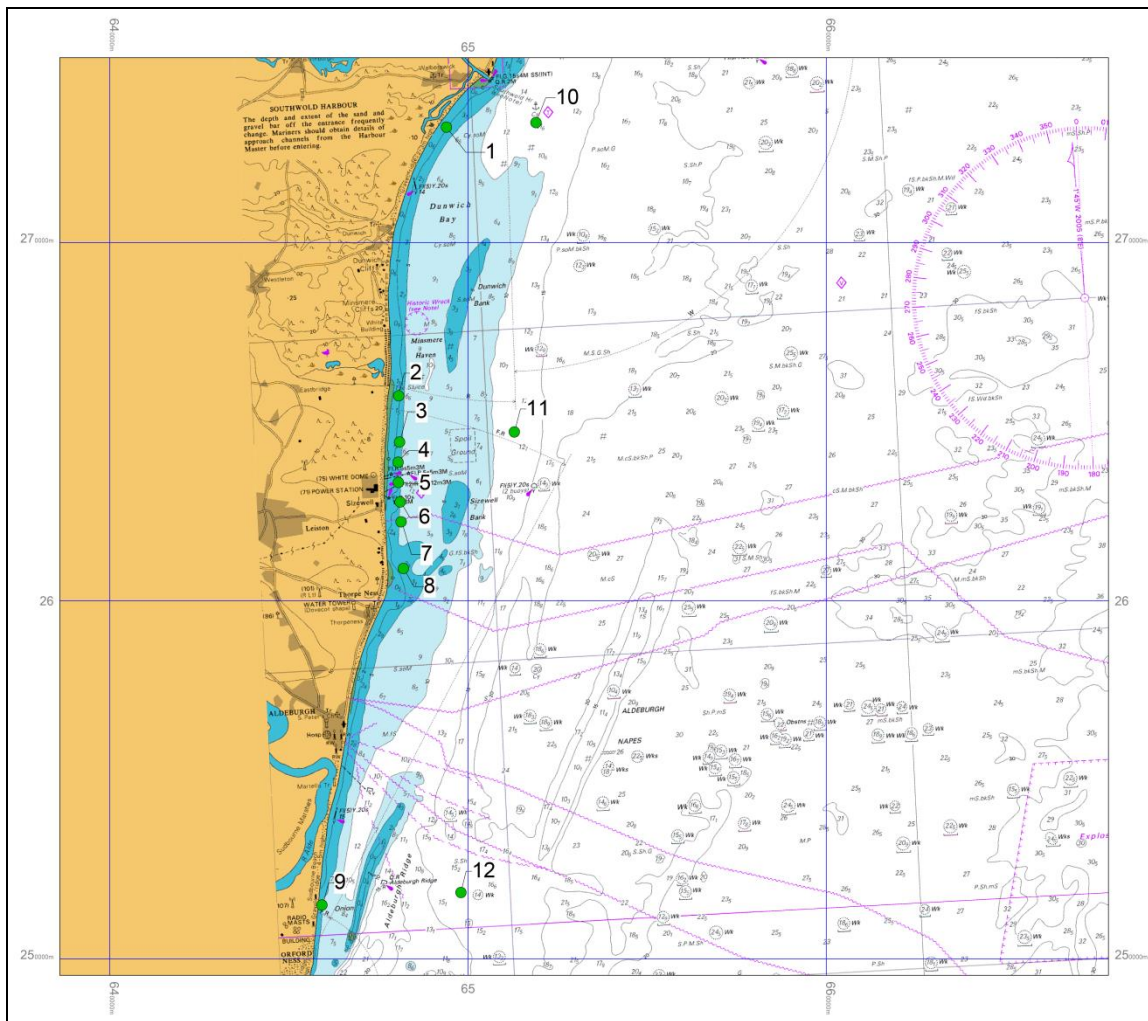


Figure 1 The locations of the sampling stations off Sizewell

The locations of the sampling stations are shown in **Figure 1** and Table 1. Surface samples were acquired at all stations as the outfall waters are thermally buoyant. Near-bed samples were also acquired at certain stations in order that concentrations from the entire water column could be assessed. Details of the samples acquired are shown in **Table 4**.

Tide times for Lowestoft and Felixstowe during the tidal cycle survey undertaken on 2 March 2010 are shown in **Table 3**. Lowestoft and Felixstowe are the nearest standard ports to the north and south of Sizewell respectively.



Figure 2 Station 5, the cooling water outfall at Sizewell. The outfall is marked at the surface by the mast visible to the left of the image.

Table 2 The positions of the sampling stations

Station	OSGB36 coordinates (m)		WGS84	
	E	N	Latitude (N)	Longitude (E)
1	649397	273225	52° 18.02'	001° 39.39'
2	648065	265724	52° 14.03'	001° 37.89
3	648088	264432	52° 13.33'	001° 37.85'
4	648048	263871	52° 13.03'	001° 37.79'
5	648054	263305	52° 12.73'	001° 37.77'
6	648104	262761	52° 12.43'	001° 37.79'
7	648131	262205	52° 12.13'	001° 37.79'
8	648196	260902	52° 11.42'	001° 37.79'
9	645922	251507	52° 06.43'	001° 35.39'
10	651897	273352	52° 18.02'	001° 41.59'
11	651293	264715	52° 13.40'	001° 40.68'
12	649802	251857	52° 06.51'	001° 38.80'

Table 3 Tide times at Felixstowe and Lowestoft during the tidal cycle survey at Station 5 on 2 March 2010 (data from Proudman Oceanographic Laboratory). The tidal cycle survey was conducted between 11:00 and 23:00.

Tide	Lowestoft	Felixstowe
HW	10:36	12:45
LW	16:36	18:19
HW	23:45	00:58 (03/02/2010)

2.2 Sampling operations

2.2.1 Water sampling

Water samples were acquired using a total of three different survey vessels operated by Gardline Environmental Ltd. The survey vessel *Melanie D* (**Figure 3**) is an 8.5 m catamaran with a low freeboard ideal for water sampling operations. The *George D* (**Figure 4**) is a 19.8 m steel-hulled ex-Trinity House buoy tender and the *Meriel D* is an aluminium-hulled catamaran of 16.0 m (**Figure 5**).



Figure 3 The *Melanie D* survey vessel



Figure 4 The *George D* survey vessel



Figure 5 The *Meriel D* survey vessel

Sampling operations were carried out at the sampling stations as shown in **Table 2**. Surface samples were acquired using a bucket of material appropriate to the analysis planned for the sample. Near-bed samples were acquired using a Niskin water sampler mounted on a stainless steel wire. The Niskin sampler was activated using a messenger weight, with samples acquired approximately 1 m above the seabed.

When sampling at Station 5 (the cooling water outfall, **Figure 2**), the vessel was positioned as close to the outfall as practical (typically within 50 to 100 m). The vessel was positioned to the south of the outfall during the flood phase of the tide and to the north during the ebb phase. Positioning in this manner ensured that the waters sampled contained the maximum possible proportion of expelled cooling water.

A SAIV CTD (model SD204) was lowered from the vessel to the seabed at each sampling station when sampling was being undertaken. A profile of the water column (with respect to salinity and temperature) was measured to assess the degree to which the water column was mixed.

A total of 81 water samples were acquired from Stations 1 to 12. The details of these samples are shown in **Table 4**.

Table 4 Details of acquired water samples

Date	Station	Time (UTC)	Samples acquired	Sample depth (m)	Survey
25/02/2010	2	09:45	Surface	0	Spatial
25/02/2010	3	10:38	Surface	0	Spatial
25/02/2010	3	11:25	Near-bed	4	Spatial
25/02/2010	4	12:20	Surface	0	Spatial
25/02/2010	5	13:05	Surface	0	Spatial/Seasonal
25/02/2010	5	13:25	Near-bed	5	Spatial
02/03/2010	5	11:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	12:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	13:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	14:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	15:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	16:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	17:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	18:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	19:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	20:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	21:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	22:00	Surface	0	Tidal cycle (spring tide)
02/03/2010	5	23:00	Surface	0	Tidal cycle (spring tide)
07/04/2010	10	10:20	Surface	0	Spatial
07/04/2010	10	10:20	Near-bed	11	Spatial
07/04/2010	1	11:50	Surface	0	Spatial
07/04/2010	1	11:50	Near-bed	5	Spatial
07/04/2010	6	13:15	Surface	0	Spatial
07/04/2010	11	13:45	Surface	0	Spatial/Seasonal
08/04/2010	12	11:30	Surface	0	Spatial
08/04/2010	12	13:00	Near-bed	17	Spatial
08/04/2010	9	14:00	Surface	0	Spatial
08/04/2010	9	14:30	Near-bed	5	Spatial
08/04/2010	8	15:45	Surface	0	Spatial
08/04/2010	7	16:15	Surface	0	Spatial
08/04/2010	7	16:30	Near-bed	7	Spatial
08/04/2010	5	17:30	Surface	0	Spatial/Seasonal
21/04/2010	5	09:45	Surface	0	Seasonal
21/04/2010	11	10:45	Surface	0	Seasonal
19/05/2010	5	08:45	Surface	0	Seasonal
19/05/2010	11	09:45	Surface	0	Seasonal
07/06/2010	5	11:20	Surface	0	Seasonal
07/06/2010	11	10:10	Surface	0	Seasonal
22/06/2010	5	09:30	Surface	0	Seasonal

Date	Station	Time (UTC)	Samples acquired	Sample depth (m)	Survey
22/06/2010	11	10:00	Surface	0	Seasonal
06/07/2010	5	12:30	Surface	0	Seasonal
06/07/2010	11	10:15	Surface	0	Seasonal
20/07/2010	5	13:45	Surface	0	Seasonal
20/07/2010	11	13:00	Surface	0	Seasonal
11/08/2010	11	10:08	Surface	0	Seasonal
11/08/2010	5	09:20	Surface	0	Seasonal
18/08/2010	5	12:05	Surface	0	Seasonal
18/08/2010	11	13:05	Surface	0	Seasonal
09/09/2010	5	09:45	Surface	0	Seasonal
09/09/2010	11	10:40	Surface	0	Seasonal
14/09/2010	5	10:45	Surface	0	Seasonal
14/09/2010	11	10:15	Surface	0	Seasonal
28/09/2010	5	10:50	Surface	0	Seasonal
28/09/2010	11	10:00	Surface	0	Seasonal
14/10/2010	5	10:15	Surface	0	Seasonal
14/10/2010	11	11:15	Surface	0	Seasonal
15/11/2010	5	12:00	Surface	0	Seasonal
15/11/2010	11	11:00	Surface	0	Seasonal
06/12/2010	5	10:02	Surface	0	Seasonal
06/12/2010	3	10:40	Surface	0	Spatial
06/12/2010	1	11:30	Surface	0	Spatial
06/12/2010	11	09:30	Surface	0	Seasonal
15/12/2010	11	10:38	Surface	0	Seasonal
15/12/2010	4	12:35	Surface	0	Spatial
15/12/2010	6	11:15	Surface	0	Spatial
15/12/2010	2	12:10	Surface	0	Spatial
15/12/2010	5	11:40	Surface	0	Seasonal
17/01/2011	11	15:55	Surface	0	Seasonal
17/01/2011	5	15:25	Surface	0	Seasonal
17/01/2011	12	12:20	Surface	0	Spatial
17/01/2011	12	12:20	Near-bed	17	Spatial
17/01/2011	9	14:35	Surface	0	Spatial
31/01/2011	10	09:20	Surface	0	Spatial
31/01/2011	11	10:10	Surface	0	Seasonal
31/01/2011	8	10:50	Surface	0	Spatial
31/01/2011	7	11:20	Surface	0	Spatial
31/01/2011	5	14:00	Surface	0	Seasonal
14/02/2011	10	11:00	Near-bed	12	Spatial
14/02/2011	11	12:45	Surface	0	Seasonal
14/02/2011	5	13:30	Surface	0	Seasonal

2.2.2 Sediment sampling

Triplicate sediment samples were acquired from Station 11 on the 17 June 2010 and from Station 5 on 18 June 2010. Samples were acquired using a Day grab from the *MV Nicola Ann*. Acquired sub-samples were sent to Scientifics Ltd and subjected to the analyses listed in **Table 7** and **Table 6**.

2.2.3 Radionuclide sampling

Surface water samples were acquired from Station 5 (the cooling water outfall) and Station 11 and subjected to radionuclide analysis. Each radionuclide sample consisted of three 1 litre plastic bottles. The sampling dates are shown in **Table 5**. The analyses carried out are detailed in **Table 8**. Surface water samples were acquired for radionuclide analysis using a clean plastic bucket and transferred into clean plastic containers. The containers were placed in an insulated box and kept cool before being submitted to the Cefas Radioanalytical Service Laboratory for analysis.

Table 5 Details of the acquired water samples for radionuclide analysis. (The station was undergoing an outage during the sampling undertaken on 19/05/2010.)

Date	Time	Station
19/05/2010	08:45	5
19/05/2010	09:45	11
17/01/2011	15:25	5
14/02/2011	13:30	5

2.3 Water sample handling and analysis

All the water samples acquired were subjected to the following types of analyses:

- ▶ Immediate measurement of total residual oxidant (TRO) and water quality parameters on board the survey vessel by Cefas personnel
- ▶ Chemical analysis for a suite of analytes by Scientifics Ltd.
- ▶ Silt Density Index (SDI) and Modified Fouling Index (MFI) analysis by WRc Ltd.

From 15 November 2010 to the end of the programme samples were also acquired for analysis for hydrazine by DVGW-Technologiezentrum Wasser (TZW).

2.3.1 On-board water sample analysis by Cefas

TRO is known to degrade rapidly and prompt analysis is therefore required to measure realistic environmental concentrations. All water samples were analysed for TRO onboard the survey vessel immediately after acquisition. Water samples for TRO analysis were acquired at each site using a stainless steel bucket (for surface samples) or a Niskin water sampler (for near-bed samples). In each case, three samples were acquired and the temperature, salinity, pH and dissolved oxygen saturation recorded using a WTW Oxi 30 meter. Three 10 ml replicate sea water sub-samples were taken from each water sample using a 10 ml pipette. Each 10 ml sub-sample was transferred to a 10 ml syringe and filtered through a 0.2 µm filter into a test tube containing a sachet of N,N-diethyl-p-phenylenediamine (DPD) total chlorine reagent. The samples were left in the test tube for the minimum duration of three minutes to allow full colour development before absorbance at 528 nm was measured using a HACH pocket colorimeter II. The colorimeter was blanked with a sample of filtered sea water without DPD before each reading. Before use the colorimeter and meters were calibrated, and reference standards were used to check that the colorimeter values were within the manufacturer's specification. The limit of detection of this method was 0.02 mg.l⁻¹.

2.3.2 Water sampling for laboratory chemical analysis by Scientifics Ltd

Scientifics Ltd provided sample containers for a suite of chemical analyses (see **Table 6**). Surface samples were acquired using a bucket and near-bed samples were acquired using a Niskin water sampler. Surface samples destined for analysis for organic compounds were acquired using a stainless steel bucket. They were transferred to the sample containers using a stainless steel pouring jug. All other samples were acquired using a plastic bucket and transferred into the sample containers using a plastic pouring jug. All samples acquired were marked with the station number, date and time of acquisition and (if required) a “B” to denote a near-bed sample. Following acquisition all samples were placed in an insulated box and stored in a cool (< 10°C), dark environment. They were transported to the analysing laboratory as soon as possible once ashore, typically reaching the laboratory within 24 hours of acquisition. The 1-litre glass container containing the sample for hydrazine analysis was pre-dosed with 10 ml of 1M hydrochloric acid to retard the degradation of hydrazine. Hydrazine has a relatively short half-life in sea water. In order to ensure that sample acidification was effective in preventing the degradation of hydrazine, some acidified control samples were spiked with a measured concentration of hydrazine and sent to the laboratory for analysis. Samples spiked with an initial concentration of 1,000 µg.l⁻¹ and immediately acidified gave laboratory analysis results of 918 µg.l⁻¹, while identical samples acidified after incubation periods of up to 23 hours showed much lower hydrazine concentrations (< 50 µg.l⁻¹), indicating that immediate acidification is an effective measure in retarding the degradation of hydrazine.

Table 6 The analyses conducted on water samples by Scientifics Ltd (entries marked with “MS” are subcontracted by Scientifics Ltd to Mountainheath Services). Detections limits are given as µg.l⁻¹ unless otherwise stated. A key to method acronyms is provided at the end of the table.

Analysis	Method	Limit of detection (µg.l ⁻¹)	Analysis	Method	Limit of detection (µg.l ⁻¹)
pH units	pH electrode		Hexachlorocyclopentadiene	L/LE GCMS	5
Suspended solids	Filtration and gravimetric analysis	5 mg.l ⁻¹	2,4,6-Trichlorophenol	L/LE GCMS	20
Total alkalinity as CaCO ₃	Titrimetry	2 mg.l ⁻¹	2,4,5-Trichlorophenol	L/LE GCMS	20
Bicarbonate alkalinity as CaCO ₃	Titrimetry	2 mg.l ⁻¹	2-Chloronaphthalene	L/LE GCMS	2
Carbonate alkalinity as CaCO ₃	Titrimetry	2 mg.l ⁻¹	Biphenyl	L/LE GCMS	2
Chloride as Cl	Colorimetric analysis	1 mg.l ⁻¹	Diphenyl ether	L/LE GCMS	2
Fluoride as F	Fluoride ISE	0.1 mg.l ⁻¹	2-Nitroaniline	L/LE GCMS	5
Total Sulphur as SO ₄ (Dissolved)	ICPOES	3 mg.l ⁻¹	Acenaphthylene	L/LE GCMS	2
Calcium as Ca (Total)	ICPOES	1 mg.l ⁻¹	Dimethylphthalate	L/LE GCMS	5
Calcium as Ca (Dissolved)	ICPOES	1 mg.l ⁻¹	2,6-Dinitrotoluene	L/LE GCMS	5
Magnesium as Mg (Total)	ICPOES	1 mg.l ⁻¹	Acenaphthene	L/LE GCMS	2
Magnesium as Mg (Dissolved)	ICPOES	1 mg.l ⁻¹	3-Nitroaniline	L/LE GCMS	5
Strontium as Sr (Total)	ICPOES	10	2,4-Dinitrophenol	L/LE GCMS	10

Analysis	Method	Limit of detection (µg.l ⁻¹)
Strontium as Sr (Dissolved)	ICPOES	10
Sodium as Na (Dissolved)	ICPOES	1 mg.l ⁻¹
Potassium as K (Total)	ICPOES	1 mg.l ⁻¹
Potassium as K (Dissolved)	ICPOES	1 mg.l ⁻¹
Nickel as Ni (Total)	ICPMS	1
Nickel as Ni (Dissolved)	ICPMS	1
Chromium as Cr (Total)	ICPMS	1
Chromium as Cr (Dissolved)	ICPMS	1
Cadmium as Cd (Total)	ICPMS	0.1
Cadmium as Cd (Dissolved)	ICPMS	0.1
Copper as Cu (Total)	ICPMS	1
Copper as Cu (Dissolved)	ICPMS	1
Lead as Pb (Total)	ICPMS	1
Lead as Pb (Dissolved)	ICPMS	1
Zinc as Zn (Total)	ICPMS	2
Zinc as Zn (Dissolved)	ICPMS	2
Manganese as Mn (Dissolved)	ICPMS	2
Iron as Fe (Total)	ICPOES	10
Iron as Fe (Dissolved)	ICPOES	10
Aluminium as Al (Dissolved)	ICPOES	10
Arsenic as As (Total)	ICPMS	1
Arsenic as As (Dissolved)	ICPMS	1
Boron as B (Total)	ICPOES	10
Boron as B (Dissolved)	ICPOES	10
Mercury as Hg (Total)	ICPMS	0.1
Mercury as Hg (Dissolved)	ICPMS	0.1

Analysis	Method	Limit of detection (µg.l ⁻¹)
Dibenzofuran	L/LE GCMS	5
4-Nitrophenol	L/LE GCMS	50
2,4-Dinitrotoluene	L/LE GCMS	5
Fluorene	L/LE GCMS	2
Diethylphthalate	L/LE GCMS	5
4-Chlorophenyl-phenylether	L/LE GCMS	5
4,6-Dinitro-2-methylphenol	L/LE GCMS	50
4-Nitroaniline	L/LE GCMS	5
N-Nitrosodiphenylamine	L/LE GCMS	5
4-Bromophenyl-phenylether	L/LE GCMS	5
Hexachlorobenzene	L/LE GCMS	5
Pentachlorophenol	L/LE GCMS	50
Phenanthrene	L/LE GCMS	2
Anthracene	L/LE GCMS	2
Di-n-butylphthalate	L/LE GCMS	5
Fluoranthene	L/LE GCMS	2
Pyrene	L/LE GCMS	2
Butylbenzylphthalate	L/LE GCMS	5
Benzo[a]anthracene	L/LE GCMS	2
Chrysene	L/LE GCMS	2
3,3'-Dichlorobenzidine	L/LE GCMS	20
Bis (2-Ethylhexyl) phthalate	L/LE GCMS	5
Di-n-octylphthalate	L/LE GCMS	2
Benzo[b]fluoranthene	L/LE GCMS	2
Benzo[k]fluoranthene	L/LE GCMS	2
Benzo[a]pyrene	L/LE GCMS	2

Analysis	Method	Limit of detection (µg.l ⁻¹)
Selenium as Se (Dissolved)	ICPMS	1
Selenium as Se (Total)	ICPMS	1
Molybdenum as Mo (Total)	ICPMS	1
Molybdenum as Mo (Dissolved)	ICPMS	1
Cobalt as Co (Total)	ICPMS	1
Cobalt as Co (Dissolved)	ICPMS	1
Ammoniacal Nitrogen as N	Colorimetric analysis	10
Nitrite as N	Colorimetric analysis	10
Nitrate as N	Calculated from total oxidised nitrogen and nitrite	0.3 mg.l ⁻¹
Phosphate as P	Colorimetric analysis	10
Chemical Oxygen Demand (Settled)	Oxygen digestion	5 mg.l ⁻¹
Total Organic Carbon	UV-IR	0.1 mg.l ⁻¹
Salinity	Salinity probe	0.1 mg.l ⁻¹
Turbidity N.T.U	Turbidity cell	1 NTU
Bromide as Br	Bromide electrode	0.1 mg.l ⁻¹
Iodide as I	ISE	1 mg.l ⁻¹
Barium as Ba (Total)	ICPOES	10
Barium as Ba (Dissolved)	ICPOES	10
Lithium as Li (Total)	ICPOES	10
Lithium as Li (Dissolved)	ICPOES	10
Silicon as Si (Total)	ICPOES	10
MBAS as Lauryl Sulphate	Methylene blue/ chloroform extraction and colorimetry	20

Analysis	Method	Limit of detection (µg.l ⁻¹)
Indeno[1,2,3-cd]pyrene	L/LE GCMS	2
Dibenzo[a,h]anthracene	L/LE GCMS	2
Benzo[g,h,i]perylene	L/LE GCMS	2
Tentatively identified semi-volatile organic compounds (SVOCs)	L/LE GCMS	variable
Dichlorodifluoromethane	HS GCMS	1
Chloromethane	HS GCMS	1
Vinyl Chloride	HS GCMS	1
Bromomethane	HS GCMS	5
Chloroethane	HS GCMS	5
Trichlorofluoromethane	HS GCMS	1
1,1-Dichloroethene	HS GCMS	1
trans 1,2-Dichloroethene	HS GCMS	1
1,1-Dichloroethane	HS GCMS	1
2,2-Dichloropropane	HS GCMS	1
cis 1,2-Dichloroethene	HS GCMS	1
Bromochloromethane	HS GCMS	1
Chloroform	HS GCMS	5
1,1,1-Trichloroethane	HS GCMS	1
Carbon Tetrachloride	HS GCMS	1
1,1-Dichloropropene	HS GCMS	1
Benzene	HS GCMS	1
1,2-Dichloroethane	HS GCMS	1

Analysis	Method	Limit of detection (µg.l ⁻¹)
Chlorophyll A (MS)	Acetone extraction and UV Spectrophotometry	
Biochemical Oxygen Demand	Dissolved Oxygen measurement before and after 5-day incubation	2 mg.l ⁻¹
Dissolved Organic Carbon	UV-IR	0.1 mg.l ⁻¹
Total Petroleum Hydrocarbons (TPH)	FTIR	0.3 mg.l ⁻¹
Total Petroleum Hydrocarbons	GC FID	10
Total Viable Count @ 22°C /ml	Incubation and colony counting	1 colony
2,4,6-tribromophenol (MS)	Liquid/liquid extraction and GCMS	0.2
Cationic Detergents	UV spectrophotometry	1 mg.l ⁻¹
Dibromoacetic acid (MS)	L/LE GCMS	1
Dibromoacetonitrile (MS)	L/LE GCMS	0.1
Dichloroacetonitrile (MS)	L/LE GCMS	0.1
Ethanolamine (MS)	GCMS	20
Hydrazine (MS)	UV-VS	1
Morpholine (MS)	GCMS	2
Phenol	L/LE GCMS	20
Bis (2-Chloroethyl) ether	L/LE GCMS	5
2-Chlorophenol	L/LE GCMS	20
1,3-Dichlorobenzene	L/LE GCMS	5
1,4-Dichlorobenzene	L/LE GCMS	5
Benzyl alcohol	L/LE GCMS	5
1,2-Dichlorobenzene	L/LE GCMS	5
2-Methylphenol	L/LE GCMS	5

Analysis	Method	Limit of detection (µg.l ⁻¹)
Trichloroethene	HS GCMS	5
1,2-Dichloropropane	HS GCMS	1
Dibromomethane	HS GCMS	1
Bromodichloromethane	HS GCMS	1
cis 1,3-Dichloropropene	HS GCMS	1
Toluene	HS GCMS	1
trans 1,3-Dichloropropene	HS GCMS	1
1,1,2-Trichloroethane	HS GCMS	1
Tetrachloroethene	HS GCMS	5
1,3-Dichloropropane	HS GCMS	1
Dibromochloromethane	HS GCMS	1
1,2-Dibromoethane	HS GCMS	1
Chlorobenzene	HS GCMS	1
Ethylbenzene	HS GCMS	1
1,1,1,2-Tetrachloroethane	HS GCMS	1
m and p-Xylene	HS GCMS	1
o-Xylene	HS GCMS	1
Styrene	HS GCMS	1
Bromoform	HS GCMS	1
iso-Propylbenzene	HS GCMS	1
1,1,2,2-Tetrachloroethane	HS GCMS	1
Propylbenzene	HS GCMS	1

Analysis	Method	Limit of detection (µg.l ⁻¹)
Bis (2-Chloroisopropyl) ether	L/LE GCMS	5
Hexachloroethane	L/LE GCMS	5
N-Nitroso-di-n-propylamine	L/LE GCMS	5
3- & 4-Methylphenol	L/LE GCMS	20
Nitrobenzene	L/LE GCMS	5
Isophorone	L/LE GCMS	5
2-Nitrophenol	L/LE GCMS	20
2,4-Dimethylphenol	L/LE GCMS	20
Benzoic Acid	L/LE GCMS	100
Bis (2-Chloroethoxy) methane	L/LE GCMS	5
2,4-Dichlorophenol	L/LE GCMS	20
1,2,4-Trichlorobenzene	L/LE GCMS	5
Naphthalene	L/LE GCMS	2
4-Chlorophenol	L/LE GCMS	20
4-Chloroaniline	L/LE GCMS	5
Hexachlorobutadiene	L/LE GCMS	5
4-Chloro-3-methylphenol	L/LE GCMS	5
2-Methylnaphthalene	L/LE GCMS	2
1-Methylnaphthalene	L/LE GCMS	2

Analysis	Method	Limit of detection (µg.l ⁻¹)
Bromobenzene	HS GCMS	1
1,2,3-Trichloropropane	HS GCMS	1
2-Chlorotoluene	HS GCMS	1
1,3,5-Trimethylbenzene	HS GCMS	1
4-Chlorotoluene	HS GCMS	1
tert-Butylbenzene	HS GCMS	1
1,2,4-Trimethylbenzene	HS GCMS	1
sec-Butylbenzene	HS GCMS	1
p-Isopropyltoluene	HS GCMS	1
1,3-Dichlorobenzene	HS GCMS	1
1,4-Dichlorobenzene	HS GCMS	1
n-Butylbenzene	HS GCMS	1
1,2-Dichlorobenzene	HS GCMS	5
1,2-Dibromo-3-chloropropane	HS GCMS	5
1,2,4-Trichlorobenzene	HS GCMS	5
Hexachlorobutadiene	HS GCMS	5
Naphthalene	HS GCMS	5
1,2,3-Trichlorobenzene	HS GCMS	5
Tentatively identified volatile organic compounds (VOCs)	HS GCMS	variable

Method key:

ISE	Ion-specific electrode
ICPOES	Inductively coupled plasma atomic emission spectroscopy
ICPMS	Inductively coupled plasma mass spectroscopy
UV-IR	uv-persulphate oxidation/IR detection
FTIR	Fourier transform infrared spectroscopy
UV-VS	Ultraviolet-visible spectrophotometry
GC FID	Gas chromatography flame ionisation detection
GCMS	Gas chromatography-mass spectroscopy
HS GCMS	Head space gas chromatography mass spectroscopy
L/LE GCMS	Liquid/liquid extraction followed by gas chromatography-mass spectroscopy

2.3.3 Water sampling for laboratory analysis by DVGW-Technologiezentrum Wasser (TZW)

Following concerns regarding the validity of the relatively high concentrations of hydrazine apparently being obtained using ultraviolet-visible spectrophotometry (see BEEMS Technical Report TR130); a more sensitive analytical method was sought. DVGW-Technologiezentrum Wasser (TZW) of Germany offered a analysis using liquid-liquid-extraction and subsequent GC-MS detection with a detection limit of 0.01µg.l⁻¹.

Sample for analysis by TZW were acquired from 15 November 2010 until the completion of fieldwork on 14 February 2011. Water samples were acquired using a stainless steel bucket and transferred to 1 litre bottles pre-dosed with 10 ml of 1 molar hydrochloric acid. Initially glass bottles were used, but following investigation by TZW, plastic bottles were also found to be suitable and were subsequently used because of the reduced likelihood of breakage in transit.

2.3.4 Water sampling for laboratory SDI/MFI analysis by WRc Ltd

Samples for SDI/MFI analysis were acquired using a bucket (for surface samples) or a Niskin water sampler (for near-bed samples). The samples were transferred to 1 litre plastic bottles and stored in insulated boxes, ensuring that the samples were in a dark, cool environment. The samples were transferred to WRc Ltd's laboratory at the earliest opportunity once ashore. All samples acquired were marked with the station number, date and time of acquisition and (if required) a "B" to denote a near-bed sample.

2.4 Sediment sample handling and analysis

Sediment samples were acquired using a Day grab. Sub-samples were taken using either plastic spatulas (for metals analyses) or metal spatulas (for hydrocarbon analyses). Metal and plastic spatulas were not used in the same grab sample. Sub-samples were not taken from near the edge or bottom of the grab to avoid contamination. A vertical cross-section of sediment from the surface to near to the bottom of the grab was sub-sampled. Sub-samples were then sent to Scientifics Ltd and subjected to the analyses shown in **Table 7**.

Table 7 The analyses conducted on sediment samples by Scientifics Ltd. Detections limits are given as mg.kg⁻¹ unless otherwise stated. A key to method acronyms is provided at the end of the table.

Analysis	Method	Limit of detection (mg.kg ⁻¹)	Analysis	Method	Limit of detection (mg.kg ⁻¹)
Boron (H ₂ O Soluble)	ICPOES	0.5	4-Chlorophenyl-phenylether	SVOC SW	0.5
Fluoride	ISEFSS	0.1	4,6-Dinitro-2-methylphenol	SVOC SW	5
pH	PH probe		4-Nitroaniline	SVOC SW	0.5
Total petroleum hydrocarbons	GC FID	10	N-Nitrosodiphenylamine	SVOC SW	0.5
Exchange.Ammonium	AMMAR	0.5	4-Bromophenyl-phenylether	SVOC SW	0.5
Total petroleum hydrocarbons	FTIR SWPER	50	Hexachlorobenzene	SVOC SW	0.5
Arsenic	ICPMSSD	0.5	Pentachlorophenol	SVOC SW	5
Cadmium	ICPMSSD	0.1	Phenanthrene	SVOC SW	0.2
Chromium	ICPMSSD	0.5	Anthracene	SVOC SW	0.2
Cobalt	ICPMSSD	0.1	Di-n-butylphthalate	SVOC SW	0.5
Copper	ICPMSSD	0.5	Fluoranthene	SVOC SW	0.2
Lead	ICPMSSD	0.5	Pyrene	SVOC SW	0.2
Manganese	ICPMSSD	1.0	Butylbenzylphthalate	SVOC SW	0.5
Molybdenum	ICPMSSD	0.5	Benzo[a]anthracene	SVOC SW	0.2
Nickel	ICPMSSD	0.5	Chrysene	SVOC SW	0.2
Selenium	ICPMSSD	0.5	3,3'-Dichlorobenzidine	SVOC SW	2
Zinc	ICPMSSD	3.0	bis(2-Ethylhexyl) phthalate	SVOC SW	0.5
Chloride	KONECL	1.0	Di-n-octylphthalate	SVOC SW	0.2
Nitrate	KoneNO ₃	0.2	Benzo[b]fluoranthene	SVOC SW	0.2
Nitrite as N:	KONENS.	0.1	Benzo[k]fluoranthene	SVOC SW	0.2
2,4,6-tribromophenol	AE GCMS		Benzo[a]pyrene	SVOC SW	0.2
Dibromoacetic Acid	AE GCMS		Indeno[1,2,3-cd]pyrene	SVOC SW	0.2
Dibromoacetonitrile	L/LE GCMS		Dibenzo[a,h]anthracene	SVOC SW	0.2
Ethanolamine	GCMS		Benzo[g,h,i]perylene	SVOC SW	0.2
Hydrazine	UV-SPEC		Dichlorodifluoro-methane	VOCSW8100	5 µg.kg ⁻¹
Morpholine	GCMS		Chloromethane	VOCSW8100	5 µg.kg ⁻¹
Mercury (Total)	TMMS1	0.1	Vinyl Chloride	VOCSW8100	5 µg.kg ⁻¹
Aluminium (Total)	TMOES	10	Bromomethane	VOCSW8100	25 µg.kg ⁻¹
Barium (Total)	TMOES	5	Chloroethane	VOCSW8100	25 µg.kg ⁻¹
Calcium (Total)	TMOES	100	Trichlorofluoromethane	VOCSW8100	5 µg.kg ⁻¹
Iron (Total)	TMOES	10	1,1-Dichloroethene	VOCSW8100	5 µg.kg ⁻¹
Lithium (Total)	TMOES	10	trans 1,2-Dichloroethene	VOCSW8100	5 µg.kg ⁻¹
Magnesium (Total)	TMOES	100	1,1-Dichloroethane	VOCSW8100	5 µg.kg ⁻¹
Phosphorous (Total)	TMOES	100	2,2-Dichloropropane	VOCSW8100	5 µg.kg ⁻¹
Potassium (Total)	TMOES	100	cis 1,2-Dichloroethene	VOCSW8100	5 µg.kg ⁻¹

Analysis	Method	Limit of detection (mg.kg ⁻¹)
Strontium (Total)	TMOES	3
Sulphur.(Total)	TSBRE1	0.005 %
Total Organic Carbon	WSLM59	0.01 %
Phenol	SVOCSW	2
bis(2-Chloroethyl)ether	SVOCSW	0.5
2-Chlorophenol	SVOCSW	2
1,3-Dichlorobenzene	SVOCSW	0.5
1,4-Dichlorobenzene	SVOCSW	0.5
Benzyl alcohol	SVOCSW	0.5
1,2-Dichlorobenzene	SVOCSW	0.5
2-Methylphenol	SVOCSW	0.5
bis(2-Chloroisopropyl) ether	SVOCSW	0.5
Hexachloroethane	SVOCSW	0.5
N-Nitroso-di-n-propylamine	SVOCSW	0.5
3- & 4-Methylphenol	SVOCSW	2
Nitrobenzene	SVOCSW	0.5
Isophorone	SVOCSW	0.5
2-Nitrophenol	SVOCSW	2
2,4-Dimethylphenol	SVOCSW	2
Benzoic Acid	SVOCSW	10
bis(2-Chloroethoxy) methane	SVOCSW	0.5
2,4-Dichlorophenol	SVOCSW	2
1,2,4-Trichlorobenzene	SVOCSW	0.5
Naphthalene	SVOCSW	0.2
4-Chlorophenol	SVOCSW	2
4-Chloroaniline	SVOCSW	0.5
Hexachlorobutadiene	SVOCSW	0.5
4-Chloro-3-methylphenol	SVOCSW	0.5
2-Methylnaphthalene	SVOCSW	0.2
1-Methylnaphthalene	SVOCSW	0.2
Hexachlorocyclopentadiene	SVOCSW	0.5
2,4,6-Trichlorophenol	SVOCSW	2
2,4,5-Trichlorophenol	SVOCSW	2
2-Chloronaphthalene	SVOCSW	0.2
Biphenyl	SVOCSW	0.2
Diphenyl ether	SVOCSW	0.2
2-Nitroaniline	SVOCSW	0.5
Acenaphthylene	SVOCSW	0.2
Dimethylphthalate	SVOCSW	0.5

Analysis	Method	Limit of detection (mg.kg ⁻¹)
Bromochloromethane	VOCSW8100	5 µg.kg ⁻¹
Chloroform	VOCSW8100	5 µg.kg ⁻¹
1,1,1-Trichloroethane	VOCSW8100	5 µg.kg ⁻¹
Carbon Tetrachloride	VOCSW8100	5 µg.kg ⁻¹
1,1-Dichloropropene	VOCSW8100	5 µg.kg ⁻¹
Benzene	VOCSW8100	5 µg.kg ⁻¹
1,2-Dichloroethane	VOCSW8100	5 µg.kg ⁻¹
Trichloroethene	VOCSW8100	5 µg.kg ⁻¹
1,2-Dichloropropane	VOCSW8100	5 µg.kg ⁻¹
Dibromomethane	VOCSW8100	5 µg.kg ⁻¹
Bromodichloromethane	VOCSW8100	5 µg.kg ⁻¹
cis 1,3-Dichloropropene	VOCSW8100	5 µg.kg ⁻¹
Toluene	VOCSW8100	5 µg.kg ⁻¹
trans 1,3-Dichloropropene	VOCSW8100	5 µg.kg ⁻¹
1,1,2-Trichloroethane	VOCSW8100	5 µg.kg ⁻¹
Tetrachloroethene	VOCSW8100	25 µg.kg ⁻¹
1,3-Dichloropropane	VOCSW8100	5 µg.kg ⁻¹
Dibromochloromethane	VOCSW8100	5 µg.kg ⁻¹
1,2-Dibromoethane	VOCSW8100	5 µg.kg ⁻¹
Chlorobenzene	VOCSW8100	5 µg.kg ⁻¹
Ethylbenzene	VOCSW8100	5 µg.kg ⁻¹
1,1,1,2-Tetrachloroethane	VOCSW8100	5 µg.kg ⁻¹
m and p-Xylene	VOCSW8100	5 µg.kg ⁻¹
o-Xylene	VOCSW8100	5 µg.kg ⁻¹
Styrene	VOCSW8100	5 µg.kg ⁻¹
Bromoform	VOCSW8100	5 µg.kg ⁻¹
iso-Propylbenzene	VOCSW8100	5 µg.kg ⁻¹
1,1,2,2-Tetrachloroethane	VOCSW8100	5 µg.kg ⁻¹
Propylbenzene	VOCSW8100	5 µg.kg ⁻¹
Bromobenzene	VOCSW8100	5 µg.kg ⁻¹
1,2,3-Trichloropropane	VOCSW8100	5 µg.kg ⁻¹
2-Chlorotoluene	VOCSW8100	5 µg.kg ⁻¹
1,3,5-Trimethylbenzene	VOCSW8100	5 µg.kg ⁻¹
4-Chlorotoluene	VOCSW8100	5 µg.kg ⁻¹
tert-Butylbenzene	VOCSW8100	5 µg.kg ⁻¹
1,2,4-Trimethylbenzene	VOCSW8100	5 µg.kg ⁻¹
sec-Butylbenzene	VOCSW8100	5 µg.kg ⁻¹
p-Isopropyltoluene	VOCSW8100	5 µg.kg ⁻¹
1,3-Dichlorobenzene	VOCSW8100	5 µg.kg ⁻¹

Analysis	Method	Limit of detection (mg.kg ⁻¹)
2,6-Dinitrotoluene	SVOCSW	0.5
Acenaphthene	SVOCSW	0.2
3-Nitroaniline	SVOCSW	0.5
2,4-Dinitrophenol	SVOCSW	1
Dibenzofuran	SVOCSW	0.5
4-Nitrophenol	SVOCSW	5
2,4-Dinitrotoluene	SVOCSW	0.5
Fluorene	SVOCSW	0.2
Diethylphthalate	SVOCSW	0.5

Analysis	Method	Limit of detection (mg.kg ⁻¹)
1,4-Dichlorobenzene	VOCSW8100	5 µg.kg ⁻¹
n-Butylbenzene	VOCSW8100	5 µg.kg ⁻¹
1,2-Dichlorobenzene	VOCSW8100	5 µg.kg ⁻¹
1,2-Dibromo-3-chloropropane	VOCSW8100	25 µg.kg ⁻¹
1,2,4-Trichlorobenzene	VOCSW8100	25 µg.kg ⁻¹
Hexachlorobutadiene	VOCSW8100	25 µg.kg ⁻¹
Naphthalene	VOCSW8100	25 µg.kg ⁻¹
1,2,3-Trichlorobenzene	VOCSW8100	25 µg.kg ⁻¹

Method Key:

AE GCMS	Aqueous extraction followed by gas chromatography mass spectroscopy
AMMAR	Determination of Exchangeable Ammonium in Soil using potassium chloride extraction, discrete colorimetric detection
FTIRSWPER	Determination of Tetrachloroethylene extractable aliphatic hydrocarbons by Fourier Transform Infrared spectroscopy (FTIR)
GCMS	Direct injection gas chromatography mass spectroscopy
ICPBOR	Determination of Boron in soil samples by hot water extraction followed by ICPOES detection
ICPMS	Inductively coupled plasma mass spectroscopy
ICPMSSD	Determination of Metals in soil samples by Hydrofluoric Acid digestion followed by ICPMS
ICPOES	Inductively coupled plasma atomic emission spectroscopy
ISEFSS	Determination of Fluoride by Ion Selective Electrode in 5:1 water soil extract
KONECL	Determination of Chloride in Soil using water extraction at the stated water: soil ratio, discrete colorimetric detection
KoneNO3	Determination of Nitrate in soil samples by water extraction followed by colorimetric detection
KONENS	Determination of Nitrate in soil samples by water extraction followed by colorimetric detection
L/LE GCMS	Liquid/liquid extraction followed by gas chromatography-mass spectroscopy
PHSOIL	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
SVOCMSUS	Determination of Semi Volatile Organic Compounds in soil samples by hexane / acetone extraction followed by GCMS detection
SVOCSW	Determination of Semi Volatile Organic Compounds in soil samples by DCM extraction followed by GCMS detection
TMMS1	Determination of total Metals in sediment samples by Nitric Acid and Hydrogen Peroxide digestion followed by ICPMS detection
TMOES	Determination of total Metals in samples by Hydrofluoric and Boric Acid digestion followed by ICPOES
TMSS	Determination of the Total Moisture content at 105°C by loss on oven drying gravimetric analysis
TPHFIDUS	Determination of hexane/acetone extractable Hydrocarbons in soil with GCFID detection.
TSBRE1	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

UV-SPEC	p-Dimethylaminobenzaldehyde is added to the acidified aqueous sample. The resulting azine concentration is determined using UV-visible spectrophotometry.
VOCSW8100	Determination of Volatile Organic Compounds (VOC) by purge and trap followed by GCMS detection
WSLM59	Determination of Organic Carbon in soil using sulphurous Acid digestion followed by high temperature combustion and IR detection

2.5 Radionuclide sample handling and analysis

Surface water samples were acquired for radionuclide analysis using a clean plastic bucket and transferred into clean plastic containers. The containers were placed in a cool box and kept cool (< 5 °C) before being transferred to the Cefas Radioanalytical Service Laboratory for the analyses shown in **Table 8**.

Table 8 The radionuclide analyses conducted on surface sea water samples by Cefas Radioanalytical Laboratory.

Analysis	Method
Gross Alpha activity	Acetone extraction followed by analysis using a low background gas flow proportional counter.
Gross Beta activity	
Tritium activity	Oxidant reflux and alkaline distillation followed by liquid scintillation spectrometry
Gamma spectrometry	Analysis using hyper-pure germanium detectors
Carbon-14 activity	Gel scintillation using a liquid scintillation spectrometer.

3 Results and Discussion

The results of the on-board analyses and CTD profiles conducted by Cefas are shown in Section 3.1 below. Section 3.2 contains the results of the chemical analyses conducted by Scientifics Ltd and TZW. The results of the SDI and MFI analyses conducted by WRc Ltd are contained in a report produced by WRc Ltd and presented here in Appendix B.

3.1 On-board analysis results

The on-board analyses conducted by Cefas were designed to measure the levels of TRO present in waters off the Suffolk coast near Sizewell. Dissolved oxygen, temperature, salinity and pH were also measured. The results of these analyses are shown in **Table 9** and **Figure 10** and **Figure 11**. Omitted values indicate failure of the relevant sensor (dissolved oxygen, temperature, salinity or pH) whilst offshore. Each TRO measurement is the mean of nine separate analyses: triplicate analyses carried out on three separate water sub-samples. Individual analysis results of zero were considered as 0.01 mg.l⁻¹, half of the limit of detection. The EQS for TRO is 0.01 mg.l⁻¹ (Defra, 2010).

3.1.1 CTD profiles

The CTD profiles acquired (see **Figure 6**) indicated that the water samples were well mixed with respect to salinity. The water expelled from the cooling water outfall is warmer than the surrounding waters. This results in a thermally buoyant plume, and this was evident in the surface water temperature measurements observed in some of the CTD profiles. In **Figure 6**, the surface water temperature is clearly elevated by several degrees at Station 5 (the cooling water outfall). At Station 2 (2.4 km distant) no temperature elevation is observed. The data from the CTD are not presented in this report but are available in the BEEMS data centre (see Table 1).

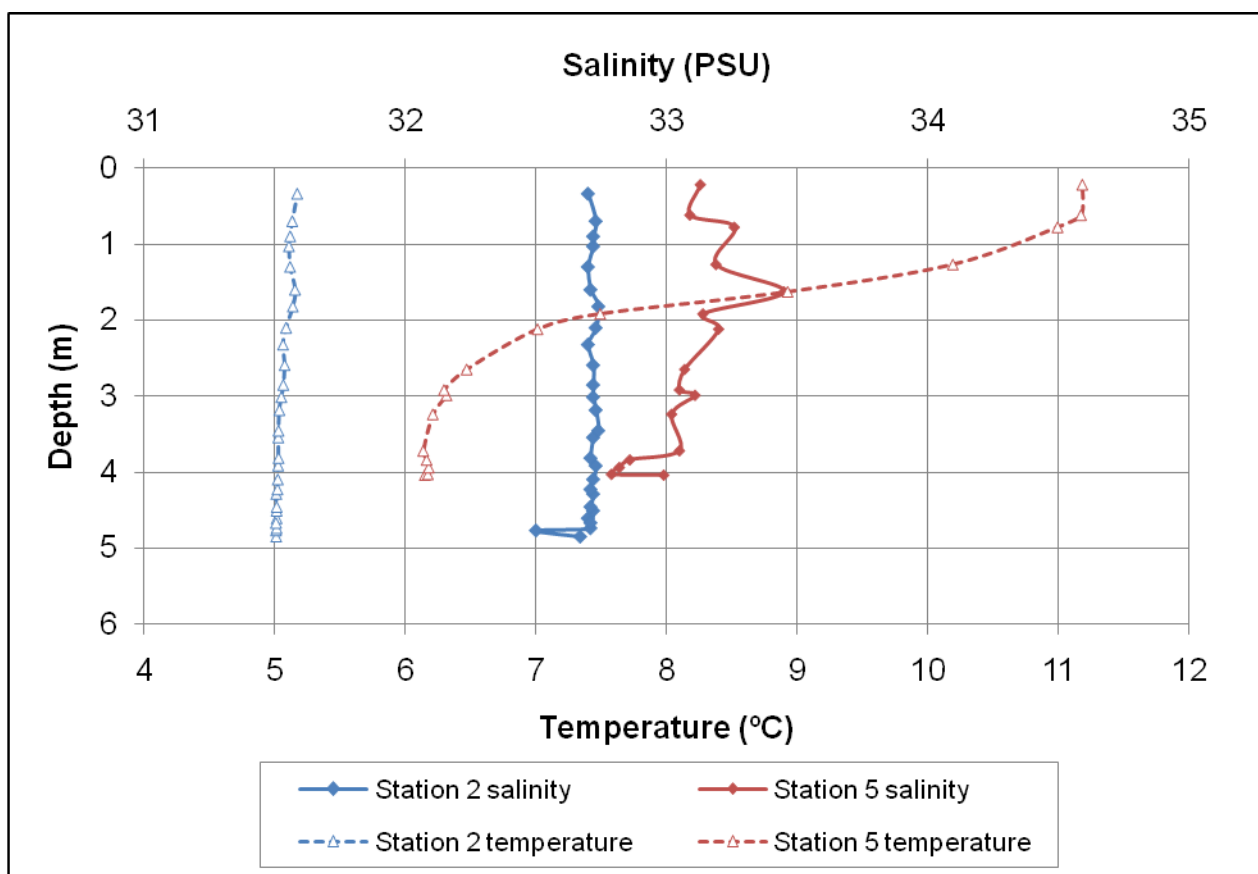


Figure 6 Example CTD profiles acquired on 25 February 2010

Table 9 Water quality and TRO measurement results. TRO concentrations of $\leq 0.01 \text{ mg.l}^{-1}$ are below the limit of detection with zero values counted as 0.01 mg.l^{-1} . Trends in TRO concentration are shown in **Figure 10** and **Figure 11**.

Station	Date acquired	Time (GMT)	Sample depth (m)	Dissolved oxygen (%)	Temp (°C)	Salinity (PSU)	pH	TRO (mg.l ⁻¹)
1	07/04/10	11:40	0.0					0.07
1	07/04/10	11:50	4.8					0.05
1	06/12/10	12:30	0.0	98.5	5.3	34.4	8.40	0.01
2	25/02/10	09:45	0.0	106.0	4.7	31.8	7.86	0.03
2	15/12/10	12:10	0.0	99.2	4.9	34.1	7.97	0.01
3	25/02/10	10:38	0.0	108.0	7.4	31.9	7.93	0.03
3	25/02/10	11:25	3.7	107.0	7.2	31.8	7.95	0.04
3	06/12/10	11:40	0.0	100.8	7.2	34.0	8.20	0.01
4	25/02/10	12:20	0.0	119.0	9.8	32.2	7.89	0.06
4	15/12/10	12:40	0.0	100.2	5.3	34.1	8.08	0.01
5	25/02/10	13:05	0.0	118.0	10.9	32.3	8.03	0.02
5	25/02/10	13:25	4.4	112.0	8.7	32.2	7.93	0.03
5	02/03/10	11:00	0.0	91.7	4.9	31.5	7.42	0.04
5	02/03/10	12:00	0.0	98.3	8.9	32.0	7.96	0.03
5	02/03/10	13:00	0.0	93.0	8.2	31.8	7.93	0.04
5	02/03/10	14:00	0.0		9.2	31.9	7.90	0.02
5	02/03/10	15:00	0.0		8.3	32.6	7.96	0.07
5	02/03/10	16:00	0.0		10.1	32.5	8.01	0.02
5	02/03/10	17:00	0.0		11.8	32.4	7.97	0.02
5	02/03/10	18:00	0.0		11.6	32.2	8.04	0.03
5	02/03/10	19:00	0.0		5.9	32.2	7.92	0.03
5	02/03/10	20:00	0.0		9.2	32.3	7.88	0.02
5	02/03/10	21:00	0.0		7.5	31.9	7.87	0.02
5	02/03/10	22:00	0.0		7.4	32.0	7.92	0.04
5	02/03/10	23:00	0.0		6.8	31.9	7.87	0.07
5	08/04/10	17:30	0.0	104.5	7.7	33.4	8.16	0.02
5	21/04/10	09:45	0.0	102.9	8.9		8.00	0.05
5	19/05/10	08:45	0.0	102.9	11.6	33.7	8.15	0.10
5	07/06/10	11:10	0.0	108.3	14.4	33.9	8.23	0.10
5	22/06/10	09:15	0.0	99.3	14.9	32.8	8.12	0.01
5	06/07/10	01:20	0.0	103.4	18.4	32.2	8.06	0.01
5	20/07/10	13:45	0.0	94.3	19.5	33.0	8.02	0.05
5	11/08/10	09:20	0.0	98.4	19.2	34.2	7.77	0.12
5	18/08/10	10:15	0.0	97.6	17.8	34.3	7.85	0.05
5	09/09/10	10:00	0.0	94.0	18.2	33.8	7.07	0.07
5	14/09/10	10:45	0.0	97.2	17.0	30.2	8.27	0.07
5	28/09/10	10:50	0.0	97.2	15.4	33.6	8.16	0.08
5	14/10/10	10:15	0.0	96.9	15.3	32.2	8.06	0.03
5	15/11/10	12:00	0.0	108.8	15.4	32.3	8.03	0.10

Station	Date acquired	Time (GMT)	Sample depth (m)	Dissolved oxygen (%)	Temp (°C)	Salinity (PSU)	pH	TRO (mg.l ⁻¹)
5	06/12/10	11:08	0.0	100.9	5.9	34.1	8.17	0.01
5	15/12/10	11:40	0.0	99.8	5.9	34.1	8.12	0.01
5	17/01/11		0.0	102.7	5.5	34.4	8.12	0.02
5	31/01/11	14:00	0.0	112.6	10.6	33.5	8.02	0.03
5	14/02/11	13:30	0.0	112.5	10.1	34.5	8.10	0.07
6	07/04/10	13:15	0.0					0.03
6	15/12/10	11:15	0.0	98.7	5.2	34.2	8.05	0.02
7	08/04/10	16:15	0.0	105.0	7.8	33.2	8.15	0.01
7	08/04/10	16:30	7.0	107.8	7.7	33.1	8.14	0.04
7	31/01/11	11:20	0.0	101.3	4.9	33.4	8.00	0.01
8	08/04/10	15:45	0.0	109.4	8.7	32.8	8.11	0.03
8	31/01/11	10:55	0.0	101.7	4.9	33.3	8.05	0.02
9	08/04/10	14:00	0.0	101.8	9.1	32.7	8.12	0.10
9	08/04/10	14:30	5.0	104.4	8.6	33.4	8.10	0.02
9	17/01/11	14:30	0.0	100.1	4.5	34.1	8.13	0.06
10	07/04/10	10:20	0.0					0.01
10	07/04/10	10:30	11.0					0.06
10	31/01/11	09:20	0.0	99.4	3.7	33.3	7.89	0.01
10	14/02/11	11:00	10	103.0	6.1	35.2	8.03	0.01
11	07/04/10	13:45	0.0					0.05
11	21/04/10	10:45	0.0	100.8	8.5		7.99	0.03
11	19/05/10	09:45	0.0	100.1	10.5	33.8	8.18	0.03
11	07/06/10	10:35	0.0	109.1	13.3	34.0	8.23	0.06
11	22/06/10	09:45	0.0	95.0	14.5	33.0	8.16	0.01
11	06/07/10	10:00	0.0	94.3	17.9	31.6	8.02	0.08
11	20/07/10	13:00	0.0	102.6	19.1	33.1	8.09	0.04
11	11/08/10	10:08	0.0	97.8	18.9	34.3	8.01	0.05
11	18/08/10	11:10	0.0	97.3	17.7	34.5	7.98	0.05
11	09/09/10	10:45	0.0	95.3	17.7	34.3	7.22	0.09
11	14/09/10	10:15	0.0	97.4	17.2	30.2	8.29	0.04
11	28/09/10	10:00	0.0	98.5	15.8	33.8	8.14	0.02
11	14/10/10	11:15	0.0	95.8	14.7	32.3	8.05	0.05
11	15/11/10	11:15	0.0	97.6	10.4	32.2	8.08	0.04
11	06/12/10	10:30	0.0	97.5	5.2	34.2	7.97	0.03
11	15/12/10	10:38	0.0	97.0	4.8	34.1	8.13	0.01
11	17/01/11	16:00	0.0	99.8	4.4	34.6	8.12	0.04
11	31/01/11	10:10	0.0	98.5	3.8	33.4	8.04	0.02
11	14/02/11	12:45	0.0	101.4	5.1	34.5	8.08	0.04
12	08/04/10	11:30	0.0	108.6	8.8	33.2	8.07	0.16
12	08/04/10	13:00	17.0	102.5	8.2	33.6	8.11	0.02
12	17/01/11	12:20	14.0	100.3	4.8	34.2	8.21	0.09
12	17/01/11	12:20	0.0	100.1	4.7	34.3	8.10	0.09

3.2 Chemical analysis results

A range of chemical analyses were conducted by Scientifics Ltd (see Table 5). Some analyses for hydrazine were also conducted by DVGW-Technologiezentrum Wasser (TZW). Many of these analyses gave negative results, indicating that the analyte of interest was either absent from the sample or present at a concentration lower than the limit of detection. Those analyses for which no positive results were recorded for any of the samples in this report are shown in

Table 10, together with the relevant Environmental Quality Standard (EQS). EQS values were obtained from the Environmental Quality Standards Directive 2008/105/EC (2008) and the European Union Dangerous Substances Directive 76/464/EEC (1976). The Dangerous Substances Directive was codified as 2006/11/EC (2006) and has been integrated into the Water Framework Directive. The EQS values shown are marine standards relating to annual average levels. Positive results obtained are shown by station from **Table 11** to **Table 22**. **Table 23** shows the positive results from the tidal cycle survey. It should be noted that for some analyses (e.g. chloroform, mercury) the limit of detection is greater than the EQS.

3.2.1 Spatial and seasonal survey chemical analysis results

Many of the analytes were not detected, indicating that they were either not present or were present at concentrations below the limits of detection. These analytes are shown in Table 10. The results of analyses that gave results exceeding or equal to the relevant EQS concentrations (or where the EQS was lower than the limit of detection) are shown in **Table 11** to **Table 22**. Hydrazine analyses conducted by DVGW-Technologiezentrum Wasser (TZW) are marked "TZW". Full results are shown in **Appendix A**. For mass spectrometry techniques, certain compounds may be detected but their identification may be tentative. Where these results are reported (**Table 35** to **Table 46**) negative results are marked as "ND" indicating "none detected", as the limits of detection may not be readily quantifiable.

The spatial survey provide measurements indicating background conditions against which the results obtained near the cooling water outfall can be compared. For most of the analyses no clear trend was evident when surface and near-bed samples were compared. This is consistent with a well-mixed water column as indicated by the CTD profiles acquired. Nitrate and phosphate were detected in surface water samples only. Total petroleum hydrocarbons were also present in surface samples at higher concentrations than in near-bed samples. Concentrations of zinc, nickel and cadmium were higher in near-bed samples than in surface samples. The possibility that benthic sediments are a source of these metals is supported by the fact that these metals are present in the sediments at concentrations two or three orders of magnitude greater than those measured in the water samples. In general, little difference was evident between the analysis results from Stations 1 to 9 (inshore of Sizewell Bank) and Stations 10 to 12 (offshore of Sizewell Bank). The concentrations of lead measured inside Sizewell Bank were higher than outside, and bromoform was detected on seven occasions, always at Station 5, the cooling water outfall.

Table 10 Water sample analyses with no positive results; the analyte was either not present or present at undetectable levels. Detection limits are given as $\mu\text{g.l}^{-1}$ unless otherwise stated.

Analysis	Limit of detection ($\mu\text{g.l}^{-1}$)	EQS ($\mu\text{g.l}^{-1}$)
Lead as Pb (Dissolved)	1	7.2
Barium as Ba (Dissolved)	10	
Dichloroacetonitrile	10	
Ethanolamine	20 mg.l^{-1}	
Phenol	20	
Bis (2-Chloroethyl) ether	5	
2-Chlorophenol	20	50
1,3-Dichlorobenzene	5	
1,4-Dichlorobenzene	5	
Benzyl alcohol	5	
1,2-Dichlorobenzene	5	
2-Methylphenol	5	
Hexachloroethane	5	
N-Nitroso-di-n-propylamine	5	
3- & 4-Methylphenol	20	
Nitrobenzene	5	
Isophorone	5	
2-Nitrophenol	20	
2,4-Dimethylphenol	20	
Benzoic Acid	100	
Bis (2-Chloroethoxy) methane	5	
2,4-Dichlorophenol	20	20
1,2,4-Trichlorobenzene	5	0.4
Naphthalene	2	5
4-Chlorophenol	20	
4-Chloroaniline	5	
Hexachloro-butadiene	5	0.1
4-Chloro-3-methylphenol	5	40
Hexachlorocyclopentadiene	5	
2,4,6-Trichlorophenol	20	
2,4,5-Trichlorophenol	20	
2-Chloronaphthalene	2	
Diphenyl ether	2	
2-Nitroaniline	5	

Analysis	Limit of detection ($\mu\text{g.l}^{-1}$)	EQS ($\mu\text{g.l}^{-1}$)
Chrysene	2	
3,3'-Dichlorobenzidine	20	
Di-n-octylphthalate	2	
Benzo[b]fluoranthene	2	0.03
Dichlorodifluoro-methane	1	
Chloromethane	1	
Vinyl Chloride	1	
Bromomethane	5	
Chloroethane	5	
Trichlorofluoro-methane	1	
1,1-Dichloroethene	1	
trans 1,2-Dichloroethene	1	
1,1-Dichloroethane	1	
2,2-Dichloropropane	1	
cis 1,2-Dichloroethene	1	
Bromochloro-methane	1	
Chloroform	5	2.5
1,1,1-Trichloroethane	1	100
Carbon Tetrachloride	1	12
1,1-Dichloropropene	1	
Benzene	1	8
1,2-Dichloroethane	1	10
Trichloroethene	5	10
1,2-Dichloropropane	1	
Dibromomethane	1	
Bromodichloro-methane	1	
cis 1,3-Dichloropropene	1	
trans 1,3-Dichloropropene	1	
1,1,2-Trichloroethane	1	300
Tetrachloroethene	5	10
1,3-Dichloropropene	1	
Dibromochloro-methane	1	
1,2-Dibromoethane	1	
Chlorobenzene	1	

Analysis	Limit of detection (µg.l ⁻¹)	EQS (µg.l ⁻¹)
Acenaphthylene	2	
Dimethylphthalate	5	
2,6-Dinitrotoluene	5	
3-Nitroaniline	5	
2,4-Dinitrophenol	10	
4-Nitrophenol	50	
2,4-Dinitrotoluene	5	
Diethylphthalate	5	
4-Chlorophenyl-phenylether	5	
4,6-Dinitro-2-methylphenol	50	
4-Nitroaniline	5	
N-Nitrosodiphenyl-amine	5	
4-Bromophenyl-phenylether	5	
Hexachlorobenzene	5	0.01
Pentachlorophenol	50	0.4
Di-n-butylphthalate	5	
Butylbenzyl-phthalate	5	
Benzo[a]anthracene	2	

Analysis	Limit of detection (µg.l ⁻¹)	EQS (µg.l ⁻¹)
1,1,1,2-Tetrachloroethane	1	
Styrene	1	
1,1,2,2-Tetrachloroethane	1	
Bromobenzene	1	
1,2,3-Trichloropropane	1	
2-Chlorotoluene	1	
4-Chlorotoluene	1	
tert-Butylbenzene	1	
1,3-Dichlorobenzene	1	
1,4-Dichlorobenzene	1	
n-Butylbenzene	1	
1,2-Dichlorobenzene	5	
1,2-Dibromo-3-chloropropane	5	
1,2,4-Trichlorobenzene	5	0.4
Hexachlorobutadiene	5	0.1
Naphthalene	2	5
1,2,3-Trichlorobenzene	5	0.4

Table 11 Station 1 spatial survey water sample analysis results which exceed the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 1 was located 10 km from the cooling water outfall.

Analysis – Station 1	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			7/4/10 Surface	7/4/10 Near-bed	6/12/10 Surface
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.006	0.003
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.012	0.046	0.008
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.016	0.016	0.031
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	0.003	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		0.003	< 0.002	< 0.002

Table 12 Station 2 spatial survey water sample analysis results which exceed the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 2 was located 2.4 km from the cooling water outfall.

Analysis – Station 2	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
bis(2-Ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002

Table 13 Station 3 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 3 was located 1.1 km from the cooling water outfall.

Analysis – Station 3	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			25/2/10 Surface	25/2/10 Near-bed	6/12/10 Surface
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.011	0.011	0.031
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	0.0001	0.0001	0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
bis(2-Ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002

Table 14 Station 4 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 4 was located 0.6 km from the cooling water outfall.

Analysis – Station 4	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.005
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	0.0002	< 0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002

Table 15 Station 5 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 5 was located at the cooling water outfall.

Analysis – Station 5	Units	EQS (annual average concn.)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.004	0.004	0.003	0.003	0.004	0.003	0.004	0.002	0.004	0.003	0.008	0.007	0.006	0.004	0.005	0.004	0.003	0.004	0.005	0.005	0.004
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.011	0.011	0.018	0.017	0.018	0.014	0.022	0.014	0.023	0.017	0.016	0.014	0.015	0.017	0.02	0.019	0.03	0.017	0.025	0.025	0.027
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	0.0002	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	0.0001	0.0001	< 0.0001
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002	< 0.002	0.026	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	0.007	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl) phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo[k] fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd] pyrene	mg.l ⁻¹	0.000002 (sum of concn.)	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i] perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Table 16 Station 6 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Station 6 was located 0.5 km from the cooling water outfall.

Analysis – Station 6	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			07/04/10 Surface	15/12/10 Surface
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹	(sum of concns)	< 0.002	< 0.002

Table 17 Station 7 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 7 was located 1.1 km from the cooling water outfall.

Analysis – Station 7	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	31/01/11 Surface
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.003	0.006
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.002	< 0.002	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹	(sum of concns)	< 0.002	< 0.002	< 0.002

Table 18 Station 8 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 8 was located 2.4 km from the cooling water outfall.

Analysis – Station 8	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			08/04/10 Surface	31/01/11 Surface
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.006
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.018	0.025
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002

Table 19 Station 9 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 9 was located 12 km from the cooling water outfall.

Analysis – Station 9	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.004	0.005
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.018	0.054	0.022
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.019	0.019	0.028
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.002	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	0.004	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		0.004	< 0.002	< 0.002

Table 20 Station 10 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 10 was located 10.8 km from the cooling water outfall.

Analysis – Station 10	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			07/04/10 Surface	07/04/10 Near-bed	31/01/11 Surface	14/02/11 Near-bed
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.003	0.007	0.007
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.013	0.043	0.018	0.516
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.017	0.017	0.023	0.029
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl) phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002

Table 21 Station 11 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 11 was located 3.5 km from the cooling water outfall.

Analysis – Station 11	Units	EQS (annual average concn.)	Concentration/value (ND = none detected)																		
			07/04/10 surface	21/04/10 surface	19/05/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.002	0.003	0.003	0.004	0.004	0.002	0.004	0.003	0.005	0.007	0.016	0.004	0.005	0.01	0.003	0.007	0.005	0.01	0.004
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.012	0.009	0.007	0.008	0.006	0.003	0.006	0.008	0.006	0.009	0.009	0.009	0.007	0.007	0.008	0.02	0.041	0.011	0.022
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.018	0.018	0.018	0.015	0.022	0.015	0.023	0.018	0.016	0.014	0.015	0.016	0.02	0.019	0.031	0.017	0.024	0.025	0.03
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concn.)	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Table 22 Station 12 spatial survey water sample analysis results which exceed or equal the relevant EQS or where the limit of detection is greater than the EQS. Negative results are presented as less than the limit of detection. Station 12 was located 11.6 km from the cooling water outfall.

Analysis – Station 12	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface	17/01/11 Near-bed
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.004	0.007	0.007
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.009	0.08	0.158	0.182
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.02	0.02	0.027	0.028
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001	0.0001
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl) phthalate	mg.l ⁻¹	0.0013	< 0.005	0.009	< 0.005	0.015
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹	(sum of concns)	< 0.002	< 0.002	< 0.002	< 0.002

3.2.2 Tidal cycle survey results

On 2 March 2010 surface water samples were acquired at station 5 (the cooling water outfall, see **Figure 1**) at hourly intervals between 11:00 and 23:00 UTC. The results are shown in **Table 23**. This survey provided results (see **Table 23**) indicating that most parameters do not show a tidally-driven pattern of variation. Exceptions to this are turbidity and suspended solids. The concentration of suspended solids was at its lowest shortly after local high and low water, and maxima occurred during the mid-tide periods of peak flow when resuspension of sediments would be expected to be greatest, a pattern also followed by turbidity (**Figure 7**). The concentration of total petroleum hydrocarbons (TPH) measured by Fourier transform infrared spectroscopy (FTIR) also displays a tidal signal, showing a peak during the mid-ebb flow (**Figure 8**), though this peak is the result of a single high reading obtained at 15:00. Concentrations of arsenic and copper exceeded EQS levels for all or part of the tidal cycle survey, though neither showed a tidal signal (**Figure 9**).

Table 23 Station 5 tidal cycle survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. All of the samples represented in this table were surface water samples acquired during 2 March 2010.

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
pH	pH units		7.7	7.7	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Suspended Solids	mg.l ⁻¹		127	118	332	381	221	215	278	180	108	328	437	134	182
Total Alkalinity as CaCO ₃	mg.l ⁻¹		121	121	121	123	123	127	123	125	126	128	124	126	130
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		121	121	121	123	123	127	123	125	126	128	124	126	130
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0	0	0	0	0	0	0	0	0	0	0
Chloride as Cl	mg.l ⁻¹		9730	11800	12900	13400	15300	15000	10200	12200	14100	13900	12600	11700	13500
Fluoride as F	mg.l ⁻¹		1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.6	1.3	1.3	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2550	2580	2600	2520	2590	2640	2630	2680	2690	2570	2570	2720	2640
Calcium as Ca (Total)	mg.l ⁻¹		241	251	243	254	247	243	247	243	258	240	232	211	248
Calcium as Ca (Dissolved)	mg.l ⁻¹		240	242	240	237	237	243	240	241	240	240	239	233	239
Magnesium as Mg (Total)	mg.l ⁻¹		1270	1240	1210	1250	1230	1200	1250	1280	1360	1240	1350	1140	1340
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1200	1220	1190	1200	1220	1200	1200	1250	1330	1210	1190	1250	1240
Strontium as Sr (Total)	mg.l ⁻¹		4.38	4.45	4.35	4.57	4.41	4.39	4.43	4.39	4.65	4.36	4.26	3.88	4.52
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.26	4.32	4.33	4.32	4.36	4.37	4.35	4.33	4.27	4.32	4.29	4.24	4.25
Sodium as Na	mg.l ⁻¹		10500	10300	10500	10500	10300	10900	10900	10900	10300	10700	10600	10500	11000

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
(Dissolved)															

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Potassium as K (Total)	mg.l ⁻¹		559	584	560	601	565	567	578	592	622	576	585	519	606
Potassium as K (Dissolved)	mg.l ⁻¹		551	554	547	541	549	562	567	580	589	561	555	574	572
Nickel as Ni (Total)	mg.l ⁻¹		0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.004	0.004	0.004	0.004
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.006	0.007	0.005	0.005	0.005	0.004	0.004	0.004	0.005	0.004	0.005	0.005	0.005
Chromium as Cr (Total)	mg.l ⁻¹		0.002	0.002	0.003	0.001	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	0.005	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.002
Cadmium as Cd (Total)	mg.l ⁻¹		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.015	0.011	0.009	0.007	0.007	0.006	0.007	0.007	0.006	0.007	0.007	0.006	0.005
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.005	0.025	0.012	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.007	0.006
Lead as Pb (Total)	mg.l ⁻¹		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.009	0.007	0.008	0.007	0.012	0.008	0.009	0.007	0.007	0.008	0.011	0.009	0.008
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.008	0.007	0.007	0.007	0.009	0.009	0.009	0.008	0.009	0.008	0.011	0.009	0.008
Manganese as Mn (Dissolved)	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron as Fe (Total)	mg.l ⁻¹		0.07	0.11	0.9	0.14	1.07	0.07	0.4	0.06	0.25	0.06	0.06	0.13	0.3
Iron as Fe (Dissolved)	mg.l ⁻¹	1	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aluminium as Al	mg.l ⁻¹		0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
(Dissolved)															

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Arsenic as As (Total)	mg.l ⁻¹		0.018	0.018	0.017	0.016	0.017	0.023	0.015	0.023	0.018	0.03	0.028	0.003	0.021
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.021	0.024	0.025	0.027	0.029	0.031	0.031	0.033	0.035	0.035	0.036	0.039	0.039
Boron as B (Total)	mg.l ⁻¹		4.71	4.39	4.42	4.63	4.43	4.28	4.55	4.54	4.74	4.38	4.77	4.02	4.66
Boron as B (Dissolved)	mg.l ⁻¹		4.44	4.32	4.2	4.22	4.2	4.2	4.19	4.35	4.61	4.22	4.14	4.34	4.32
Mercury as Hg (Total)	mg.l ⁻¹		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.044	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium as Se (Total)	mg.l ⁻¹		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum as Mo (Total)	mg.l ⁻¹		0.011	0.008	0.009	0.008	0.008	0.008	0.009	0.008	0.006	0.009	0.009	0.008	0.007
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.011	0.011	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cobalt as Co (Total)	mg.l ⁻¹		<0.001	0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.46	0.46	0.46	0.46	0.2	0.45	0.45	0.2	0.2	0.45	0.43	0.2	0.43
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Phosphate as P	mg.l ⁻¹		0.07	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		160	150	180	160	220	190	180	160	190	220	120	210	210

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Total Organic Carbon	mg.l ⁻¹		0.49	0.57	0.48	0.55	0.52	0.44	0.48	0.47	0.49	0.55	0.54	0.5	0.54
Salinity	ppt		38	38	38.4	38.4	38.9	38.8	39.1	38.8	38.3	38.6	38.3	38.5	38.7
Turbidity N.T.U	NTU		78	200	220	250	200	150	200	120	110	190	310	140	110
Bromide as Br	mg.l ⁻¹		185	230	188	170	190	191	199	210	204	170	172	190	168
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Silicon as Si (Total)	mg.l ⁻¹		0.4	0.5	1.2	0.5	1.2	0.4	0.8	0.4	0.5	0.4	0.4	0.4	0.6
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		3.0	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.55	0.58	0.54	0.5	0.52	0.46	0.53	0.54	0.58	0.53	0.54	0.47	0.52
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		< 0.3	< 0.3	0.3	0.4	15.8	0.5	0.4	0.3	< 0.3	< 0.3	< 0.3	< 0.3	1
Total Viable Count @ 22°C	Counts .ml ⁻¹		1504	1376	704	352	288	320	608	416	296	528	456	576	688
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		0.05	< 0.01	0.04	< 0.01	< 0.01	< 0.01	0.01	0.03	0.02	0.02	0.01	< 0.01	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	1.6	3.2	< 1.0	< 1.0	< 1.0	< 1.0	1.6

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Hydrazine	µg.l ⁻¹		0.5	0.5	0.5	10	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Morpholine	mg.l ⁻¹		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bis (2-Chloroisopropyl) ether	mg.l ⁻¹		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Methylnaphthalene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1-Methylnaphthalene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Biphenyl	mg.l ⁻¹	0.025	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibenzofuran	mg.l ⁻¹		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluorene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Phenanthrene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Anthracene	mg.l ⁻¹	0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Fluoranthene	mg.l ⁻¹	0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Pyrene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
bis(2-Ethylhexyl) phthalate	mg.l ⁻¹		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo[k] fluoranthene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo[a]pyrene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dibenzo[a,h]	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Analysis – Station 5 (ND = None detected)	Units	EQS	Time sampled (UTC)												
			11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
anthracene															
Benzo[g,h,i] perylene	mg.l ⁻¹		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Toluene	µg.l ⁻¹	10	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m and p-Xylene	µg.l ⁻¹	30	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg.l ⁻¹	30	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
iso-Propylbenzene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Propylbenzene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

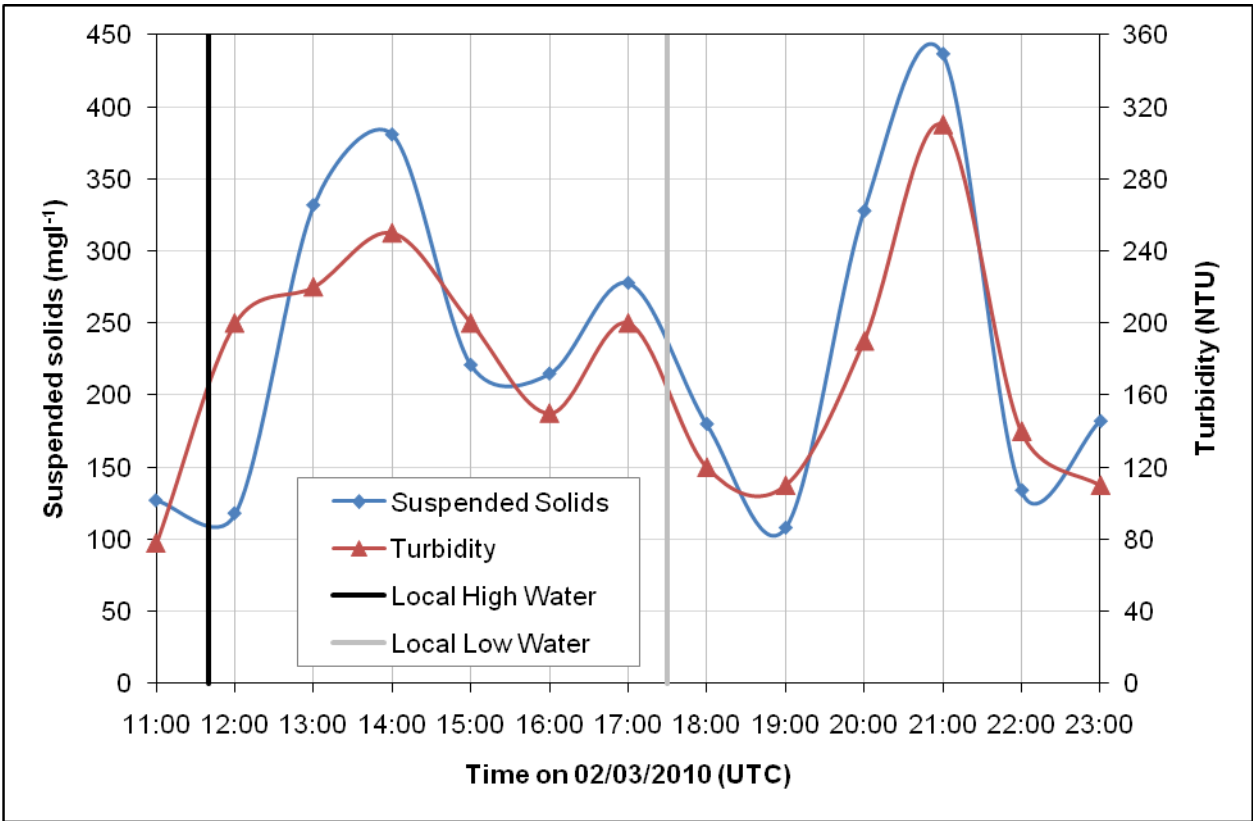


Figure 7 Suspended solids concentration and turbidity obtained during the tidal cycle survey (spring tide conditions) conducted at Station 5 (the cooling water outfall).

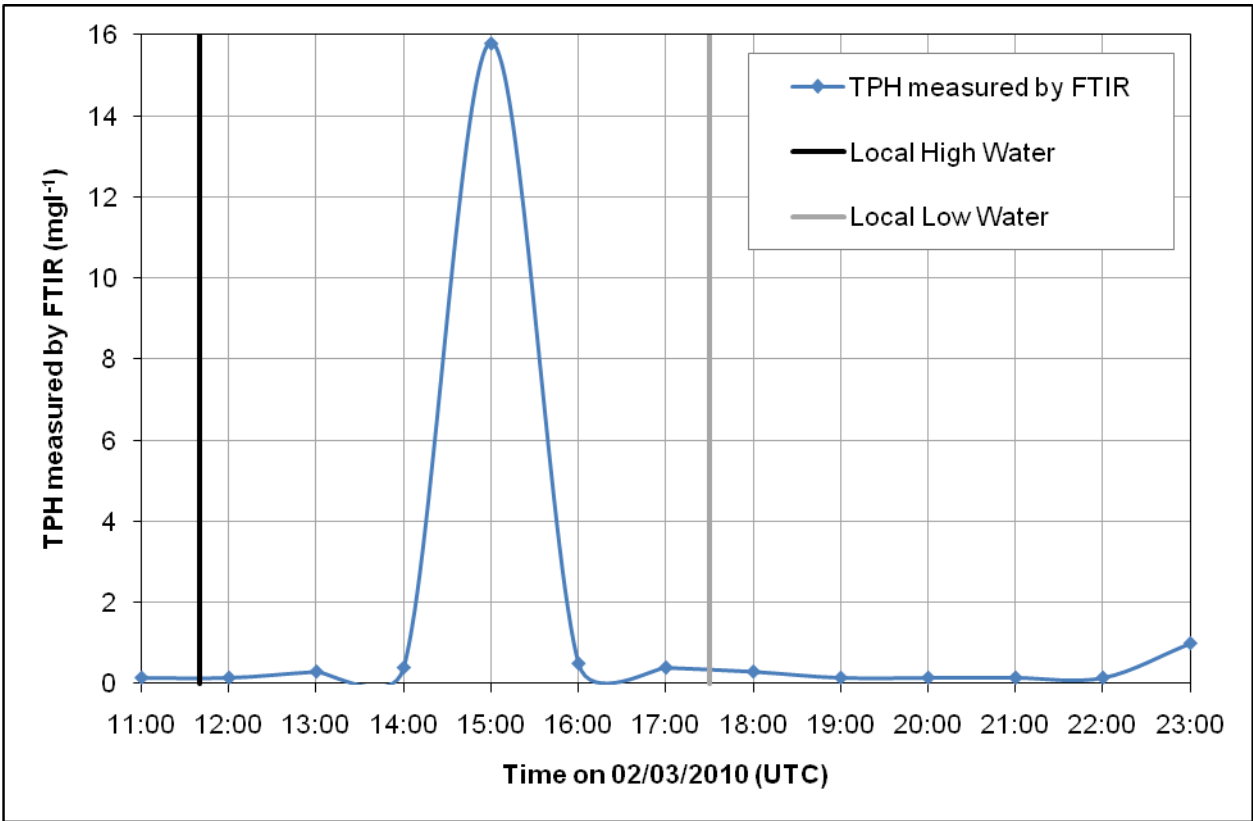


Figure 8 Total petroleum hydrocarbon concentration (TPH) measured by Fourier transform infrared spectroscopy (FTIR) and obtained during the tidal cycle survey conducted at Station 5 (the cooling water outfall).

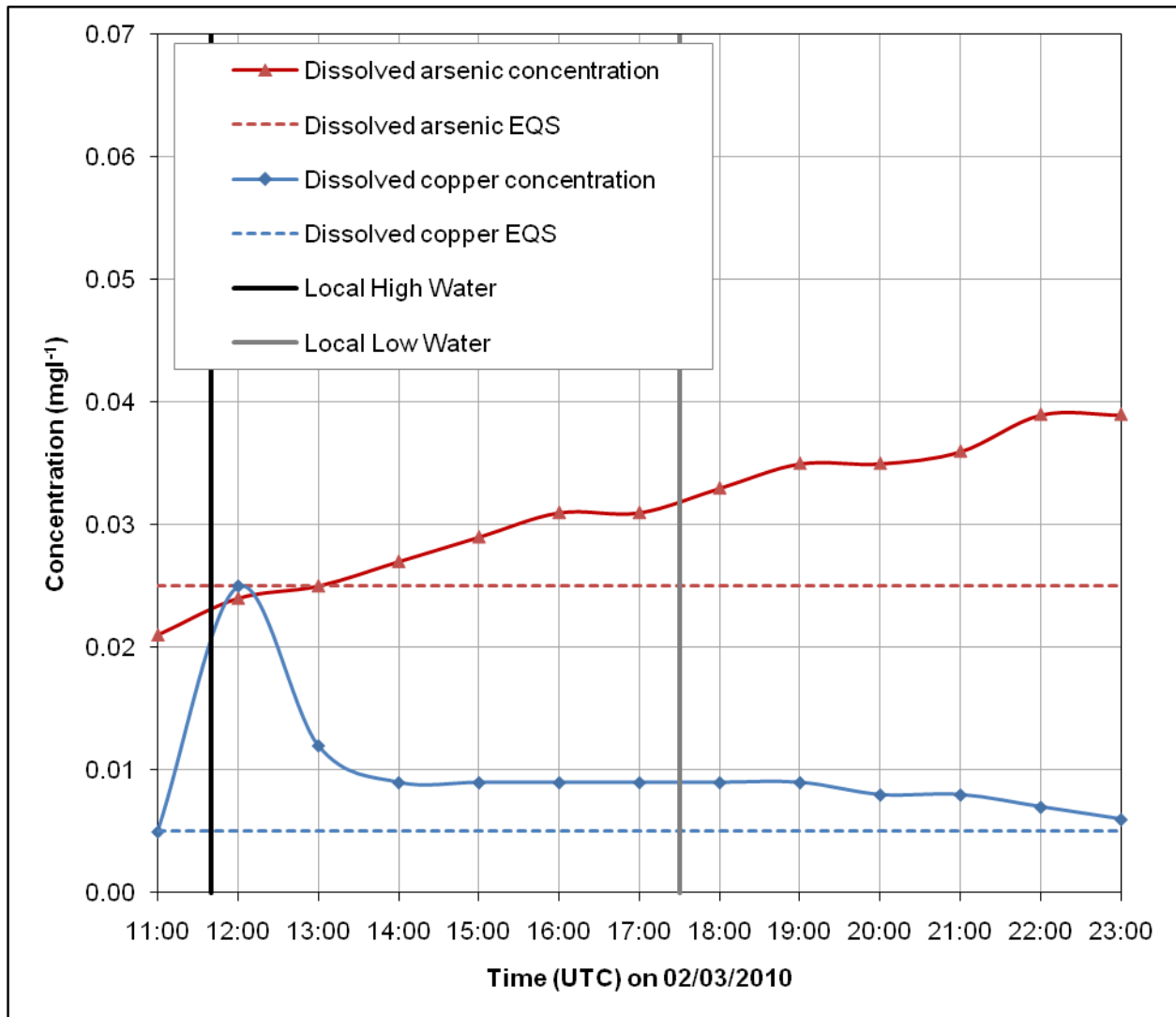


Figure 9 Dissolved arsenic and copper concentrations obtained during the tidal cycle survey conducted at Station 5 (the cooling water outfall).

3.2.3 Total Residual Oxidant (TRO)

TRO measurements (see Table 9) ranged from 0.01 mg.l⁻¹ to 0.16 mg.l⁻¹. Each TRO value in Table 9 was obtained by taking the mean of triplicate readings from three separate sub-samples. The limit of detection for the TRO analysis was 0.02 mg.l⁻¹ and negative (zero) analysis results were taken to be 0.01 mg.l⁻¹ (half of the limit of detection) when calculating the mean values for each station and their standard deviations. The mean values for each station are presented in **Figure 10** and also Table 24 where the numbers of individual readings and the standard deviations are also given. All of the stations showed mean concentrations within one standard deviation of the limit of detection. The mean of all individual readings (n = 725) taken was 0.04 mg.l⁻¹ (standard deviation 0.045).

TRO appears to be elevated at Station 5 compared with nearby stations along the coast (Stations 2, 3 and 4 to the north of the outfall and 6, 7 and 8 to the south). The TRO elevation reduces to limit of detection within 500 m to the north and 2.4 km to the south (at Stations 6 and 2 respectively). The highest mean TRO concentration was observed at Station 12, over 11 km south of the cooling water outfall, and the second highest at Station 9, 12 km south of the outfall. Stations 9 and 12 were sampled on two occasions during the survey programme on 08/04/2010 and 17/01/2011. The TRO measurements taken at other Stations on those days are presented in

Table 25. Some of the TRO measurements at stations other than 9 and 12 were average or lower than average for those stations (for instance at Stations 5 and 7), indicating that the measurements at Stations 9

and 12 were not the result of systematically elevated analyses on those days. This is reinforced by the observation that the TRO elevation observed at Stations 9 and 12 on the 08/04/2010 occurred in the surface samples only and not in the samples taken from near the seabed. These results do not suggest that TRO was regionally elevated because samples taken at other stations on the same day were unremarkable. The high TRO values therefore appear to be the result of localised TRO levels in the south of the survey area, or an unidentified factor causing spurious elevated readings. Manganese or chromium are known to have the potential to cause spurious elevated TRO readings (HACH, 2006) but no elevated levels of these substances were observed in the water samples from Stations 9 and 12. No spatial pattern exists to suggest that the elevated TRO at the southerly stations is linked to the Sizewell cooling water outfall.

Figure 11 shows that no clear temporal pattern of TRO was evident during a flood ebb cycle. The maximum mean TRO value occurred at 15:00 on the peak flow of the ebb tide, indicating increased TRO levels to the south of Sizewell. No similar maximum was observed during the peak flow of the flood tide. Peak concentrations of TRO might be expected to occur during slack water when water from the outfall can form a buoyant pool around the outfall structure rather than being advected away by the tidal flow. No such peaks are observed and so there is no evidence from this survey that TRO levels are driven by out-flowing cooling water beyond the localised increase observed in **Figure 10**.

Figure 12 shows the individual TRO measurements plotted against water temperature. Water temperature varies seasonally, but higher water temperatures also indicate samples containing a higher proportion of warm water from the outfall. No link between temperature and TRO is apparent: some high TRO measurements were acquired from cold water samples and some warm water samples gave low TRO readings.

Table 24 TRO measurements for each station

Station	Distance from outfall (km)	Mean TRO (mg.l ⁻¹)	Standard deviation	Number of readings
1	10	0.04	0.044	27
2	2.4	0.02	0.015	18
3	1.1	0.03	0.025	27
4	0.6	0.03	0.033	18
5	0.0	0.04	0.042	304
6	0.5	0.02	0.023	18
7	1.1	0.02	0.029	27
8	2.4	0.02	0.032	18
9	12.0	0.06	0.052	26
10	10.8	0.02	0.029	36
11	3.5	0.04	0.034	171
12	11.6	0.09	0.071	35
All stations	n/a	0.04	0.042	725

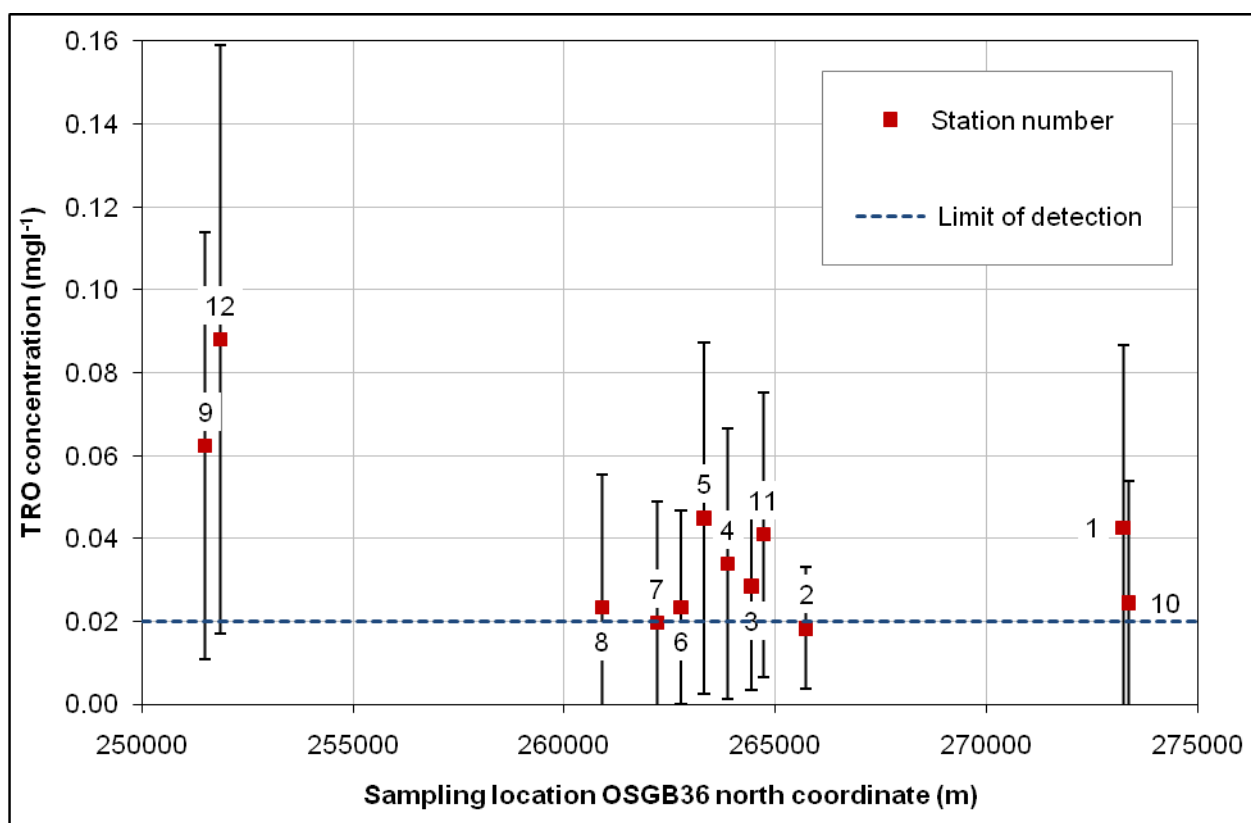


Figure 10 TRO values for each station plotted against the sample locations' north coordinates. Error bars show ± 1 standard deviation of the TRO measurements for that station.

Table 25 TRO analyses conducted on the days during which Stations 9 and 12 were sampled. Results from Stations 9 and 12 are highlighted in bold.

Sampling date	Station	Sample depth (m)	Mean TRO (mg.l ⁻¹)	Standard deviation	Number of TRO analyses carried out
08/04/2010	5	0	0.02	0.017	9
08/04/2010	7	0	0.01	0.000	9
08/04/2010	7	7	0.04	0.047	9
08/04/2010	8	0	0.03	0.041	9
08/04/2010	9	0	0.10	0.046	8
08/04/2010	9	5	0.02	0.031	9
08/04/2010	12	0	0.16	0.097	9
08/04/2010	12	17	0.02	0.016	9
17/01/2011	5	0	0.02	0.026	7
17/01/2011	9	0	0.06	0.048	9
17/01/2011	11	0	0.04	0.044	9
17/01/2011	12	0	0.09	0.016	9
17/01/2011	12	17	0.09	0.034	8

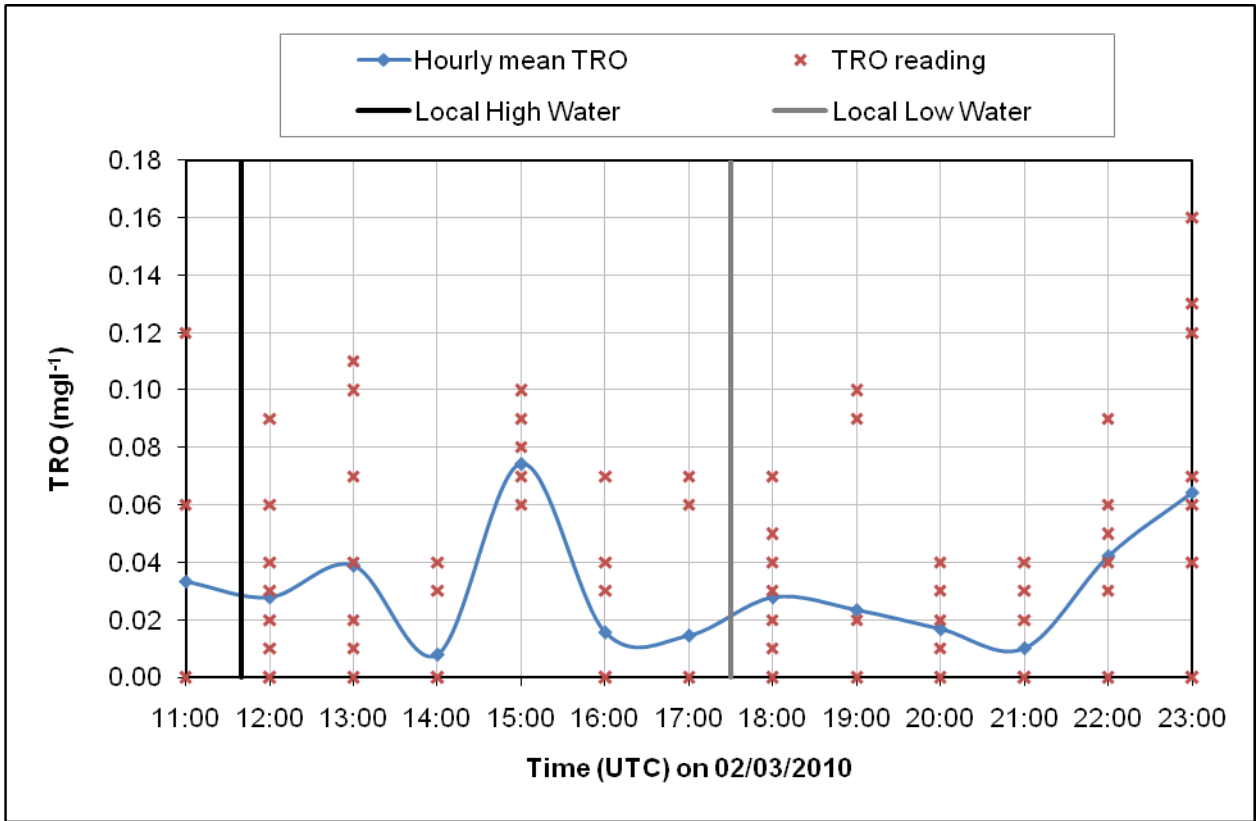


Figure 11 TRO values measured over a tidal cycle during spring tide conditions at Station 5

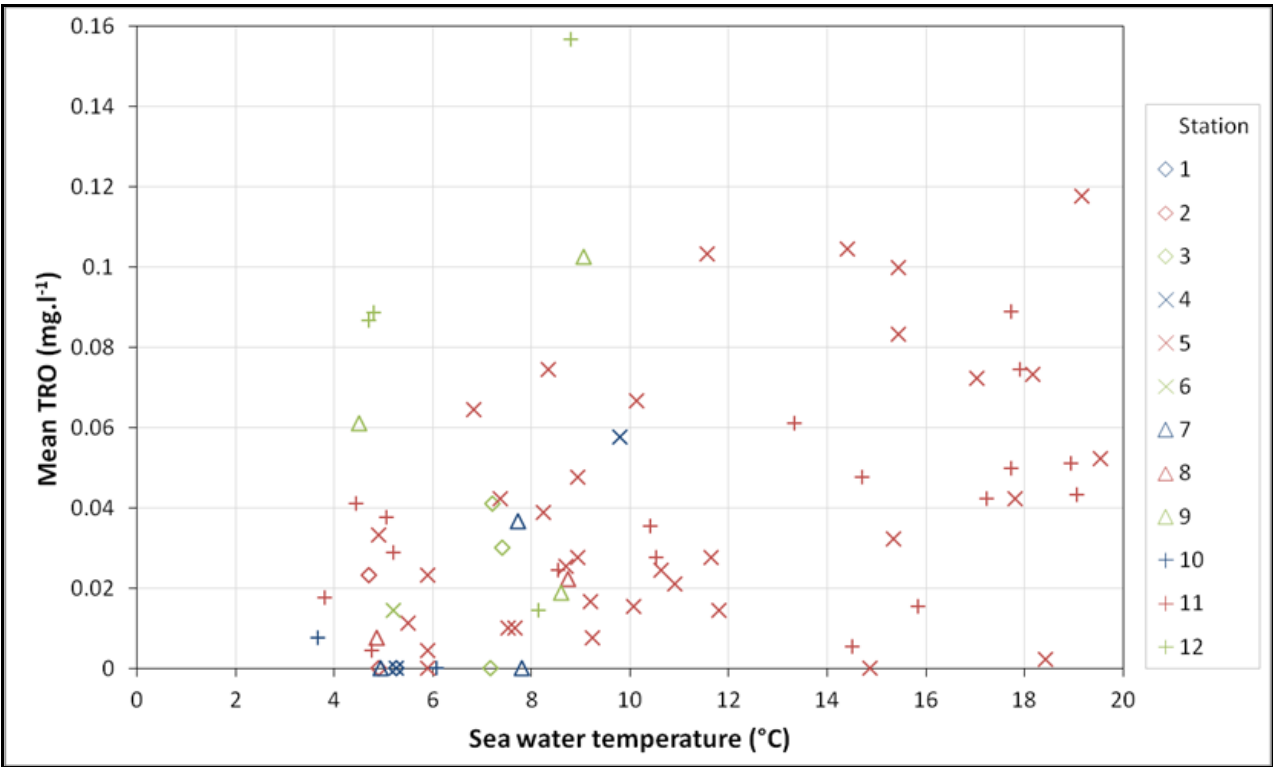


Figure 12 Individual TRO readings taken during the survey period plotted against water temperature.

3.2.4 Hydrazine

At the outset of the programme, the hydrazine analysis offered by Scientifics Ltd appeared to be the most suitable analysis for the proposed monitoring. Following the analysis of hydrazine results presented in BEEMS Technical Report TR130, Cefas were concerned about the validity of the relatively high concentrations of hydrazine apparently being detected. From August 2010 triplicate hydrazine samples (instead of a single sample) were acquired and analysed for each station visited. Surface water samples were also acquired from locations more distant from Sizewell. The results of these analyses are shown in **Table 26**. It can be seen that high hydrazine concentrations (up to 7 $\mu\text{g.l}^{-1}$) were recorded, even in Lowestoft, over 27 km to the north of the cooling water outfall. Following a request from Cefas, Scientifics Ltd and Mountainheath Ltd (who conducted the hydrazine analyses on Scientifics Ltd's behalf) examined their analytical methods and calculated the limit of quantification for the hydrazine analysis for natural sea water samples. The limit of quantification was estimated to be 10 $\mu\text{g.l}^{-1}$ and they advised that any results below this level should be interpreted with caution.

Examination of the triplicate results of the hydrazine analyses revealed considerable variation in the results from samples taken from the same sampling bucket. Triplicate samples acquired on 31/01/2011 at Station 5, for example, returned analysis results of < 1, 21.7 and 2.4 $\mu\text{g.l}^{-1}$ (see **Table 27**). Concerns regarding the elevated concentrations being measured by Scientifics Ltd, exacerbated by the wide variation in the analysis results obtained from triplicate samples and the analysing laboratory's comments regarding the limit of quantification, led Cefas to seek an alternative, more sensitive analysis. DVGW-Technologiezentrum Wasser (TZW) were contacted on EDF's recommendation. TZW had considerable experience analysing hydrazine in fresh water samples using liquid-liquid-extraction and subsequent GC-MS detection after derivatization. TZW agreed to carry out validation experiments to assess the applicability of their technique to seawater sample analysis. TZW found that their technique was suitable for analysing seawater samples, and began analysing samples for Cefas during November 2010. Analysing spiked samples showed that TZW could achieve the same limit of detection for both seawater and fresh water samples: 0.01 $\mu\text{g.l}^{-1}$. During sampling operations a 1 litre sample was acquired for analysis by TZW alongside the triplicate samples acquired for Scientifics Ltd. All of the hydrazine samples acquired were acidified (using 10 ml of 1 M hydrochloric acid per litre of seawater) in order to stabilise the sample and prevent degradation of the hydrazine. Further work conducted by Cefas involving hydrazine analysis by TZW (BEEMS Technical Reports TR146 and TR145) indicated that the sample were stable once acidified.

Table 26 Hydrazine results from Scientifics Ltd for analyses of samples acquired from outside the spatial survey area.

Date	Time	Location (WGS84)			Hydrazine concentration ($\mu\text{g.l}^{-1}$)			
		Latitude (N)	Longitude (E)	Description	Replicate 1	Replicate 2	Replicate 3	Mean
07/06/2010	08:26	52° 25.0'	001° 48.0'	S13	3.7	-	-	3.7
20/07/2010	16:00	52° 28.3'	001° 45.3'	Lowestoft Trawl Dock	0.5	-	-	0.5
11/08/2010	12:05	52° 18.8'	001° 40.9'	Southwold Harbour entrance	4.8	-	-	4.8
18/08/2010	15:45	52° 28.4'	001° 44.4'	Lowestoft North Quay	6.8	6.2	7.9	7.0
14/10/2010	08:10	52° 28.3'	001° 45.3'	Lowestoft Trawl Dock	4.0	10	4.0	6.0

The hydrazine concentrations measured by TZW are shown in **Table 27**, together with the concentrations measured by Scientifics from the same samples. All of the TZW results were negative (i.e. < 0.01 $\mu\text{g.l}^{-1}$) except for the concentration measured in the sample from Station 11 acquired on 15/12/2010, which was

0.01 $\mu\text{g.l}^{-1}$. The TZW mass spectrometry method was a far more sensitive than the Scientifics Ltd technique, with a limit of detection able to detect hydrazine at concentrations two orders of magnitude lower than that of Scientifics Ltd. Cefas therefore considers that the hydrazine results provided by Scientifics Ltd to be unreliable. One possible explanation for this is that the spectrophotometric technique used by Scientifics Ltd, although capable of resolving concentrations of 1 $\mu\text{g.l}^{-1}$ in artificial seawater samples, appear to have been confounded by some sort of interference related to the suspended sediment present in the analysed samples or another unknown cause. This monitoring programme has therefore gathered approximately three months of reliable hydrazine data (November 2010 to February 2011) during which period the concentration of hydrazine measured has been less than or equal to 0.01 $\mu\text{g.l}^{-1}$. The TZW and Scientifics Ltd results are shown plotted by latitude in **Figure 13**, showing how the higher levels of hydrazine recorded by Scientifics Ltd are not detected by the more sensitive GC-MS technique applied by TZW.

Table 27 A comparison of hydrazine concentrations measured by different analytical techniques. Scientifics Ltd used an ultraviolet-visible spectrophotometry technique. TZW used a liquid-liquid extraction followed by gas chromatography mass spectrometry.

Station	Sampling date	Surface (s) or near-bed (b) sample	Scientifics results ($\mu\text{g.l}^{-1}$)				TZW result ($\mu\text{g.l}^{-1}$)
			Sample A	Sample B	Sample C	Mean	
1	06/12/2010	s	< 1	< 1	2.6	1.2	< 0.01
2	15/12/2010	s	2.4	3.9	3.7	3.3	< 0.01
3	06/12/2010	s	< 1	< 1	< 1	0.5	< 0.01
4	15/12/2010	s	4.5	4.1	5.2	4.6	< 0.01
5	15/11/2010	s	1.1	4.1		2.6	< 0.01
5	06/12/2010	s	< 1	< 1	< 1	0.5	< 0.01
5	15/12/2010	s	12.2	14.0	8.4	11.5	< 0.01
5	17/01/2011	s	< 1	< 1	< 1	0.5	< 0.01
5	31/01/2011	s	< 1	21.7	2.4	8.2	< 0.01
5	14/02/2011	s	1.7	< 1	< 1	0.9	< 0.01
6	15/12/2010	s	2.1	3.7	2.8	2.9	< 0.01
7	31/01/2011	s	2.5	1.4	< 1	1.5	< 0.01
8	31/01/2011	s	1.0	7.8	4.6	4.5	< 0.01
9	17/01/2011	s	4.0	6.0	40.0	16.7	< 0.01
10	31/01/2011	s	4.2	2.0	1.9	2.7	< 0.01
10	14/02/2011	b	1.1	1.5	1.6	1.4	< 0.01
11	15/11/2010	s	2.6	< 1	1.9	1.7	< 0.01
11	06/12/2010	s	< 1	< 1	5.7	2.2	< 0.01
11	15/12/2010	s	7.2	4.1	6.2	5.8	< 0.01
11	17/01/2011	s	1.0	4.0	< 1	1.8	< 0.01
11	31/01/2011	s	2.5	1.9	< 1	1.6	< 0.01
11	14/02/2011	s	3.1	4.5	3.1	3.6	< 0.01
12	17/01/2011	s	4.0	2.0	< 1	2.2	< 0.01
12	17/01/2011	b	40.0	7.0	1.0	16.0	< 0.01

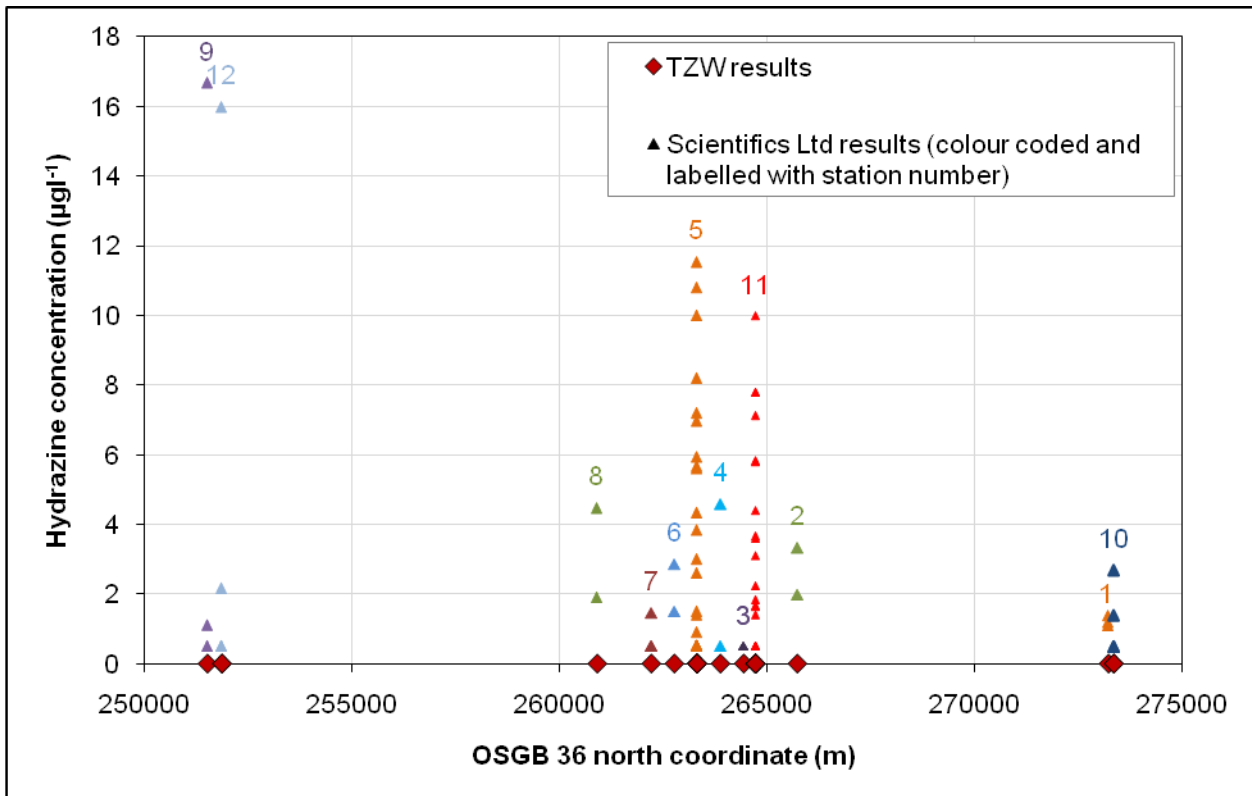


Figure 13 Hydrazine concentrations measured across the survey area including results from both analysing laboratories. Station 5 was located at the cooling water outfall.

3.2.5 Morpholine

Of the 81 water samples acquired at Stations 1 to 12, 78 gave negative results for morpholine. The three positive results (all obtained from surface-water samples) are summarised in **Table 28**. For all of the spatial survey results (taking negative results as 1 mg.l⁻¹, half of the detection limit) the mean concentration of morpholine measured was 2.0 mg.l⁻¹. Morpholine is not used by Sizewell power station as a conditioning product and does not occur naturally. The reason for these analysis results is therefore cryptic. Analytical problems or some form of interference are possible explanations, as is an external, unknown source of morpholine.

Table 28 A summary of positive morpholine results

Station	Date	Time	Morpholine concentration (mg.l ⁻¹)
5	21/04/2010	09:45	14.8
5	22/06/2010	09:30	34.5
11	22/06/2010	10:00	31.8

3.2.6 Analysis results exceeding EQS values

Only a small proportion of the analyses conducted gave results in excess of the EQS values. These analyses are summarised in **Table 29** (metals and metalloids) and **Table 30** (organic compounds).

Table 29 Metal and metalloid analysis results exceeding EQS values

Station	Sample depth (m)	Date acquired	Time acquired (UTC)	Analysis	Result (mg.l ⁻¹)	EQS (mg.l ⁻¹)
1	5	07/04/2010	11:50	Copper (dissolved)	0.006	0.005
1	5	07/04/2010	11:50	Zinc (dissolved)	0.046	0.04
1	0	06/12/2010	11:30	Arsenic (dissolved)	0.031	0.025
1	0	06/12/2010	11:30	Mercury (dissolved)	0.0001	0.00005
3	0	25/02/2010	10:38	Mercury (dissolved)	0.0001	0.00005
3	4	25/02/2010	11:25	Mercury (dissolved)	0.0001	0.00005
3	0	06/12/2010	10:40	Mercury (dissolved)	0.0001	0.00005
3	0	06/12/2010	10:40	Arsenic (dissolved)	0.031	0.025
4	0	25/02/2010	12:20	Mercury (dissolved)	0.0002	0.00005
5	5	25/02/2010	13:25	Mercury (dissolved)	0.0002	0.00005
5	0	25/02/2010	13:05	Mercury (dissolved)	0.0002	0.00005
5	0	06/07/2010	12:30	Mercury (dissolved)	0.0001	0.00005
5	0	06/12/2010	10:02	Mercury (dissolved)	0.0001	0.00005
5	0	17/01/2010	15:25	Mercury (dissolved)	0.0001	0.00005
5	0	31/01/2011	14:00	Mercury (dissolved)	0.0001	0.00005
5	0	02/03/2010	12:00	Copper (dissolved)	0.025	0.005
5	0	02/03/2010	13:00	Copper (dissolved)	0.012	0.005
5	0	02/03/2010	14:00	Copper (dissolved)	0.009	0.005
5	0	02/03/2010	15:00	Copper (dissolved)	0.009	0.005
5	0	02/03/2010	16:00	Copper (dissolved)	0.009	0.005
5	0	02/03/2010	17:00	Copper (dissolved)	0.009	0.005
5	0	02/03/2010	18:00	Copper (dissolved)	0.009	0.005
5	0	02/03/2010	19:00	Copper (dissolved)	0.009	0.005
5	0	02/03/2010	20:00	Copper (dissolved)	0.008	0.005
5	0	02/03/2010	21:00	Copper (dissolved)	0.008	0.005
5	0	02/03/2010	22:00	Copper (dissolved)	0.007	0.005
5	0	02/03/2010	23:00	Copper (dissolved)	0.006	0.005
5	0	18/08/2010	12:05	Copper (dissolved)	0.008	0.005
5	0	09/09/2010	09:45	Copper (dissolved)	0.007	0.005
5	0	14/09/2010	10:45	Copper (dissolved)	0.006	0.005
5	0	02/03/2010	14:00	Arsenic (dissolved)	0.027	0.025
5	0	02/03/2010	15:00	Arsenic (dissolved)	0.029	0.025
5	0	02/03/2010	16:00	Arsenic (dissolved)	0.031	0.025

Station	Sample depth (m)	Date acquired	Time acquired (UTC)	Analysis	Result (mg.l ⁻¹)	EQS (mg.l ⁻¹)
5	0	02/03/2010	17:00	Arsenic (dissolved)	0.031	0.025
5	0	02/03/2010	18:00	Arsenic (dissolved)	0.033	0.025
5	0	02/03/2010	19:00	Arsenic (dissolved)	0.035	0.025
5	0	02/03/2010	20:00	Arsenic (dissolved)	0.035	0.025
5	0	02/03/2010	21:00	Arsenic (dissolved)	0.036	0.025
5	0	02/03/2010	22:00	Arsenic (dissolved)	0.039	0.025
5	0	02/03/2010	23:00	Arsenic (dissolved)	0.039	0.025
5	0	14/02/2010	13:30	Arsenic (dissolved)	0.027	0.025
5	0	25/02/2010	13:05	Cadmium (dissolved)	0.0003	0.0002
5	0	17/01/2011	15:25	Mercury (dissolved)	0.0001	0.00005
5	0	31/01/2011	14:00	Mercury (dissolved)	0.0001	0.00005
7	0	31/01/2011	11:20	Copper (dissolved)	0.006	0.005
7	0	31/01/2011	11:20	Mercury (dissolved)	0.0001	0.00005
8	0	31/01/2011	10:50	Copper (dissolved)	0.006	0.005
8	0	31/01/2011	10:50	Mercury (dissolved)	0.0001	0.00005
9	5	08/04/2010	14:30	Zinc (dissolved)	0.054	0.04
9	0	17/01/2011	14:35	Arsenic (dissolved)	0.028	0.025
9	0	17/01/2011	14:35	Mercury (dissolved)	0.0001	0.00005
10	11	07/04/2010	10:20	Zinc (dissolved)	0.043	0.04
10	12	14/02/2011	11:00	Zinc (dissolved)	0.516	0.04
10	0	09/09/2010	11:00	Copper (dissolved)	0.007	0.005
10	12	14/02/2011	11:00	Copper (dissolved)	0.007	0.005
10	12	14/02/2011	11:00	Arsenic (dissolved)	0.029	0.025
11	0	09/09/2010	10:40	Copper (dissolved)	0.007	0.005
11	0	14/09/2010	10:15	Copper (dissolved)	0.016	0.005
11	0	15/11/2010	11:00	Copper (dissolved)	0.010	0.005
11	0	15/12/2010	10:38	Copper (dissolved)	0.007	0.005
11	0	31/01/2011	10:10	Copper (dissolved)	0.010	0.005
11	0	06/07/2010	10:15	Mercury (dissolved)	0.00010	0.00005
11	0	17/01/2011	15:55	Mercury (dissolved)	0.00010	0.00005
11	0	06/12/2010	09:30	Arsenic (dissolved)	0.031	0.025
11	0	17/01/2011	15:55	Zinc (dissolved)	0.041	0.04
12	0	08/04/2010	11:30	Zinc (dissolved)	0.08	0.04
12	0	17/01/2011	12:20	Zinc (dissolved)	0.158	0.04
12	17	17/01/2011	12:20	Zinc (dissolved)	0.182	0.04
12	0	17/01/2011	12:20	Copper (dissolved)	0.007	0.005
12	17	17/01/2011	12:20	Copper (dissolved)	0.007	0.005
12	0	17/01/2011	12:20	Arsenic (dissolved)	0.027	0.025

Station	Sample depth (m)	Date acquired	Time acquired (UTC)	Analysis	Result (mg.l ⁻¹)	EQS (mg.l ⁻¹)
12	17	17/01/2011	12:20	Arsenic (dissolved)	0.028	0.025
12	0	17/01/2011	12:20	Mercury (dissolved)	0.00010	0.00005
12	17	17/01/2011	12:20	Mercury (dissolved)	0.00010	0.00005

Table 30 Organic analysis results exceeding EQS values

Station	Sample depth (m)	Date acquired	Time acquired (UTC)	Analysis	Result (mg.l ⁻¹)	EQS (mg.l ⁻¹)
1	0	07/04/2010	11:40	Benzo[k]fluoranthene	0.002	0.00003
1	0	07/04/2010	11:40	Benzo[a]pyrene	0.002	0.00005
1	0	07/04/2010	11:40	Indeno[1,2,3-cd]pyrene	0.003	0.00002 (sum of concns)
1	0	07/04/2010	11:40	Benzo[g,h,i]perylene	0.003	
5	0	19/05/2010	08:45	Biphenyl	0.026	0.025
9	0	08/04/2010	14:00	Indeno[1,2,3-cd]pyrene	0.004	0.00002 (sum of concns)
9	0	08/04/2010	14:00	Benzo[g,h,i]perylene	0.004	
12	0	08/04/2010	11:30	Bis (2-ethylhexyl) phthalate (DEHP)	0.009	0.0013

Metal and metalloid analysis results exceeding EQSs

EQS values were exceeded in some analyses for copper, arsenic, cadmium, zinc and mercury. The spatial distribution of these results is shown in **Figure 14** (zinc), **Figure 15** (copper and arsenic) and **Figure 16** (mercury and cadmium).

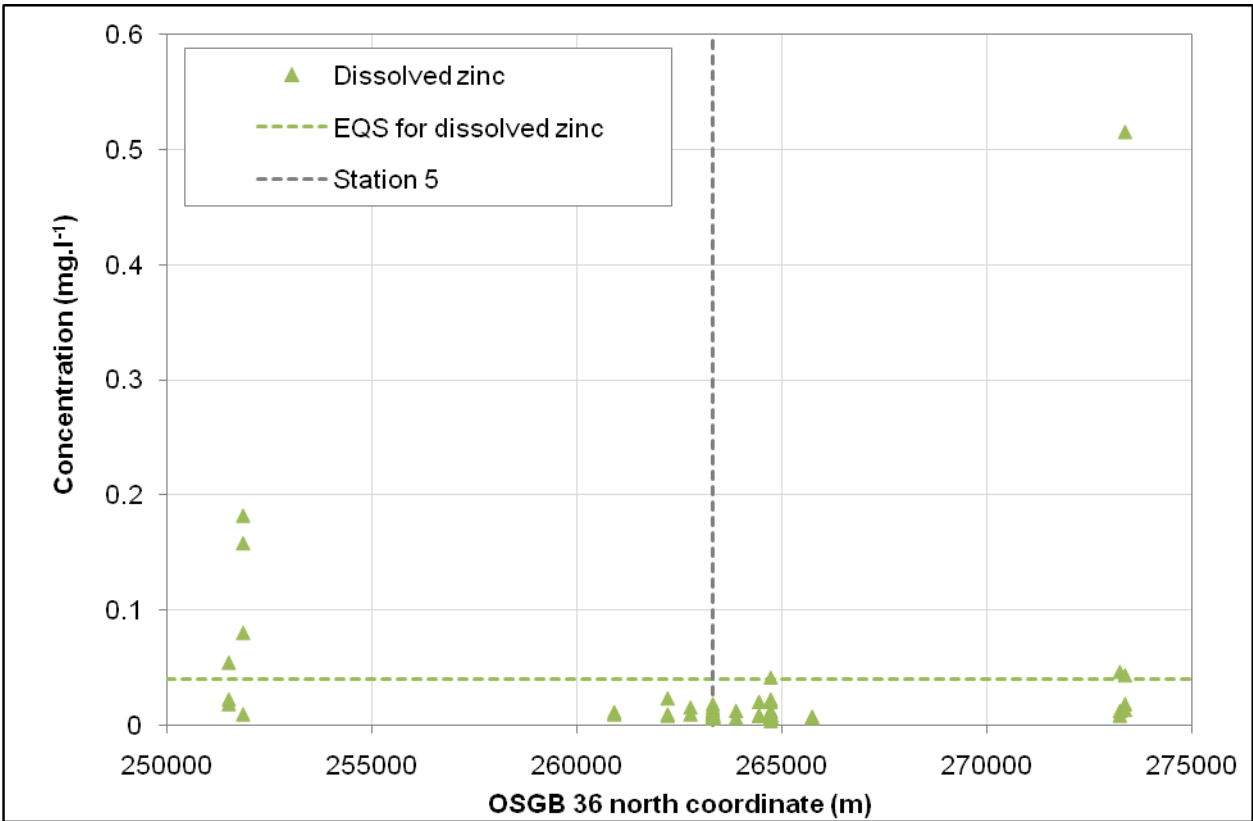


Figure 14 Dissolved zinc concentrations plotted against north coordinate. Station 5 was located at the cooling water outfall.

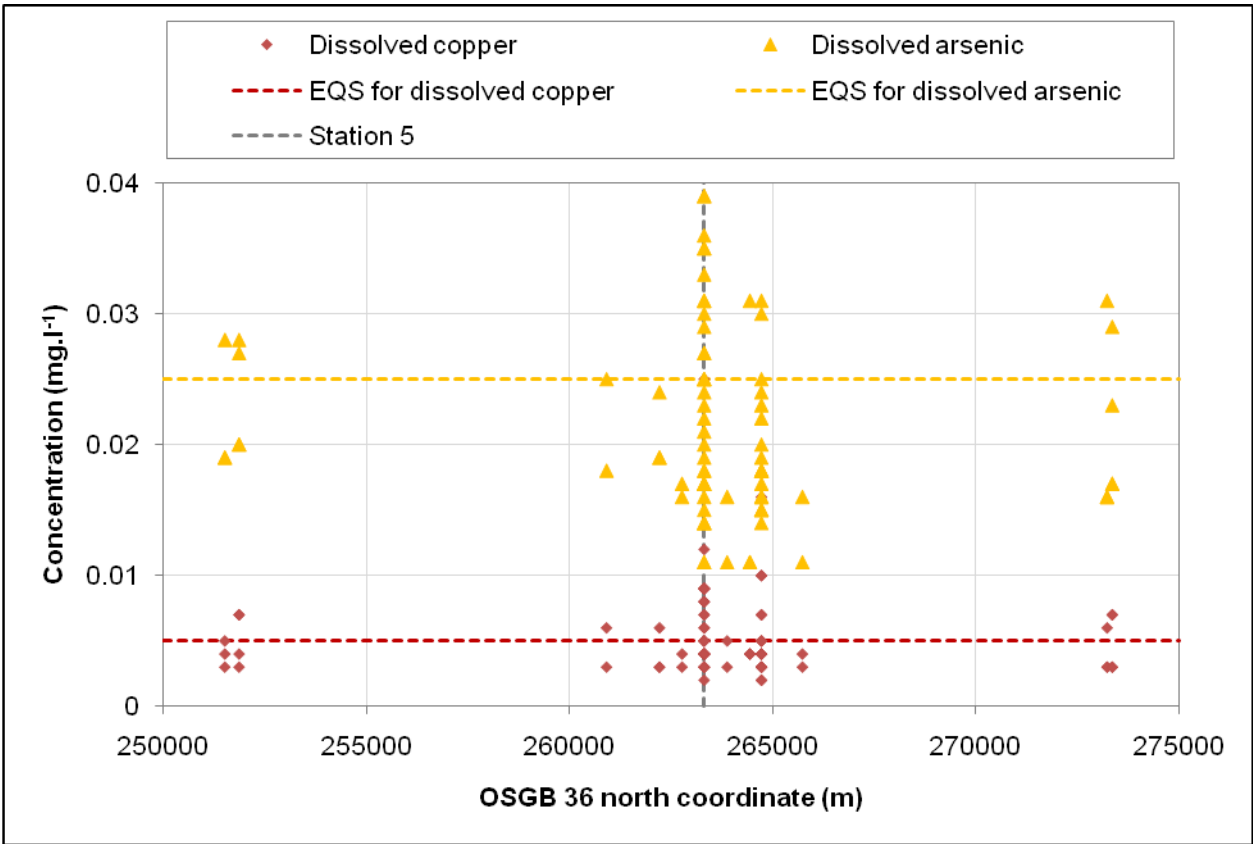


Figure 15 Dissolved copper and arsenic concentrations plotted against north coordinate. Station 5 was located at the cooling water outfall.

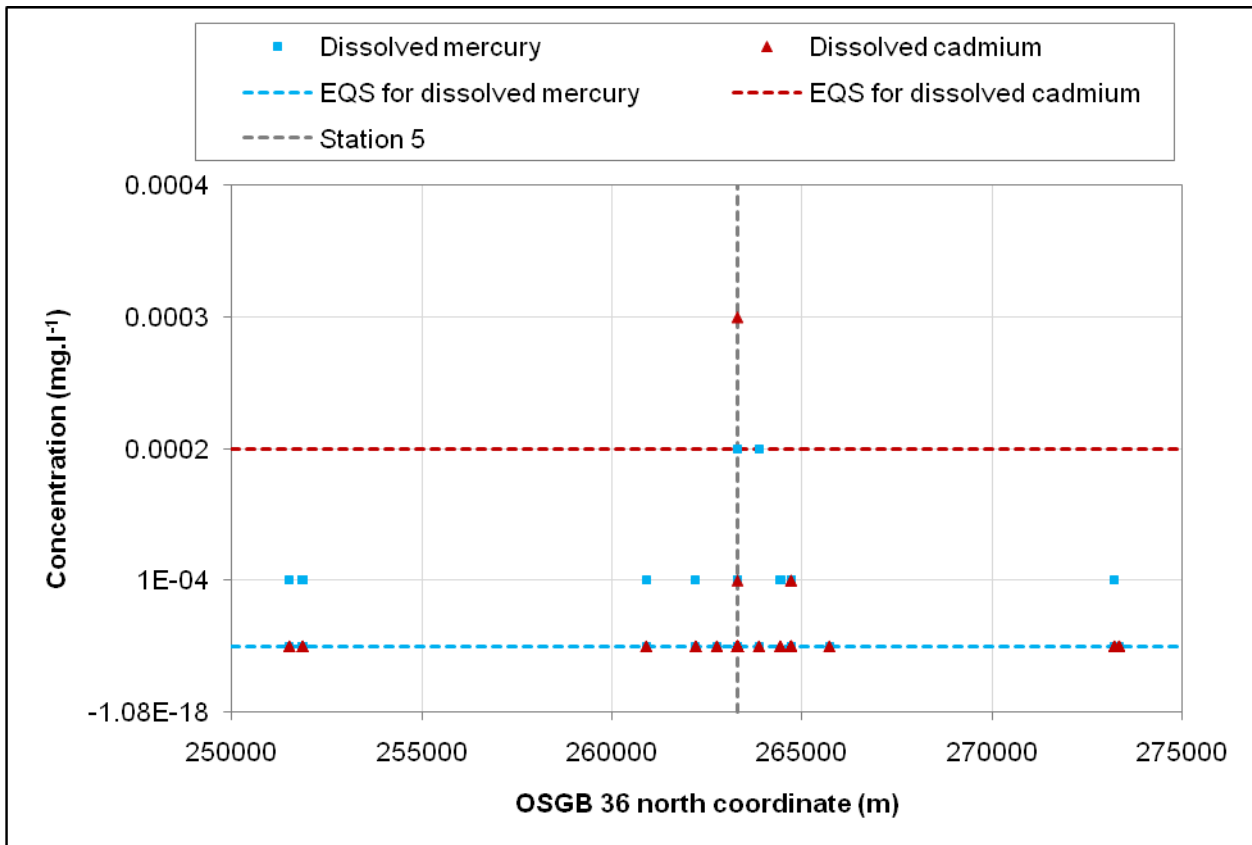


Figure 16 Dissolved mercury and cadmium concentrations plotted against north coordinate. Station 5 was located at the cooling water outfall.

Figure 14 shows that zinc concentrations are generally well below the EQS. The exceptions to this occur at Stations 9, 12 and 10 all distant from the cooling water outfall by over 10 km. High zinc concentrations were often observed in near-bed water samples and may be the result of zinc-laden suspended sediment. This may also explain the extremely high ($> 0.5 \text{ mg.l}^{-1}$) result observed at Station 10.

Figure 15 shows the concentrations of copper and arsenic. Both substances were measured at concentrations exceeding the EQS and in both cases exceedance of the EQS is more common close to the cooling water outfall at Station 5.

Figure 16 shows the concentrations of mercury and cadmium. Cadmium concentrations were generally well below the EQS. Of 81 analyses, 77 gave negative results ($< 0.0001 \text{ mg.l}^{-1}$) and only one of the remaining analyses exceeded the EQS. For mercury, 63 out of 81 analyses gave negative results. These 63 results are represented in **Figure 16** as concentrations of 0.0001 mg.l^{-1} (half of the limit of detection). These 63 results may not, therefore, represent actual environmental conditions where the EQS has been exceeded.

Certain dissolved metal concentrations measured were greater than the total metal concentrations measured from the same sub-sample (e.g. copper analyses for the sample from Station 5 acquired at 15:25 on the 17 January 2011 gave results of 0.004 mg.l^{-1} (total concentration) and 0.005 mg.l^{-1} (dissolved concentration). This occurs due to the sometimes heterogeneous nature of the sample and the variability inherent in making measurements very close to limit of detection.

Organic compound analysis results exceeding EQSs

Eight organic compound analyses produced results exceeding EQS levels (see **Table 30**). These included four different polycyclic aromatic hydrocarbons (PAHs) (Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno[1,2,3-cd]pyrene and Benzo[g,h,i]perylene) detected at Stations 1 and 9. There were a total of six positive analyses for these compounds. The remaining 318 analyses conducted failed to detect any traces of these four PAHs during the remainder of the year's monitoring.

Biphenyl was detected at Station 5 on the 19/05/2010 at a concentration of 0.026 mg.l^{-1} , exceeding the EQS by 0.001 mg.l^{-1} . A further 80 analyses conducted during the monitoring programme failed to detect biphenyl.

Bis (2-ethylhexyl) phthalate (DEHP), a common plasticizer, was detected on four occasions during the monitoring programme. Only one of these occasions (Station 12 on the 08/04/2010) exceeded the EQS of 0.0013 mg.l⁻¹. The remaining 77 DEHP analyses were negative.

3.2.7 Sediment analysis results

Many of the analyses employed for sediment samples gave no positive results. These analyses are shown in **Table 31**. Sediment analyses giving positive results are shown in **Table 32**.

Table 31 Sediment sample analyses with no positive results; the analyte was either not present or present at undetectable levels

Analysis	Limit of detection (mg.kg ⁻¹ unless otherwise stated)	Analysis	Limit of detection (mg.kg ⁻¹ unless otherwise stated)
Selenium	0.5	N-Nitrosodiphenylamine	0.5
Nitrite as N	0.1	4-Bromophenyl-phenylether	0.5
2,4,6-tribromophenol	0.2	Hexachlorobenzene	0.5
Dibromoacetic Acid	0.1	Pentachlorophenol	5
Dibromoacetonitrile	0.1	Phenanthrene	0.2
Dichloroacetonitrile	0.1	Anthracene	0.2
Ethanolamine	20	Di-n-butylphthalate	0.5
Hydrazine	1	Fluoranthene	0.2
Morpholine	10	Pyrene	0.2
Phenol	2	Butylbenzylphthalate	0.5
bis(2-Chloroethyl)ether	0.5	Benzo[a]anthracene	0.2
2-Chlorophenol	2	Chrysene	0.2
1,3-Dichlorobenzene	0.5	3,3'-Dichlorobenzidine	2
1,4-Dichlorobenzene	0.5	bis(2-Ethylhexyl)phthalate	0.5
Benzyl alcohol	0.5	Di-n-octylphthalate	0.2
1,2-Dichlorobenzene	0.5	Benzo[b]fluoranthene	0.2
2-Methylphenol	0.5	Benzo[k]fluoranthene	0.2
bis(2-Chloroisopropyl)ether	0.5	Benzo[a]pyrene	0.2
Hexachloroethane	0.5	Indeno[1,2,3-cd]pyrene	0.2
N-Nitroso-di-n-propylamine	0.5	Dibenzo[a,h]anthracene	0.2
3- & 4-Methylphenol	2.0	Benzo[g,h,i]perylene	0.2
Nitrobenzene	0.5	Dichlorodifluoromethane	5 µg.l ⁻¹
Isophorone	0.5	Chloromethane	5 µg.l ⁻¹
2-Nitrophenol	2	Vinyl Chloride	5 µg.l ⁻¹
2,4-Dimethylphenol	2	Bromomethane	25 µg.l ⁻¹
Benzoic Acid	< 10	Chloroethane	25 µg.l ⁻¹
bis(2-Chloroethoxy) methane	0.5	Trichlorofluoromethane	5 µg.l ⁻¹
2,4-Dichlorophenol	2.0	1,1-Dichloroethene	5 µg.l ⁻¹
1,2,4-Trichlorobenzene	0.5	trans 1,2-Dichloroethene	5 µg.l ⁻¹
Naphthalene	0.2	1,1-Dichloroethane	5 µg.l ⁻¹
4-Chlorophenol	2	2,2-Dichloropropane	5 µg.l ⁻¹
4-Chloroaniline	0.5	cis 1,2-Dichloroethene	5 µg.l ⁻¹
Hexachlorobutadiene	0.5	Bromochloromethane	5 µg.l ⁻¹
4-Chloro-3-methylphenol	0.5	Chloroform	5 µg.l ⁻¹

Analysis	Limit of detection (mg.kg ⁻¹ unless otherwise stated)
2-Methylnaphthalene	0.2
1-Methylnaphthalene	0.2
Hexachlorocyclopentadiene	0.5
2,4,6-Trichlorophenol	2
2,4,5-Trichlorophenol	2
2-Chloronaphthalene	0.2
Biphenyl	0.2
Diphenyl ether	0.2
2-Nitroaniline	0.5
Acenaphthylene	0.2
Dimethylphthalate	0.5
2,6-Dinitrotoluene	0.5
Acenaphthene	0.2
3-Nitroaniline	0.5
2,4-Dinitrophenol	1
Dibenzofuran	0.5
4-Nitrophenol	5
2,4-Dinitrotoluene	0.5
Fluorene	0.2
Diethylphthalate	0.5
4-Chlorophenyl-phenylether	0.5
4,6-Dinitro-2-methylphenol	5
4-Nitroaniline	0.5

Analysis	Limit of detection (mg.kg ⁻¹ unless otherwise stated)
1,1,1-Trichloroethane	5 µg.l ⁻¹
Carbon Tetrachloride	5 µg.l ⁻¹
1,1-Dichloropropene	5 µg.l ⁻¹
Benzene	5 µg.l ⁻¹
1,2-Dichloroethane	5 µg.l ⁻¹
Trichloroethene	5 µg.l ⁻¹
1,2-Dichloropropane	5 µg.l ⁻¹
Dibromomethane	5 µg.l ⁻¹
Bromodichloromethane	5 µg.l ⁻¹
cis 1,3-Dichloropropene	5 µg.l ⁻¹
Toluene	5 µg.l ⁻¹
trans 1,3-Dichloropropene	5 µg.l ⁻¹
1,1,2-Trichloroethane	5 µg.l ⁻¹
Tetrachloroethene	25 µg.l ⁻¹
1,3-Dichloropropane	5 µg.l ⁻¹
Dibromochloromethane	5 µg.l ⁻¹
1,2-Dibromoethane	5 µg.l ⁻¹
Chlorobenzene	5 µg.l ⁻¹
Ethylbenzene	5 µg.l ⁻¹
1,1,1,2-Tetrachloroethane	5 µg.l ⁻¹
m and p-Xylene	5 µg.l ⁻¹
o-Xylene	5 µg.l ⁻¹

Table 32 Sediment sample analyses with positive results. Negative results are presented as less than the limit of detection or "ND" (none detected) for tentatively identified compounds, for which the limits of detection vary.

Analysis	Units	Station 5 (sampled 18/06/2010)			Station 11 (sampled 17/06/2010)		
		Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3
Boron (H ₂ O Soluble)	mg.kg ⁻¹	7.5	4.5	3.2	6.7	5.3	5.7
Fluoride	mg.kg ⁻¹	4.3	1.4	1.2	< 2.0	< 2.0	< 2.0
pH	pH Units	8	8.3	8.3	8	8	8.1
TPH (by GCFID)	mg.kg ⁻¹	27	< 12.0	< 11.9	45	36	39
Exchange.Ammonium	mg.kg ⁻¹	< 0.6	< 0.6	< 0.6	61.3	69.6	41.7
TPH (by FTIRPER)	mg.kg ⁻¹	< 60	< 60	128	< 50	< 50	< 50
Arsenic	mg.kg ⁻¹	3	3.2	2.9	13.4	12.4	13.2
Cadmium	mg.kg ⁻¹	0.42	0.61	0.45	0.5	0.5	0.5
Chromium	mg.kg ⁻¹	5.1	7.5	6.6	41.1	35.4	39.5
Cobalt	mg.kg ⁻¹	0.9	1	0.9	7.8	6.7	7
Copper	mg.kg ⁻¹	5.8	3.9	3.7	19.2	16.4	26.2
Lead	mg.kg ⁻¹	8.9	8.7	7.4	28.7	24.4	28.2
Manganese	mg.kg ⁻¹	57	90.3	67.6	303.9	292.2	261.5
Molybdenum	mg.kg ⁻¹	< 1.0	< 1.0	< 1.0	1	0.8	0.9
Nickel	mg.kg ⁻¹	2	1.8	1.7	18.3	15.5	16.2

Zinc	mg.kg ⁻¹	8.2	8.6	5.8	96.3	88.7	79
Chloride:(2:1)	mg.l ⁻¹	1600	1580	1520	5590	4530	5200
Nitrate (2:1)	mg.l ⁻¹	0.4	< 0.4	< 0.4	< 0.2	< 0.2	< 0.2
Mercury	mg.kg ⁻¹	0.02	0.02	0.2	< 0.1	< 0.1	< 0.1
Aluminium	mg.kg ⁻¹	6950	6050	1130	34800	29100	31200
Barium	mg.kg ⁻¹	160	150	24	230	205	218
Calcium	mg.kg ⁻¹	3860	5200	4330	33400	27500	30800
Iron	mg.kg ⁻¹	6130	8570	1370	22700	18400	20200
Lithium	mg.kg ⁻¹	< 10	< 10	< 10	29.2	23.8	26.7
Magnesium	mg.kg ⁻¹	765	671	507	64900	5240	5900
Phosphorous	mg.kg ⁻¹	108	205	< 99	536	15.4	492
Potassium	mg.kg ⁻¹	4840	4530	4450	13900	11900	12700
Strontium	mg.kg ⁻¹	46	43	7	141	115	125
Total Sulphur.	%	0.057	0.049	0.068	0.176	0.161	0.199
Total Organic Carbon	% M/M	0.09	0.08	0.1	0.82	0.58	0.67
Tentatively-identified semi-volatile organic compounds							
(Z)-9-Octadecenamide	mg.kg ⁻¹	0.8	0.4	ND	ND	ND	ND
2-methyl-2-Hexanol	mg.kg ⁻¹	ND	ND	ND	ND	ND	0.5
17-Pentatriacontene	mg.kg ⁻¹	ND	ND	ND	ND	0.5	ND

Sediment analysis results were compared with Cefas Action Levels (**Table 33**) to determine if any of the results represented contamination levels of concern based on those values used to guide dredging and disposal activities. Concentrations below Cefas Action Level 1 are considered to be of no concern. Concentrations above Cefas Action Level 2 may raise concern for operations that require sediment removal and disposal. Dredged material containing contaminant concentrations above Action Level 2 would not be permitted to be disposed of at sea, for example.

Only two of the analytes detected exceeded Cefas Action level 1. Chromium was detected at a concentration exceeding Action Level 1 by 3 % in one of the samples from Station 11, though the mean concentration at Station 11 was just below Action Level 1. At Station 5 chromium concentrations were well below Action Level 1. Cadmium was detected at both Station 5 and 11 at concentrations slightly in excess of Action Level 1. Therefore neither chromium nor cadmium is present at concentrations that are of major concern as both are only slightly in excess of action level 1.

Table 33 A summary of positive sediment chemical analysis results for which a Cefas Action level exists.

Compound	Cefas Action level 1 (mg.kg ⁻¹)	Cefas Action level 2 (mg.kg ⁻¹)	Station 5		Station 11	
			Mean concentration (mg.kg ⁻¹)	Maximum concentration (mg.kg ⁻¹)	Mean concentration (mg.kg ⁻¹)	Maximum concentration (mg.kg ⁻¹)
Arsenic	20	100	3.0	3.2	13.0	13.4
Cadmium	0.4	5	0.49	0.61	0.50	0.50
Chromium	40	400	6.4	7.5	38.67	41.1
Copper	40	400	4.5	5.8	20.6	26.2
Mercury	0.3	3	0.08	0.20	< 0.1	< 0.1
Nickel	20	200	1.8	2.0	16.7	18.3
Lead	50	500	8.3	8.9	27.1	28.7
Zinc	130	800	7.5	8.6	88.0	96.3

3.2.8 Radionuclide analysis results

The results of the radionuclide analyses are shown in **Table 34**. Full results of radionuclide analyses are shown in **Appendix C**. The radionuclide results indicate that radionuclide concentrations in seawater are low and consistent with routine local radionuclide monitoring (Environment Agency et al., 2010).

Table 34 Radionuclide sample analysis results.

Analysis	Analysis results (Bq.l ⁻¹)				
	19/05/2010	19/05/2010	17/01/2011	17/01/2011	14/02/2011
	Station 5	Station 11	Station 5	Station 11	Station 5
Gross Alpha	< 3.80	< 3.80	< 3.80	< 3.80	< 3.80
Gross Beta	< 5.30	< 5.30	< 5.30	11.13	< 5.30
Tritium	4.44	< 3.19	1.77	2.23	44.90
Cs-134	< 0.107	< 0.109	< 0.119	< 0.105	< 0.095
Cs-137	< 0.105	< 0.107	< 0.119	< 0.105	< 0.095
K-40	10.215	11.229	11.696	14.009	13.130
Artificial C-14	< 2.045	< 0.056	< 1960	< 1960	< 1960
Natural C-14	3.570	3.330	3.84	3.63	3.27

4 Conclusions

Conclusions needed addressing main aims (or purpose) of this monitoring study, which was 'to establish the environmental concentrations of certain chemical additives and their derivatives that are discharged from the existing cooling water outfall at Sizewell B, as well as establishing the local baseline environmental concentrations of numerous substances'.

What are the implications and/or recommendations which follow from these various baseline studies, with respect to 'future engineering projects associated with the power station infrastructure at Sizewell'? e.g.

- Radionuclide levels are consistent with routine monitoring, hence any anomalies should be detectable
- Future monitoring of hydrazine should only use GC-MS methods...
- Etc....or something along those lines for all chemical analyses.

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Appendix A Water analysis results from Scientifics Ltd: spatial and seasonal surveys

Table 35 Station 1 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or "ND" (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 1 was located 10 km from the cooling water outfall.

Analysis – Station 1	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			7/4/10 Surface	7/4/10 Near-bed	6/12/10 Surface
pH	pH units		7.5	7.6	7.9
Suspended Solids	mg.l ⁻¹		26	73	56
Total Alkalinity as CaCO ₃	mg.l ⁻¹		135	141	137
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		135	141	137
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0
Chloride as Cl	mg.l ⁻¹		12900	12700	13600
Fluoride as F	mg.l ⁻¹		1.3	1.2	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		3110	3240	2830
Calcium as Ca (Total)	mg.l ⁻¹		265	214	267
Calcium as Ca (Dissolved)	mg.l ⁻¹		255	259	251
Magnesium as Mg (Total)	mg.l ⁻¹		1290	1070	1200
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1390	1430	1260
Strontium as Sr (Total)	mg.l ⁻¹		4.9	3.86	4.89
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.82	4.78	4.67
Sodium as Na (Dissolved)	mg.l ⁻¹		11600	8900	10600
Potassium as K (Total)	mg.l ⁻¹		589	496	564
Potassium as K (Dissolved)	mg.l ⁻¹		640	656	586
Nickel as Ni (Total)	mg.l ⁻¹		0.003	0.004	0.004
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.004	0.004	0.004
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.004	0.005	0.003
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.006	0.003
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001

Analysis – Station 1	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			7/4/10 Surface	7/4/10 Near-bed	6/12/10 Surface
Zinc as Zn (Total)	mg.l ⁻¹		0.013	0.046	0.018
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.012	0.046	0.008
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Iron as Fe (Total)	mg.l ⁻¹		0.02	< 0.01	0.11
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	0.01	0.01
Arsenic as As (Total)	mg.l ⁻¹		0.011	0.016	0.024
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.016	0.016	0.031
Boron as B (Total)	mg.l ⁻¹		4.68	3.9	4.09
Boron as B (Dissolved)	mg.l ⁻¹		5.01	5.03	4.33
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.033	0.002	0.058
Selenium as Se (Total)	mg.l ⁻¹		0.01	0.008	0.039
Molybdenum as Mo (Total)	mg.l ⁻¹		0.009	0.011	0.01
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.011	0.011	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.45	0.3	0.41
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		210	205	230
Total Organic Carbon	mg.l ⁻¹		0.57	0.54	0.63
Salinity	ppt		38.3	38.3	35.8
Turbidity N.T.U	NTU		13	43	18
Bromide as Br	mg.l ⁻¹		105	120	236
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.08	0.08	0.07
Silicon as Si (Total)	mg.l ⁻¹		0.5	0.4	0.6
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	40	< 20
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2	< 2

Analysis – Station 1	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			7/4/10 Surface	7/4/10 Near-bed	6/12/10 Surface
Dissolved Organic Carbon	mg.l ⁻¹		0.45	0.42	0.47
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		< 0.3	< 1.2	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		76	160	268
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	0.03	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		1.2	1.9	< 1.0
Dibromoacetic acid	µg.l ⁻¹		< 1.00	15.5	< 1.00
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		1.4	1.1	1.2
Hydrazine (TZW)	µg.l ⁻¹		-	-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	0.003	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	0.003	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		0.003	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		0.003	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1

Analysis – Station 1	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			7/4/10 Surface	7/4/10 Near-bed	6/12/10 Surface
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:					
Tribromophenol	mg.l ⁻¹		0.022	ND	ND
2,2'-azobis 2-methyl-propanenitrile	mg.l ⁻¹		ND	0.012	ND
2,4-Dibromophenol	mg.l ⁻¹		≤ 0.002	≤ 0.002	≤ 0.002
2,6-Dibromophenol	mg.l ⁻¹		≤ 0.002	≤ 0.002	≤ 0.002
Tentatively identified volatile organic compounds:					
	µg.l ⁻¹		ND	ND	ND

Table 36 Station 2 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 2 was located 2.4 km from the cooling water outfall.

Analysis – Station 2	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
pH	pH units		7.7	7.9
Suspended Solids	mg.l ⁻¹		102	48
Total Alkalinity as CaCO ₃	mg.l ⁻¹		137	135
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		137	135
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0
Chloride as Cl	mg.l ⁻¹		10200	16300
Fluoride as F	mg.l ⁻¹		1.3	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2610	2670
Calcium as Ca (Total)	mg.l ⁻¹		239	264
Calcium as Ca (Dissolved)	mg.l ⁻¹		241	259
Magnesium as Mg (Total)	mg.l ⁻¹		1120	1380
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1150	1210
Strontium as Sr (Total)	mg.l ⁻¹		4.43	4.96
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.47	4.54
Sodium as Na (Dissolved)	mg.l ⁻¹		10200	11200
Potassium as K (Total)	mg.l ⁻¹		532	686
Potassium as K (Dissolved)	mg.l ⁻¹		537	582
Nickel as Ni (Total)	mg.l ⁻¹		0.009	0.003
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.012	0.004
Chromium as Cr (Total)	mg.l ⁻¹		0.001	< 0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	0.002	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		0.0002	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.005	0.004
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.004
Lead as Pb (Total)	mg.l ⁻¹		0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.007	0.007
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.006	0.007
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002

Analysis – Station 2	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.16	< 0.01

Analysis – Station 2	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		< 0.01	< 0.01
Arsenic as As (Total)	mg.l ⁻¹		0.006	0.015
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.011	0.016
Boron as B (Total)	mg.l ⁻¹		4.06	4.63
Boron as B (Dissolved)	mg.l ⁻¹		4.01	4.01
Mercury as Hg (Total)	mg.l ⁻¹		0.0002	< 0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		< 0.001	0.045
Selenium as Se (Total)	mg.l ⁻¹		0.012	0.021
Molybdenum as Mo (Total)	mg.l ⁻¹		0.008	0.009
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.012	0.01
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.42	0.39
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		0.2	< 0.2
Phosphate as P	mg.l ⁻¹		0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		200	200
Total Organic Carbon	mg.l ⁻¹		0.42	0.64
Salinity	ppt		34.5	35.5
Turbidity N.T.U	NTU		30	10
Bromide as Br	mg.l ⁻¹		160	238
Iodide as I	mg.l ⁻¹		< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.05	0.09
Silicon as Si (Total)	mg.l ⁻¹		0.6	0.4
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	40
Chlorophyll A	µg.l ⁻¹		< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.39	0.44
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.6	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		> 1000	75

Analysis – Station 2	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.2	< 0.2
Cationic Detergents	mg.l ⁻¹		< 1.0	< 1.0
Dibromoacetic acid	µg.l ⁻¹		< 1.00	< 1.00
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 0.1
Hydrazine (measurement not reliable)	µg.l ⁻¹		2	3.3
Hydrazine (TZW)	µg.l ⁻¹		-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002
bis(2-Ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1

Analysis – Station 2	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1
Tentatively identified semi-volatile organic compounds:				
2,4-Dibromophenol	mg.l ⁻¹		ND	< 0.002
2,6-Dibromophenol	mg.l ⁻¹		ND	< 0.002
Tentatively identified volatile organic compounds:				
	µg.l ⁻¹		ND	ND

Table 37 Station 3 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 3 was located 1.1 km from the cooling water outfall.

Analysis – Station 3	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			25/2/10 Surface	25/2/10 Near-bed	6/12/10 Surface
pH	pH units		7.7	7.7	7.8
Suspended Solids	mg.l ⁻¹		187	167	53
Total Alkalinity as CaCO ₃	mg.l ⁻¹		134	145	136
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		134	145	136
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0
Chloride as Cl	mg.l ⁻¹		11500	12900	14900
Fluoride as F	mg.l ⁻¹		1.3	1.3	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2600	2630	2780
Calcium as Ca (Total)	mg.l ⁻¹		240	243	262
Calcium as Ca (Dissolved)	mg.l ⁻¹		243	239	254
Magnesium as Mg (Total)	mg.l ⁻¹		1140	1170	1220
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1150	1150	1230
Strontium as Sr (Total)	mg.l ⁻¹		4.46	4.47	4.82
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.42	4.42	4.66
Sodium as Na (Dissolved)	mg.l ⁻¹		10200	10400	10800
Potassium as K (Total)	mg.l ⁻¹		542	549	568
Potassium as K (Dissolved)	mg.l ⁻¹		535	541	566
Nickel as Ni (Total)	mg.l ⁻¹		0.011	0.01	0.012
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.012	0.013	0.005
Chromium as Cr (Total)	mg.l ⁻¹		0.001	0.001	0.013
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	0.002	0.002	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.003	0.004	0.004
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.004	0.004	0.004
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.007	0.035	0.017
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.008	0.02	0.008
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002

Analysis – Station 3	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			25/2/10 Surface	25/2/10 Near-bed	6/12/10 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.07	0.2	0.28

Analysis – Station 3	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			25/2/10 Surface	25/2/10 Near-bed	6/12/10 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		< 0.01	< 0.01	0.01
Arsenic as As (Total)	mg.l ⁻¹		0.008	0.007	0.028
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.011	0.011	0.031
Boron as B (Total)	mg.l ⁻¹		4.14	4.14	4.16
Boron as B (Dissolved)	mg.l ⁻¹		4.01	3.99	4.19
Mercury as Hg (Total)	mg.l ⁻¹		0.0001	0.0001	0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	0.0001	0.0001	0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.008	0.008	0.032
Selenium as Se (Total)	mg.l ⁻¹		< 0.001	0.002	0.045
Molybdenum as Mo (Total)	mg.l ⁻¹		0.01	0.009	0.012
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.012	0.012	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	0.001	0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.42	0.2	0.41
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		190	240	220
Total Organic Carbon	mg.l ⁻¹		0.4	0.38	0.67
Salinity	ppt		34.9	35.3	35.6
Turbidity N.T.U	NTU		72	< 1	20
Bromide as Br	mg.l ⁻¹		142	170	236
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.05	0.05	0.07
Silicon as Si (Total)	mg.l ⁻¹		0.5	0.6	0.8
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	< 20	< 20
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.39	0.37	0.4
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.3	< 0.3	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		584	160	91

Analysis – Station 3	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			25/2/10 Surface	25/2/10 Near-bed	6/12/10 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		0.94	0.02	0.02
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	< 1	< 1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1	2.2
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		0.5	0.5	0.5
Hydrazine (TZW)	µg.l ⁻¹		-	-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
bis(2-Ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1

Analysis – Station 3	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			25/2/10 Surface	25/2/10 Near-bed	6/12/10 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:					
2,4-Dibromophenol	mg.l ⁻¹		ND	ND	≤0.002
2,6-Dibromophenol	mg.l ⁻¹		ND	ND	≤0.002
Tentatively identified volatile organic compounds:					
	µg.l ⁻¹		ND	ND	ND

Table 38 Station 4 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 4 was located 0.6 km from the cooling water outfall.

Analysis – Station 4	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
pH	pH units		7.7	7.9
Suspended Solids	mg.l ⁻¹		131	53
Total Alkalinity as CaCO ₃	mg.l ⁻¹		138	110
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		138	110
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0
Chloride as Cl	mg.l ⁻¹		13600	16400
Fluoride as F	mg.l ⁻¹		1.5	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2600	2730
Calcium as Ca (Total)	mg.l ⁻¹		243	259
Calcium as Ca (Dissolved)	mg.l ⁻¹		238	253
Magnesium as Mg (Total)	mg.l ⁻¹		1170	1380
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1150	1220
Strontium as Sr (Total)	mg.l ⁻¹		4.43	4.89
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.41	4.51
Sodium as Na (Dissolved)	mg.l ⁻¹		10200	11100
Potassium as K (Total)	mg.l ⁻¹		547	691
Potassium as K (Dissolved)	mg.l ⁻¹		534	593
Nickel as Ni (Total)	mg.l ⁻¹		0.01	0.004
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.012	0.004
Chromium as Cr (Total)	mg.l ⁻¹		0.001	< 0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	0.001	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		0.0002	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.003	0.004
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.005
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.01	0.008
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.012	0.006
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002

Analysis – Station 4	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.2	< 0.01

Analysis – Station 4	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		< 0.01	< 0.01
Arsenic as As (Total)	mg.l ⁻¹		0.007	0.014
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.011	0.016
Boron as B (Total)	mg.l ⁻¹		4.24	4.66
Boron as B (Dissolved)	mg.l ⁻¹		4.01	4.08
Mercury as Hg (Total)	mg.l ⁻¹		0.0001	< 0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	0.0002	< 0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.019	< 0.001
Selenium as Se (Total)	mg.l ⁻¹		< 0.001	0.016
Molybdenum as Mo (Total)	mg.l ⁻¹		0.009	0.009
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.012	0.01
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.42	0.39
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		230	230
Total Organic Carbon	mg.l ⁻¹		0.38	0.59
Salinity	ppt		35.4	35.5
Turbidity N.T.U	NTU		45	4
Bromide as Br	mg.l ⁻¹		179	302
Iodide as I	mg.l ⁻¹		< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.05	0.09
Silicon as Si (Total)	mg.l ⁻¹		0.6	0.3
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	50
Chlorophyll A	µg.l ⁻¹		< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.36	0.43
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		< 0.3	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		164	95

Analysis – Station 4	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		0.03	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.2	< 0.2
Cationic Detergents	mg.l ⁻¹		< 1	< 1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 0.1
Hydrazine (measurement not reliable)	µg.l ⁻¹		0.5	4.6
Hydrazine (TZW)	µg.l ⁻¹		-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1

Analysis – Station 4	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			25/2/10 Surface	15/12/10 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1
Tentatively identified semi-volatile organic compounds:				
2,4-Dibromophenol	mg.l ⁻¹		ND	< 0.002
2,6-Dibromophenol	mg.l ⁻¹		ND	< 0.002
Tentatively identified volatile organic compounds:				
	µg.l ⁻¹		ND	ND

Table 39 Station 5 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 5 was located at the cooling water outfall.

Analysis – Station 5	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
pH	pH units		7.7	7.7	7.8	7.9	7.7	8.1	7.8	7.9	7.9	8	7.9	7.6	7.7	7.9	7.9	7.8	7.7	7.9	7.7	7.8	7.4
Suspended Solids	mg.l ⁻¹		135	203	58	142	144	14	15	49	74	95	34	109	9	48	110	302	76	89	31	124	426
Total Alkalinity as CaCO ₃	mg.l ⁻¹		136	138	139	135	132	126	111	125	129	134	136	131	125	129	131	133	137	140	135	139	132
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		136	138	139	135	92	126	111	125	129	134	136	131	125	129	131	133	137	140	135	139	132
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloride as Cl	mg.l ⁻¹		14200	14200	14800	15400	10100	14800	17200	17000	15600	13200	16400	16200	15000	14800	12500	15100	16400	16000	12400	11000	13400
Fluoride as F	mg.l ⁻¹		1.3	1.3	1.3	1.3	1.3	1.3	8.1	1.3	1.9	2.6	1.3	1.3	1.3	1.3	1.2	1.3	1.3	1.4	1.3	1.3	1.4
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2570	2620	2860	3060	2720	2610	2500	2810	2590	2670	2620	2630	2460	2810	2700	3900	1730	2730	2890	2750	2630
Calcium as Ca (Total)	mg.l ⁻¹		250	246	308	259	228	257	197	225	259	267	260	252	280	264	264	269	256	262	281	250	258
Calcium as Ca (Dissolved)	mg.l ⁻¹		245	241	253	260	255	250	245	247	251	254	242	255	276	262	252	278	251	260	273	263	249
Magnesium as Mg (Total)	mg.l ⁻¹		1170	1150	1470	1180	1030	1150	807	1010	1200	1230	1200	1190	1140	1230	1220	1560	1190	1280	1330	1080	1260
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1150	1160	1240	1280	1150	1140	1110	1210	1100	1170	1120	1120	1110	1370	1240	1420	252	1220	1420	1260	1170
Strontium as Sr (Total)	mg.l ⁻¹		4.59	4.49	5.61	4.66	4.16	4.64	3.58	4.13	4.72	4.91	4.75	4.63	5.07	4.81	4.85	4.87	4.72	4.94	5.14	4.38	4.8
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.5	4.49	4.78	4.69	4.61	4.48	4.45	4.54	4.63	4.67	4.44	4.63	4.94	4.8	4.72	4.99	4.59	4.53	4.96	4.76	4.66
Sodium as Na (Dissolved)	mg.l ⁻¹		10200	10300	9880	11000	10700	10400	10200	11500	9740	11000	9790	9970	9460	11000	10500	11500	288	11300	11400	11600	11100
Potassium as K (Total)	mg.l ⁻¹		551	534	677	567	480	533	388	482	575	604	588	566	540	548	559	750	558	634	628	513	611
Potassium as K (Dissolved)	mg.l ⁻¹		534	542	571	615	530	521	540	576	521	569	546	521	520	362	570	687	18	589	437	593	565
Nickel as Ni (Total)	mg.l ⁻¹		0.013	0.011	0.003	0.003	0.003	0.003	0.004	0.003	0.007	0.002	0.004	0.005	0.005	0.003	0.005	0.006	0.005	0.003	0.004	0.006	0.005
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.012	0.012	0.003	0.004	0.003	0.005	0.004	0.003	0.005	0.003	0.004	0.004	0.004	0.004	0.004	0.006	0.006	0.004	0.004	0.005	0.004
Chromium as Cr (Total)	mg.l ⁻¹		0.001	0.005	< 0.001	< 0.001	0.001	0.001	0.001	0.001	0.003	< 0.001	0.001	0.001	0.001	0.001	0.013	0.001	< 0.001	< 0.001	< 0.001	0.002	0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	0.001	0.001	< 0.001	< 0.001	0.002	0.002	< 0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	0.001
Cadmium as Cd (Total)	mg.l ⁻¹		<0.0001	0.0004	< 0.001	<0.0001	<0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Analysis – Station 5	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	0.0003	<0.0001	<0.0001	<0.0001	< .0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.004	0.004	0.002	0.002	0.004	0.003	0.004	0.002	0.004	0.002	0.006	0.005	0.013	0.004	0.007	0.007	0.004	0.003	0.004	0.008	0.004
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.004	0.004	0.003	0.003	0.004	0.003	0.004	0.002	0.004	0.003	0.008	0.007	0.006	0.004	0.005	0.004	0.003	0.004	0.005	0.005	0.004
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.008	0.016	0.009	0.016	0.014	0.007	0.008	0.006	0.008	0.005	0.015	0.006	0.01	0.01	0.013	0.008	0.018	0.011	0.016	0.013	0.009
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.008	0.015	0.008	0.01	0.007	0.007	0.007	0.006	0.01	0.006	0.008	0.006	0.008	0.009	0.008	0.008	0.007	0.013	0.018	0.011	0.007
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.005	< 0.002	< 0.002	0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.025
Iron as Fe (Total)	mg.l ⁻¹		0.22	0.08	0.03	0.26	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06	0.09	0.09	< 0.01	< 0.01	< 0.01	< 0.01	2.98	< 0.01
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.01	0.01	0.02	0.01	0.06	0.01	< 0.01	0.01	< 0.01	< 0.01
Arsenic as As (Total)	mg.l ⁻¹		0.009	0.008	0.012	0.013	0.016	0.01	0.019	0.014	0.018	0.012	0.013	0.011	0.014	0.013	0.02	0.016	0.025	0.013	0.02	0.024	0.023
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.011	0.011	0.018	0.017	0.018	0.014	0.022	0.014	0.023	0.017	0.016	0.014	0.015	0.017	0.02	0.019	0.03	0.017	0.025	0.025	0.027
Boron as B (Total)	mg.l ⁻¹		4.17	4.02	5.26	4.19	3.85	4.15	2.83	3.41	4.4	4.56	4.23	4.41	4.27	4.19	4.16	5.22	4.05	4.33	4.34	3.64	4.25
Boron as B (Dissolved)	mg.l ⁻¹		3.98	4.08	4.36	4.46	4.49	4.1	3.86	4.07	4	4.35	4.04	4.3	4.12	4.96	4.21	4.8	0.3	4.04	3.49	4.11	3.88
Mercury as Hg (Total)	mg.l ⁻¹		0.0002	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0003	< 0.0001	0.0001	< 0.0001	0.0001	0.0007	< 0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	0.0002	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	0.0001	0.0001	< 0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		< 0.001	0.01	0.055	0.063	0.04	0.012	0.04	0.03	0.054	0.032	< 0.001	< 0.001	0.01	0.021	< 0.001	0.042	< 0.001	0.024	0.08	< 0.001	0.096
Selenium as Se (Total)	mg.l ⁻¹		0.01	< 0.001	0.033	0.033	0.01	0.014	0.033	0.027	0.046	0.025	< 0.001	< 0.001	0.02	0.008	< 0.001	< 0.001	0.039	0.026	0.052	0.008	0.078
Molybdenum as Mo (Total)	mg.l ⁻¹		0.01	0.01	0.009	0.008	0.011	0.008	0.01	0.012	0.01	0.009	0.012	0.009	0.011	0.01	0.011	0.011	0.011	0.008	0.01	0.01	0.011
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.012	0.011	0.011	0.011	0.01	0.011	0.01	0.012	0.011	0.011	0.013	0.011	0.011	0.011	0.01	0.011	0.012	0.01	0.011	0.011	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.45	0.45	0.44	0.3	0.2	0.2	0.42	0.4	0.45	0.46	0.45	0.46	0.4	0.41	0.44	0.36	0.45	0.52	0.2	0.41	0.41
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

Analysis – Station 5	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.31	< 0.01	0.02	< 0.01	0.03	0.03	0.21	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		230	200	185	240	< 5	< 5	1100	240	230	180	280	280	270	370	270	280	320	250	125	320	120
Total Organic Carbon	mg.l ⁻¹		0.39	0.42	0.55	0.56	0.62	0.53	0.54	0.51	0.87	0.64	0.58	0.63	0.72	0.59	0.67	0.63	0.59	0.65	0.59	0.6	0.76
Salinity	ppt		35.4	35.4	37.4	35.2	33.8	28	31.9	29.9	3502	36.1	37	37.2	35.5	36.3	35.5	40.4	35.5	35.6	36	32.6	33.2
Turbidity N.T.U	NTU		38	96	4	17	16	< 1	14	32	3	2	6	22	2	16	32	7	26	11	5	31	< 1
Bromide as Br	mg.l ⁻¹		174	191	242	160	99.5	194	162	197	552	380	226	218	196	180	212	250	254	266	770	61.5	65.3
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2	2.1	0.4	< 2	< 2	2.2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.05	0.05	0.07	0.03	0.06	0.06	0.06	0.05	0.07	0.05	0.05	0.06	0.07	0.07	0.07	0.06	0.07	0.09	0.07	0.06	0.09
Silicon as Si (Total)	mg.l ⁻¹		0.6	0.5	0.6	0.4	0.4	0.1	0.4	0.3	0.2	< 0.1	0.3	0.4	0.5	0.6	0.4	0.2	0.4	0.3	0.3	2.5	0.2
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	< 20	20	< 20	< 20	26	28	109	< 20	< 20	70	< 20	< 20	51	< 20	45	25	30	20	30	136
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1.4	1.4	< 10	< 10	12.5	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	2	< 2	< 2	< 2	< 2	7.5	< 2	< 2	8.5	< 2	< 2	3.5	< 2	< 2	5.5	< 2	< 2	< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.37	0.38	0.33	0.52	0.5	0.43	0.34	0.18	0.14	0.66	0.38	0.25	< 0.1	0.43	0.36	0.27	0.38	0.53	0.31	0.44	0.35
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.4	0.5	0.6	< 0.3	14.7	< 0.3	2	4.3	< 0.3	< 0.3	1.3	< 0.3	0.0231	< 0.3	0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		488	76	624	>1000	6	88	5	1	1008	28	>1000	200	608	25	408	348	114	145	51	109	232
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		0.01	0.02	< 0.01	< 0.01	< 0.01	0.02	0.01	0.02	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.02	< 0.01	0.15
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	0.39	< 0.20	< 0.2	< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.4	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromoacetic acid	µg.l ⁻¹		< 1.00	< 1.00	< 1.00	2.4	< 1.0	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	1.2	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
Dibromo-acetonitrile	µg.l ⁻¹		< 10	< 10	< 10	< 10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.1	0.26	< 0.10	< 0.1	< 0.10	< 0.10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		3.0	0.5	0.5	1.5	1.4	10.8	7.2	0.5	0.5	5.9	7.0	5.7	5.6	3.8	4.3	2.6	0.5	11.5	0.5	8.2	0.9
Hydrazine (TZW)	µg.l ⁻¹		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 10	14.8	< 2	< 10	34.5	< 10	< 10	< 10	< 10	< 10	< 20	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl)	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005	0.008	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Analysis – Station 5	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
ether																							
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	0.05	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	0.036	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002	< 0.002	0.026	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	0.011	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	0.028	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	0.048	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	0.007	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	0.026	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl) phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concentrations)	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1	< 1	9	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	13	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1	58	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1	38	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2
Bromoform	µg.l ⁻¹		< 1	< 1	< 1	2	< 1	< 1	< 1	< 1	8	8	6	< 1	< 1	7	< 1	10	< 1	2	< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	45	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	3
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	188	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	9
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1	< 1	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Analysis – Station 5	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Tentatively identified semi-volatile organic compounds:																							
2,4 Dibromophenol	mg.l ⁻¹		ND	ND	< 0.002	< 0.002	ND	< 0.002	< 0.05	< 0.05	< 0.002	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	ND	< 0.002	ND	< 0.002	< 0.02	ND	< 0.02
2,6- Dibromophenol	mg.l ⁻¹		ND	ND	< 0.02	< 0.02	ND	< 0.002	< 0.05	< 0.05	< 0.002	< 0.02	< 0.02	< 0.02	< 0.02	< 0.002	ND	< 0.002	ND	< 0.002	< 0.02	ND	< 0.02
Tetrachloro-ethylene	mg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.016	ND	ND	ND	ND	ND
2-Oxazolidone	mg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.018	ND	ND
butyl cyclohexyl ester 1,2-Benzene dicarboxylic acid	mg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,5-trimethyl-Phenanthrene	mg.l ⁻¹		ND	ND	ND	ND	0.125	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Eicosane	mg.l ⁻¹		ND	ND	ND	ND	0.114	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bacchotricuneatin c	mg.l ⁻¹		ND	ND	ND	ND	0.081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6,10,14-tetramethyl-Hexadecane	mg.l ⁻¹		ND	ND	ND	ND	0.079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Bromo dodecane	mg.l ⁻¹		ND	ND	ND	ND	0.072	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dodecane	mg.l ⁻¹		ND	ND	ND	ND	0.064	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methyl-Pyrene	mg.l ⁻¹		ND	ND	ND	ND	0.061	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methyl-Phenanthrene	mg.l ⁻¹		ND	ND	ND	ND	0.057	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9-methyl-9H-Fluorene	mg.l ⁻¹		ND	ND	ND	ND	0.054	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6,10,15-tetramethyl-Heptadecane	mg.l ⁻¹		ND	ND	ND	ND	0.053	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,7-dimethyl-Phenanthrene	mg.l ⁻¹		ND	ND	ND	ND	0.051	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetradecane	mg.l ⁻¹		ND	ND	ND	ND	0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methyl-Octadecane	mg.l ⁻¹		ND	ND	ND	ND	0.049	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methyl-6-propyl-Dodecane	mg.l ⁻¹		ND	ND	ND	ND	0.045	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptacosane	mg.l ⁻¹		ND	ND	ND	ND	0.044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Octadecane	mg.l ⁻¹		ND	ND	ND	ND	0.041	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetradecane	mg.l ⁻¹		ND	ND	ND	ND	0.039	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentadecane	mg.l ⁻¹		ND	ND	ND	ND	0.037	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-tetrahydro-Phenanthrene	mg.l ⁻¹		ND	ND	ND	ND	0.034	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Analysis – Station 5	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																				
			25/2/10 surface	25/2/10 near-bed	8/4/10 surface	21/4/10 surface	19/5/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Tentatively identified volatile organic compounds:																							
Dodecane	µg.l ⁻¹		ND	ND	ND	ND	183	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methyl-Naphthalene	µg.l ⁻¹		ND	ND	ND	ND	132	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-methyl-Undecane	µg.l ⁻¹		ND	ND	ND	ND	132	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetradecane	µg.l ⁻¹		ND	ND	ND	ND	126	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methyl-1-propenyl-Benzene	µg.l ⁻¹		ND	ND	ND	ND	117	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-tetrahydro-5-methyl-Naphthalene	µg.l ⁻¹		ND	ND	ND	ND	107	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-ethenyl-2-methyl-Benzene	µg.l ⁻¹		ND	ND	ND	ND	106	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-ethyl-2,3-dimethyl-Benzene	µg.l ⁻¹		ND	ND	ND	ND	76	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-tetrahydro-Naphthalene	µg.l ⁻¹		ND	ND	ND	ND	74	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha, beta, beta.-Trimethylstyrene	µg.l ⁻¹		ND	ND	ND	ND	74	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methyl-2-(2-propenyl)-Benzene	µg.l ⁻¹		ND	ND	ND	ND	64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methyl-4-(1-methylethyl)-Benzene	µg.l ⁻¹		ND	ND	ND	ND	64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,5,6,7-Hexahydro-1H-cyclopenta[a]pentalene	µg.l ⁻¹		ND	ND	ND	ND	63	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methyl-4-propyl-Benzene	µg.l ⁻¹		ND	ND	ND	ND	58	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
(2-methyl-1-butenyl)-Benzene	µg.l ⁻¹		ND	ND	ND	ND	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methyl-4-(2-propenyl)-Benzene	µg.l ⁻¹		ND	ND	ND	ND	43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-butyl-Benzene-sulfonamide	µg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	ND

Table 40 Station 6 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 6 was located 0.5 km from the cooling water outfall.

Analysis – Station 6	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			07/04/10 Surface	15/12/10 Surface
pH	pH units		7.7	7.9
Suspended Solids	mg.l ⁻¹		58	84
Total Alkalinity as CaCO ₃	mg.l ⁻¹		135	100
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		135	100
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0
Chloride as Cl	mg.l ⁻¹		13400	15800
Fluoride as F	mg.l ⁻¹		1.3	1.2
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2780	2710
Calcium as Ca (Total)	mg.l ⁻¹		268	257
Calcium as Ca (Dissolved)	mg.l ⁻¹		260	264
Magnesium as Mg (Total)	mg.l ⁻¹		1400	1300
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1230	1210
Strontium as Sr (Total)	mg.l ⁻¹		5	4.86
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.75	4.54
Sodium as Na (Dissolved)	mg.l ⁻¹		9570	11400
Potassium as K (Total)	mg.l ⁻¹		640	637
Potassium as K (Dissolved)	mg.l ⁻¹		564	589
Nickel as Ni (Total)	mg.l ⁻¹		0.002	0.004
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.004
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.002	0.004
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.004
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.015	0.011
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.015	0.009
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002

Analysis – Station 6	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			07/04/10 Surface	15/12/10 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.01	< 0.01

Analysis – Station 6	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			07/04/10 Surface	15/12/10 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	< 0.01
Arsenic as As (Total)	mg.l ⁻¹		0.008	0.015
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.017	0.016
Boron as B (Total)	mg.l ⁻¹		4.99	4.37
Boron as B (Dissolved)	mg.l ⁻¹		4.37	4.07
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	0.0002
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.025	0.024
Selenium as Se (Total)	mg.l ⁻¹		0.015	0.015
Molybdenum as Mo (Total)	mg.l ⁻¹		0.007	0.01
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.01	0.01
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.43	0.4
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		220	240
Total Organic Carbon	mg.l ⁻¹		0.48	0.55
Salinity	ppt		38	35.6
Turbidity N.T.U	NTU		37	11
Bromide as Br	mg.l ⁻¹		125	253
Iodide as I	mg.l ⁻¹		< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.08	0.09
Silicon as Si (Total)	mg.l ⁻¹		0.5	0.4
MBAS as Lauryl Sulphate	µg.l ⁻¹		60	< 20
Chlorophyll A	µg.l ⁻¹		< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.4	0.46
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		< 0.3	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		800	256

Analysis – Station 6	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			07/04/10 Surface	15/12/10 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.2
Cationic Detergents	mg.l ⁻¹		< 1	< 1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 0.1
Hydrazine (measurement not reliable)	µg.l ⁻¹		1.5	2.9
Hydrazine (TZW)	µg.l ⁻¹		-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns.)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1

Analysis – Station 6	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			07/04/10 Surface	15/12/10 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1
Tentatively identified semi-volatile organic compounds:				
2,4-Dibromophenol	mg.l ⁻¹		ND	< 0.002
2,6-Dibromophenol	mg.l ⁻¹		ND	< 0.002
Tentatively identified volatile organic compounds:				
	µg.l ⁻¹		ND	ND

Table 41 Station 7 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or "ND" (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 7 was located 1.1 km from the cooling water outfall.

Analysis – Station 7	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	31/01/11 Surface
pH	pH units		7.9	7.9	7.8
Suspended Solids	mg.l ⁻¹		100	95	57
Total Alkalinity as CaCO ₃	mg.l ⁻¹		139	126	142
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		139	126	142
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0
Chloride as Cl	mg.l ⁻¹		14300	11600	16600
Fluoride as F	mg.l ⁻¹		1.3	1.3	1.2
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		3080	2780	2760
Calcium as Ca (Total)	mg.l ⁻¹		275	268	261
Calcium as Ca (Dissolved)	mg.l ⁻¹		260	261	259
Magnesium as Mg (Total)	mg.l ⁻¹		1370	1480	1200
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1340	1250	1240
Strontium as Sr (Total)	mg.l ⁻¹		5.09	4.93	4.65
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.77	4.8	4.75
Sodium as Na (Dissolved)	mg.l ⁻¹		9400	10100	11600
Potassium as K (Total)	mg.l ⁻¹		629	673	578
Potassium as K (Dissolved)	mg.l ⁻¹		615	567	585
Nickel as Ni (Total)	mg.l ⁻¹		0.002	0.003	0.006
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.003	0.005
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.004
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001	0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.002	0.003	0.01
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.003	0.006
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.002
Zinc as Zn (Total)	mg.l ⁻¹		0.007	0.018	0.016
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.008	0.023	0.009
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002

Analysis – Station 7	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	31/01/11 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.03	0.07	1.07

Analysis – Station 7	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	31/01/11 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	0.01	0.01
Arsenic as As (Total)	mg.l ⁻¹		0.013	0.014	0.011
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.019	0.019	0.024
Boron as B (Total)	mg.l ⁻¹		4.89	5.26	4.05
Boron as B (Dissolved)	mg.l ⁻¹		4.7	4.57	4.12
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	0.0002
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.043	0.054	< 0.001
Selenium as Se (Total)	mg.l ⁻¹		0.038	0.036	< 0.001
Molybdenum as Mo (Total)	mg.l ⁻¹		0.008	0.008	0.01
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.01	0.01	0.011
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.002
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.4	0.47	0.44
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		225	190	280
Total Organic Carbon	mg.l ⁻¹		0.49	0.48	0.61
Salinity	ppt		37.9	38.1	32.9
Turbidity N.T.U	NTU		12	16	121
Bromide as Br	mg.l ⁻¹		219	254	60.9
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.07	0.05
Silicon as Si (Total)	mg.l ⁻¹		0.5	0.5	1.6
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	60	< 20
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.34	0.29	0.45
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.6	1.1	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		32	160	29

Analysis – Station 7	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	31/01/11 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	0.02	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	< 1	< 1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		0.5	0.5	1.5
Hydrazine (TZW)	µg.l ⁻¹		-	-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1

Analysis – Station 7	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	31/01/11 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:					
2,4-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	ND
2,6-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	ND
Tentatively identified volatile organic compounds:					
	µg.l ⁻¹		ND	ND	ND

Table 42 Station 8 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 8 was located 2.4 km from the cooling water outfall.

Analysis – Station 8	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			08/04/10 Surface	31/01/11 Surface
pH	pH units		7.9	7.8
Suspended Solids	mg.l ⁻¹		96	69
Total Alkalinity as CaCO ₃	mg.l ⁻¹		137	129
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		137	129
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0
Chloride as Cl	mg.l ⁻¹		14200	12300
Fluoride as F	mg.l ⁻¹		1.3	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2870	2630
Calcium as Ca (Total)	mg.l ⁻¹		200	261
Calcium as Ca (Dissolved)	mg.l ⁻¹		261	263
Magnesium as Mg (Total)	mg.l ⁻¹		841	1310
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1250	1220
Strontium as Sr (Total)	mg.l ⁻¹		3.58	4.7
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.77	4.74
Sodium as Na (Dissolved)	mg.l ⁻¹		10000	11400
Potassium as K (Total)	mg.l ⁻¹		380	616
Potassium as K (Dissolved)	mg.l ⁻¹		573	582
Nickel as Ni (Total)	mg.l ⁻¹		0.003	0.007
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.006
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	0.004
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.003	0.01
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.006
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	0.003
Zinc as Zn (Total)	mg.l ⁻¹		0.011	0.02
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.011	0.009
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002

Analysis – Station 8	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			08/04/10 Surface	31/01/11 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.01	3.97

Analysis – Station 8	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			08/04/10 Surface	31/01/11 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	0.01
Arsenic as As (Total)	mg.l ⁻¹		0.009	0.022
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.018	0.025
Boron as B (Total)	mg.l ⁻¹		3.03	4.31
Boron as B (Dissolved)	mg.l ⁻¹		4.45	3.99
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	0.0002
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.057	< 0.001
Selenium as Se (Total)	mg.l ⁻¹		0.017	< 0.001
Molybdenum as Mo (Total)	mg.l ⁻¹		0.01	0.01
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.01	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	0.002
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.45	0.44
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		200	300
Total Organic Carbon	mg.l ⁻¹		0.51	0.68
Salinity	ppt		37.9	33.1
Turbidity N.T.U	NTU		9	12
Bromide as Br	mg.l ⁻¹		189	61.1
Iodide as I	mg.l ⁻¹		< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.05
Silicon as Si (Total)	mg.l ⁻¹		0.3	4.6
MBAS as Lauryl Sulphate	µg.l ⁻¹		20	< 20
Chlorophyll A	µg.l ⁻¹		< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.28	0.61
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.7	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		180	118

Analysis – Station 8	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			08/04/10 Surface	31/01/11 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	< 0.01
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	1.6
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		1.9	4.5
Hydrazine (TZW)	µg.l ⁻¹		-	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1

Analysis – Station 8	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)	
			08/04/10 Surface	31/01/11 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1
Tentatively identified semi-volatile organic compounds:				
2,4-Dibromophenol	mg.l ⁻¹		ND	< 0.002
2,6-Dibromophenol	mg.l ⁻¹		ND	< 0.002
Tentatively identified volatile organic compounds:				
	µg.l ⁻¹		ND	ND

Table 43 Station 9 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 9 was located 12 km from the cooling water outfall.

Analysis – Station 9	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface
pH	pH units		7.9	7.9	7.8
Suspended Solids	mg.l ⁻¹		68	80	65
Total Alkalinity as CaCO ₃	mg.l ⁻¹		134	140	149
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		134	140	149
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0
Chloride as Cl	mg.l ⁻¹		14300	15500	13000
Fluoride as F	mg.l ⁻¹		1.4	1.3	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2800	3200	2820
Calcium as Ca (Total)	mg.l ⁻¹		258	266	262
Calcium as Ca (Dissolved)	mg.l ⁻¹		256	262	272
Magnesium as Mg (Total)	mg.l ⁻¹		1240	1420	1340
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1270	1430	1350
Strontium as Sr (Total)	mg.l ⁻¹		4.73	5.01	4.78
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.81	4.79	4.95
Sodium as Na (Dissolved)	mg.l ⁻¹		10100	9510	11000
Potassium as K (Total)	mg.l ⁻¹		563	646	626
Potassium as K (Dissolved)	mg.l ⁻¹		582	656	417
Nickel as Ni (Total)	mg.l ⁻¹		0.003	0.004	0.005
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.003	0.004
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.003	0.003	0.006
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.004	0.005
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.016	0.044	0.027
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.018	0.054	0.022
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002

Analysis – Station 9	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface
Iron as Fe (Total)	mg.l ⁻¹		0.03	0.06	< 0.01

Analysis – Station 9	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	0.02	0.01
Arsenic as As (Total)	mg.l ⁻¹		0.014	0.014	0.026
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.019	0.019	0.028
Boron as B (Total)	mg.l ⁻¹		4.45	5.06	4.37
Boron as B (Dissolved)	mg.l ⁻¹		4.51	5.05	3.25
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.061	0.054	0.1
Selenium as Se (Total)	mg.l ⁻¹		0.034	0.044	0.082
Molybdenum as Mo (Total)	mg.l ⁻¹		0.008	0.008	0.012
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.011	0.01	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.47	0.3	0.4
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		0.02	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		250	240	300
Total Organic Carbon	mg.l ⁻¹		0.45	0.52	0.52
Salinity	ppt		38.2	38	36.2
Turbidity N.T.U	NTU		8	21	< 1
Bromide as Br	mg.l ⁻¹		229	215	786
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.07	0.06
Silicon as Si (Total)	mg.l ⁻¹		0.4	0.5	0.5
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	20	30
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.42	0.24	0.36
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.3	0.9	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		456	184	72

Analysis – Station 9	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	0.01	0.03
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	2	< 1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		1.1	0.5	16.7
Hydrazine (TZW)	µg.l ⁻¹		-	-	< 0.01
Morpholine	mg.l ⁻¹		< 0.0	< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	0.004	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		0.004	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		0.004	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1

Analysis – Station 9	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)		
			08/04/10 Surface	08/04/10 Near-bed	17/01/11 Surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:					
2,4-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	< 0.02
2,6-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	< 0.02
Tentatively identified volatile organic compounds:					
	µg.l ⁻¹		ND	ND	ND

Table 44 Station 10 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 10 was located 10.8 km from the cooling water outfall.

Analysis – Station 10	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			07/04/10 Surface	07/04/10 Near-bed	31/01/11 Surface	14/02/11 Near-bed
pH	pH units		7.7	7.7	7.2	7.5
Suspended Solids	mg.l ⁻¹		17	75	28	778
Total Alkalinity as CaCO ₃	mg.l ⁻¹		130	133	101	140
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		130	133	101	140
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0	0
Chloride as Cl	mg.l ⁻¹		15300	10600	10600	14500
Fluoride as F	mg.l ⁻¹		1.3	1.3	1.2	1.2
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		3130	2700	2620	2760
Calcium as Ca (Total)	mg.l ⁻¹		258	269	256	262
Calcium as Ca (Dissolved)	mg.l ⁻¹		258	254	261	251
Magnesium as Mg (Total)	mg.l ⁻¹		1280	1390	1260	1240
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1380	1210	1210	1270
Strontium as Sr (Total)	mg.l ⁻¹		4.82	4.93	4.62	4.82
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.75	4.81	4.73	4.66
Sodium as Na (Dissolved)	mg.l ⁻¹		9430	9610	11800	10500
Potassium as K (Total)	mg.l ⁻¹		582	635	594	599
Potassium as K (Dissolved)	mg.l ⁻¹		626	562	574	616
Nickel as Ni (Total)	mg.l ⁻¹		0.004	0.002	0.007	0.004
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.003	0.006	0.004
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.002	0.002
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001	0.001	0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001	0.0001
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.002	0.002	0.017	0.007
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.003	0.007	0.007
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.015	0.036	0.017	0.434
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.013	0.043	0.018	0.516
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	0.002	< 0.02
Iron as Fe (Total)	mg.l ⁻¹		0.04	0.03	0.54	0.58

Analysis – Station 10	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			07/04/10 Surface	07/04/10 Near-bed	31/01/11 Surface	14/02/11 Near-bed
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.02	0.01	0.01	< 0.01
Arsenic as As (Total)	mg.l ⁻¹		0.014	0.013	0.027	0.019
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.017	0.017	0.023	0.029
Boron as B (Total)	mg.l ⁻¹		4.6	4.89	4.31	4.2
Boron as B (Dissolved)	mg.l ⁻¹		4.86	4.31	4.38	4.14
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	0.0002	< 0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.04	0.043	< 0.001	0.097
Selenium as Se (Total)	mg.l ⁻¹		0.036	0.041	< 0.001	0.063
Molybdenum as Mo (Total)	mg.l ⁻¹		0.009	0.008	0.01	0.011
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.01	0.01	0.011	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.002	0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	0.001	0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.44	0.46	0.42	0.36
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		230	230	200	< 100
Total Organic Carbon	mg.l ⁻¹		0.44	0.51	0.49	0.65
Salinity	ppt		38.3	38.6	33	33
Turbidity N.T.U	NTU		8	43	2	173
Bromide as Br	mg.l ⁻¹		128	128	61	65.9
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.07	0.05	0.09
Silicon as Si (Total)	mg.l ⁻¹		0.4	0.5	1.1	1.2
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	< 20	32	40
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.35	0.36	0.53	0.44
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		< 0.3	0.4	< 0.3	< 1.2
Total Viable Count @ 22°C	Counts.ml ⁻¹		> 1000	> 1000	6	440

Analysis – Station 10	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			07/04/10 Surface	07/04/10 Near-bed	31/01/11 Surface	14/02/11 Near-bed
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		0.01	0.12	0.04	0.02
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	1.3	< 1	1.1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1	< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		0.5	0.5	2.7	1.4
Hydrazine (TZW)	µg.l ⁻¹		-	-	< 0.01	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl) ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl) phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1

Analysis – Station 10	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			07/04/10 Surface	07/04/10 Near-bed	31/01/11 Surface	14/02/11 Near-bed
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:						
2,4-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	ND	< 0.02
2,6-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	ND	< 0.02
Tentatively identified volatile organic compounds:						
	µg.l ⁻¹		ND	ND	ND	ND

Table 45 Station 11 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 11 was located 3.5 km from the cooling water outfall.

Analysis – Station 11	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																		
			07/04/10 surface	21/04/10 surface	19/05/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
pH	pH units		7.7	7.9	7.7	8.2	7.9	7.9	8	7.8	8	7.9	7.9	8	7.9	7.9	7.8	7.8	7.7	7.7	7.6
Suspended Solids	mg.l ⁻¹		28	122	244	43	52	49	58	95	44		89	49	113	81	90	155	59	31	246
Total Alkalinity as CaCO ₃	mg.l ⁻¹		136	132	128	130	136	125	132	136	136	132	127	130	130	131	136	123	120	142	161
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		136	132	82	130	136	125	132	136	136	132	127	130	130	131	136	123	120	142	161
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloride as Cl	mg.l ⁻¹		15100	11600	10400	14000	14200	17800	13000	11900	16900	15700	16400	14400	13800	13100	18000	14000	11300	17300	15200
Fluoride as F	mg.l ⁻¹		1.3	1.2	0.2	1.3	1.5	1.4	2.5	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.3	1.4	1.2	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2930	2970	2760	2700	2530	2800	2610	2750	2610	2650	2500	2690	2530	3810	2870	2630	3150	2630	2780
Calcium as Ca (Total)	mg.l ⁻¹		254	203	172	221	198	216	253	207	265	236	280	265	257	285	259	255	274	253	251
Calcium as Ca (Dissolved)	mg.l ⁻¹		259	256	254	254	246	251	248	247	248	250	280	258	256	267	249	258	269	262	246
Magnesium as Mg (Total)	mg.l ⁻¹		1110	928	653	941	857	958	1150	843	1210	1070	1160	1270	1230	1580	1230	1280	1270	1170	1210
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1300	1260	1180	1160	1140	1210	1150	1160	1130	1170	1120	1360	1190	1400	1280	1180	1440	1180	1280
Strontium as Sr (Total)	mg.l ⁻¹		4.54	3.72	2.98	3.95	3.65	3.96	4.61	3.77	4.79	4.34	5.07	4.97	4.94	5.16	4.82	4.78	4.98	4.61	4.69
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.83	4.66	4.6	4.58	4.43	4.59	4.61	4.64	4.46	4.55	5.02	4.73	4.76	4.89	4.65	4.5	4.93	4.76	4.59
Sodium as Na (Dissolved)	mg.l ⁻¹		9870	10100	11100	9580	10100	11600	10100	11300	9640	9950	9200	10900	10600	11400	10900	11200	11700	11500	10100
Potassium as K (Total)	mg.l ⁻¹		517	438	276	440	420	455	550	417	591	503	548	561	563	771	568	636	608	560	584
Potassium as K (Dissolved)	mg.l ⁻¹		587	616	535	528	553	579	547	554	555	557	525	363	538	672	596	571	444	560	620
Nickel as Ni (Total)	mg.l ⁻¹		0.003	0.004	0.003	0.004	0.005	0.003	0.006	0.003	0.003	0.005	0.004	0.003	0.004	0.006	0.003	0.005	0.005	0.006	0.005
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.003	0.003	0.004	0.005	0.003	0.007	0.003	0.003	0.005	0.005	0.003	0.004	0.007	0.004	0.005	0.005	0.006	0.005
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001	0.001	0.001	0.003	0.001	0.001	< 0.001	< 0.001	0.001	0.002	0.002	0.006	0.001	0.001	0.001	0.002	0.001	0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001	0.002	0.001	< 0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.002	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.002	0.003	0.004	0.004	0.004	0.002	0.003	0.003	0.003	0.006	0.012	0.004	0.005	0.008	0.003	0.007	0.005	0.011	0.005
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.002	0.003	0.003	0.004	0.004	0.002	0.004	0.003	0.005	0.007	0.016	0.004	0.005	0.01	0.003	0.007	0.005	0.01	0.004
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.014	0.014	0.012	0.008	0.009	0.005	0.007	0.019	0.007	0.01	0.01	0.01	0.013	0.007	0.012	0.022	0.016	0.02	0.03
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.012	0.009	0.007	0.008	0.006	0.003	0.006	0.008	0.006	0.009	0.009	0.009	0.007	0.007	0.008	0.02	0.041	0.011	0.022
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	0.009	< 0.002	< 0.002	0.003	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.02
Iron as Fe (Total)	mg.l ⁻¹		0.02	0.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.6	0.14	0.07	0.02	0.43	< 0.01	1.46	0.72	< 0.01

Analysis – Station 11	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																		
			07/04/10 surface	21/04/10 surface	19/05/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.2	< 0.01	< 0.01	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	0.01	0.17	< 0.01	0.01	0.02	0.01	0.01	0.01	< 0.01	0.01	0.01	0.02
Arsenic as As (Total)	mg.l ⁻¹		0.018	0.014	0.013	0.015	0.021	0.015	0.016	0.014	0.014	0.013	0.012	0.013	0.019	0.015	0.024	0.015	0.021	0.024	0.029
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.018	0.018	0.018	0.015	0.022	0.015	0.023	0.018	0.016	0.014	0.015	0.016	0.02	0.019	0.031	0.017	0.024	0.025	0.03
Boron as B (Total)	mg.l ⁻¹		4.07	3.29	2.07	3.43	3	3.19	4.16	3.13	4.14	4.04	4.31	4.25	4.25	5.35	4.19	4.29	4.16	3.94	4.07
Boron as B (Dissolved)	mg.l ⁻¹		4.56	4.4	4.37	4.14	3.9	4.04	4.11	4.29	3.91	4.35	4.15	4.81	4.03	4.69	4.42	3.98	3.74	4.01	4.19
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	0.0001	< 0.0001	< 0.0001	0.0001	0.0002	< 0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.036	0.062	0.051	0.023	0.013	0.036	0.05	0.033	< 0.001	< 0.001	< 0.001	0.02	0.008	< 0.001	0.073	< 0.001	0.08	< 0.001	0.1
Selenium as Se (Total)	mg.l ⁻¹		0.04	0.025	0.029	0.028	0.032	0.029	0.023	0.012	0.027	< 0.001	0.011	0.019	< 0.001	< 0.001	0.067	< 0.001	0.054	< 0.001	0.096
Molybdenum as Mo (Total)	mg.l ⁻¹		0.011	0.01	0.011	0.011	0.01	0.012	0.008	0.009	0.012	0.012	0.009	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.012
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.011	0.01	0.01	0.011	0.01	0.012	0.011	0.01	0.012	0.011	0.011	0.011	0.01	0.011	0.012	0.01	0.011	0.012	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	0.001	0.001	0.001
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.002	0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.2	0.3	0.46	0.3	0.42	0.43	0.59	0.2	0.48	0.46	0.44	0.42	0.42	0.35	0.42	0.43	0.39	0.42	0.36
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		0.06	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		210	235	< 5	< 5	975	250	210	200	200	260	240	210	280	270	220	280	150	200	< 100
Total Organic Carbon	mg.l ⁻¹		0.54	0.54	0.64	0.38	0.7	0.46	0.66	0.7	0.59	0.6	0.66	0.57	0.59	0.52	0.52	0.75	0.57	0.56	0.55
Salinity	ppt		38.5	35.6	33.8	28.6	31.3	29.8	3507	40.3	37	37.4	36.1	35.7	37.5	40.2	36	36	36.7	32.8	32.7
Turbidity N.T.U	NTU		7	14	6	< 1	105	22	< 1	1	5	1	2	8	17	< 1	28	40	1	9	4
Bromide as Br	mg.l ⁻¹		129	415	105	171	172	212	480	405	218	253	188	190	223	330	264	246	760	59.6	66.9
Iodide as I	mg.l ⁻¹		< 2	2.1	2.4	< 2	< 2	2.2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.03	0.06	0.06	0.06	0.05	0.06	0.05	0.06	0.06	0.07	0.07	0.07	0.06	0.07	0.09	0.07	0.06	0.08
Silicon as Si (Total)	mg.l ⁻¹		0.3	0.3	0.1	< 0.1	0.2	0.2	0.2	0.1	0.2	0.3	0.7	0.6	0.5	0.4	0.9	0.4	2.1	1	0.4
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	< 20	< 20	< 20	30	40	< 20	68	30	100	< 20	30	< 20	20	40	30	39	30	20
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10	< 10	< 10	< 10	< 10	1.1	1.2	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2	< 2	< 2	4.5	< 2	< 2	8.5	< 2	< 2	3	< 2	< 2	3	< 2	< 2	< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.43	0.48	0.54	0.43	0.36	0.17	0.12	0.58	0.23	0.33	< 0.1	0.43	0.29	0.34	0.66	0.62	0.33	0.42	0.37
Total petroleum hydrocarbons (FTIRPER)	mg.l ⁻¹		0.4	0.5	0.9	< 0.3	1.4	3.8	< 0.3	< 0.3	1.4	< 0.3	0.0533	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Total Viable Count @ 22°C	Counts.ml ⁻¹		1152	1040	800	10	5	91	180	51	1	>1000	>1000	848	312	195	496	283	86	27	51

Analysis – Station 11	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																		
			07/04/10 surface	21/04/10 surface	19/05/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		1.05	0.01	0.11	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.01	< 0.01	< 0.01	0.01	0.03	0.01	0.02	< 0.01	0.02	0.01	0.09
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.2	< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		1.1	< 1.0	< 1.0	1.2	< 1.0	1.7	2	< 1.0	< 1.0	< 1.0	< 1.0	1.4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.9
Dibromoacetic acid	µg.l ⁻¹		< 1.00	< 1.00	< 1.0	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.1	< 0.10	< 0.10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		0.5	0.5	0.5	7.8	7.8	1.4	0.5	4.4	5.8	10	7.1	3.1	3.7	1.7	2.2	5.8	1.8	1.6	3.6
Hydrazine (TZW)	µg.l ⁻¹		-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 2	< 10	31.8	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl)ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	0.006	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl)phthalate	mg.l ⁻¹	0.0013	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concentrations)	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Analysis – Station 11	Units	EQS (annual average concn)	Concentration/value (ND = none detected)																		
			07/04/10 surface	21/04/10 surface	19/05/10 surface	07/06/10 surface	22/06/10 surface	06/07/10 surface	20/07/10 surface	11/08/10 surface	18/08/10 surface	09/09/10 surface	14/09/10 surface	28/09/10 surface	14/10/10 surface	15/11/10 surface	06/12/10 surface	15/12/10 surface	17/01/11 surface	31/01/11 surface	14/02/11 surface
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:																					
2,4 Dibromophenol	mg.l ⁻¹		< 0.002	< 0.02	< 0.002	< 0.002	< 0.05	< 0.05	< 0.002	< 0.02	< 0.02	< 0.02	< 0.02	< 0.002	< 0.02	ND	< 0.002	< 0.002	< 0.02	ND	< 0.02
2,6-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.02	< 0.002	< 0.002	< 0.05	< 0.05	< 0.002	< 0.02	< 0.02	< 0.02	< 0.02	< 0.002	< 0.02	ND	< 0.002	< 0.002	< 0.02	ND	< 0.02
Pentanamide	mg.l ⁻¹		ND	0.036	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,5-dimethyl- Phenanthrene	mg.l ⁻¹		ND	ND	0.019	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bacchotricuneatin c	mg.l ⁻¹		ND	ND	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methyl- Phenanthrene	mg.l ⁻¹		ND	ND	0.017	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methyl-9H-Fluorene	mg.l ⁻¹		ND	ND	0.013	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3-dimethyl-9H-Fluorene	mg.l ⁻¹		ND	ND	0.012	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-tetrahydro- Phenanthrene	mg.l ⁻¹		ND	ND	0.012	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexadecane	mg.l ⁻¹		ND	ND	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Nonylcyclohexane	mg.l ⁻¹		ND	ND	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Docosane	mg.l ⁻¹		ND	ND	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentadecane	mg.l ⁻¹		ND	ND	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetradecane	mg.l ⁻¹		ND	ND	0.011	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-ethyl-4-methyl-1- Pentanol	mg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.107	ND	ND	ND	ND	ND	ND
1,3-dichloro-2-Propanol	mg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	ND	ND	ND	ND	ND	ND
2-ethyl-4-methyl-1,3- Dioxolane	mg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	ND	ND	ND	ND
Tentatively identified volatile organic compounds:																					
	µg.l ⁻¹		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 46 Station 12 spatial survey water sample analysis results. Negative results are presented as less than the limit of detection or “ND” (none detected) for tentatively identified compounds, for which the limits of detection vary. Station 12 was located 11.6 km from the cooling water outfall.

Analysis – Station 12	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			08/04/10 Surface	08/04/10 Near- bed	17/01/11 Surface	17/01/11 Near- bed
pH	pH units		7.9	7.9	7.7	7.7
Suspended Solids	mg.l ⁻¹		52	53	86	115
Total Alkalinity as CaCO ₃	mg.l ⁻¹		135	137	151	127
Bicarbonate Alkalinity as CaCO ₃	mg.l ⁻¹		135	137	151	127
Carbonate Alkalinity as CaCO ₃	mg.l ⁻¹		0	0	0	0
Chloride as Cl	mg.l ⁻¹		16600	13700	10700	12900
Fluoride as F	mg.l ⁻¹		1.3	1.3	1.3	1.3
Total Sulphur as SO ₄ (Dissolved)	mg.l ⁻¹		2820	3240	2940	2690
Calcium as Ca (Total)	mg.l ⁻¹		265	269	277	296
Calcium as Ca (Dissolved)	mg.l ⁻¹		256	261	267	272
Magnesium as Mg (Total)	mg.l ⁻¹		1340	1280	1310	902
Magnesium as Mg (Dissolved)	mg.l ⁻¹		1260	1420	1430	1380
Strontium as Sr (Total)	mg.l ⁻¹		4.92	4.94	5	5.4
Strontium as Sr (Dissolved)	mg.l ⁻¹		4.79	4.81	4.91	4.95
Sodium as Na (Dissolved)	mg.l ⁻¹		10300	9830	11600	11200
Potassium as K (Total)	mg.l ⁻¹		616	584	627	383
Potassium as K (Dissolved)	mg.l ⁻¹		576	645	444	424
Nickel as Ni (Total)	mg.l ⁻¹		0.003	0.003	0.004	0.013
Nickel as Ni (Dissolved)	mg.l ⁻¹	0.02	0.003	0.003	0.004	0.005
Chromium as Cr (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	< 0.001
Chromium as Cr (Dissolved)	mg.l ⁻¹	0.015	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium as Cd (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	< 0.0001	0.0005
Cadmium as Cd (Dissolved)	mg.l ⁻¹	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper as Cu (Total)	mg.l ⁻¹		0.01	0.004	0.007	0.003
Copper as Cu (Dissolved)	mg.l ⁻¹	0.005	0.003	0.004	0.007	0.007
Lead as Pb (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	0.001
Zinc as Zn (Total)	mg.l ⁻¹		0.011	0.073	0.144	0.054
Zinc as Zn (Dissolved)	mg.l ⁻¹	0.04	0.009	0.08	0.158	0.182
Manganese as Mn (Dissolved)	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002

Analysis – Station 12	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			08/04/10 Surface	08/04/10 Near- bed	17/01/11 Surface	17/01/11 Near- bed
Iron as Fe (Total)	mg.l ⁻¹		0.02	0.04	< 0.01	0.36
Iron as Fe (Dissolved)	mg.l ⁻¹	1	< 0.01	< 0.01	< 0.01	< 0.01
Aluminium as Al (Dissolved)	mg.l ⁻¹		0.01	0.01	0.01	< 0.01
Arsenic as As (Total)	mg.l ⁻¹		0.016	0.017	0.023	< 0.001
Arsenic as As (Dissolved)	mg.l ⁻¹	0.025	0.02	0.02	0.027	0.028
Boron as B (Total)	mg.l ⁻¹		4.76	4.68	4.37	3.04
Boron as B (Dissolved)	mg.l ⁻¹		4.45	5.03	3.5	3.19
Mercury as Hg (Total)	mg.l ⁻¹		< 0.0001	< 0.0001	0.0001	0.0001
Mercury as Hg (Dissolved)	mg.l ⁻¹	0.00005	< 0.0001	< 0.0001	0.0001	0.0001
Selenium as Se (Dissolved)	mg.l ⁻¹		0.064	0.069	0.071	0.08
Selenium as Se (Total)	mg.l ⁻¹		0.044	0.054	0.062	0.002
Molybdenum as Mo (Total)	mg.l ⁻¹		0.009	0.009	0.011	< 0.001
Molybdenum as Mo (Dissolved)	mg.l ⁻¹		0.011	0.011	0.012	0.012
Cobalt as Co (Total)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	0.004
Cobalt as Co (Dissolved)	mg.l ⁻¹		< 0.001	< 0.001	< 0.001	< 0.001
Ammoniacal Nitrogen as N	mg.l ⁻¹		0.46	0.3	0.3	0.37
Nitrite as N	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01
Nitrate as N	mg.l ⁻¹		< 0.2	< 0.2	< 0.2	< 0.2
Phosphate as P	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	< 0.01
Chemical Oxygen Demand (Settled)	mg.l ⁻¹		250	210	240	280
Total Organic Carbon	mg.l ⁻¹		0.43	0.48	0.54	0.54
Salinity	ppt		38.2	38.3	36.3	35.8
Turbidity N.T.U	NTU		< 1	< 1	6	2
Bromide as Br	mg.l ⁻¹		211	237	845	665
Iodide as I	mg.l ⁻¹		< 2	< 2	< 2	< 2
Barium as Ba (Total)	mg.l ⁻¹		< 0.01	< 0.01	< 0.01	0.02
Lithium as Li (Dissolved)	mg.l ⁻¹		0.07	0.08	0.06	0.07
Silicon as Si (Total)	mg.l ⁻¹		0.3	0.3	0.3	1.8
MBAS as Lauryl Sulphate	µg.l ⁻¹		< 20	< 20	20	40
Chlorophyll A	µg.l ⁻¹		< 10	< 10	< 10	< 10
Biochemical Oxygen Demand	mg.l ⁻¹		< 2	< 2	< 2	< 2
Dissolved Organic Carbon	mg.l ⁻¹		0.28	0.32	0.48	0.37
Total petroleum	mg.l ⁻¹		0.3	0.5	< 0.3	< 0.3

Analysis – Station 12	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			08/04/10 Surface	08/04/10 Near- bed	17/01/11 Surface	17/01/11 Near- bed
hydrocarbons (FTIRPER)						
Total Viable Count @ 22°C	Counts.ml ⁻¹		81	188	880	944
Total petroleum hydrocarbons (GC)	mg.l ⁻¹		< 0.01	< 0.01	0.02	0.12
2,4,6-tribromophenol	µg.l ⁻¹		< 0.20	< 0.20	< 0.20	< 0.20
Cationic Detergents	mg.l ⁻¹		< 1	< 1	< 1	< 1
Dibromoacetic acid	µg.l ⁻¹		< 1	< 1	< 1	< 1
Dibromoacetonitrile	µg.l ⁻¹		< 10	< 10	< 0.10	< 0.10
Hydrazine (measurement not reliable)	µg.l ⁻¹		0.5	0.5	2.2	16.0
Hydrazine (TZW)	µg.l ⁻¹		-	-	< 0.01	< 0.01
Morpholine	mg.l ⁻¹		< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl) ether	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005
2-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
1-Methylnaphthalene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Biphenyl	mg.l ⁻¹	0.025	< 0.002	< 0.002	< 0.002	< 0.002
Acenaphthene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Dibenzofuran	mg.l ⁻¹		< 0.005	< 0.005	< 0.005	< 0.005
Fluorene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Phenanthrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Anthracene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Fluoranthene	mg.l ⁻¹	0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Pyrene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
bis(2-ethylhexyl) phthalate	mg.l ⁻¹	0.0013	< 0.005	0.009	< 0.005	0.015
Benzo[k]fluoranthene	mg.l ⁻¹	0.000003	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[a]pyrene	mg.l ⁻¹	0.000005	< 0.002	< 0.002	< 0.002	< 0.002
Indeno[1,2,3-cd]pyrene	mg.l ⁻¹	0.000002 (sum of concns)	< 0.002	< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg.l ⁻¹		< 0.002	< 0.002	< 0.002	< 0.002
Toluene	µg.l ⁻¹	10	< 1	< 1	< 1	< 1
Ethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
m and p-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1
o-Xylene	µg.l ⁻¹	30	< 1	< 1	< 1	< 1
Bromoform	µg.l ⁻¹		< 1	< 1	< 1	< 1
iso-Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
Propylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1

Analysis – Station 12	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			08/04/10 Surface	08/04/10 Near- bed	17/01/11 Surface	17/01/11 Near- bed
1,3,5-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1

Analysis – Station 12	Units	EQS (annual average concentration)	Concentration/value (ND = none detected)			
			08/04/10 Surface	08/04/10 Near- bed	17/01/11 Surface	17/01/11 Near- bed
sec-Butylbenzene	µg.l ⁻¹		< 1	< 1	< 1	< 1
p-Isopropyltoluene	µg.l ⁻¹		< 1	< 1	< 1	< 1
Tentatively identified semi-volatile organic compounds:						
2,4-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	< 0.02	< 0.02
2,6-Dibromophenol	mg.l ⁻¹		< 0.002	< 0.002	< 0.02	< 0.02
2-Oxazolidone	mg.l ⁻¹		ND	ND	ND	0.019
Tentatively identified volatile organic compounds:						
	µg.l ⁻¹		ND	ND	ND	ND

Appendix B Silt Density Index (SDI) and Modified Fouling Index (MFI) measurements for sea water samples



SILT DENSITY INDEX (SDI) AND MODIFIED FOULING INDEX (MFI) MEASUREMENTS FOR SEA WATER SAMPLES

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B1 Introduction

Cefas commissioned WRc to undertake analysis of sea water samples for:

- SDI (Silt Density Index) – 15 minutes (or 10 or 5 minutes, depending on fouling rate);
- MFI (Modified Fouling Index) - same as SDI with time integration.

This report summarises the results of SDI and MFI analyses on 71 samples submitted by Cefas over the period to March 2010 to March 2011:

- 19 on 12 March 2010
- 14 on 13 April 2010
- 2 on 23 April 2010
- 2 on 20 May 2010
- 10 on 23 July 2010
- 18 on 5 January 2011
- 6 on 8 March 2011

B2 Measurement Methods

B2.1 Silt Density Index

Silt Density Index (SDI) indicates the quantity of particulate matter and colloidal solids in a sample of water. It is calculated from the rate of “plugging” of a 47 mm, 0.45 µm membrane filter, when the sample of water is applied to the filter at a constant pressure of 30 psi (pounds per square inch) - the filter outlet is at atmospheric pressure. The reference method is given in: ASTM D4189-07.

The time (in seconds) it takes to collect the first 500 ml of filtrate after commencement of filtration is recorded. The time to collect 500 ml of filtrate *after* 5, 10, and 15 minutes of filtration is also recorder. The times are denoted t_0 , t_5 , t_{10} , and t_{15} , respectively, with t_0 being the time taken for the first 500 ml of water to pass through the filter.

The SDI is calculated according the following equation:

$$SDI_T = \frac{\% P_{30}}{T} = \frac{\left(1 - \frac{t_0}{t_T}\right) \times 100}{T}$$

where $\% P_{30}$ refers to percentage plugging at a pressure of 30 psi, T stands for the elapsed time in minutes and t_T = the time to collect the specified volume (usually 500 ml) after T .

For Swindon tap water with a starting temperature of 9°C, values of $t_0 = 30$ s and $t_{15} = 100$ s were recorded. SDI_{15} is then calculated as follows:

$$SDI_{15} = \frac{\left(1 - \frac{30}{100}\right) \times 100}{15} = 4.7$$

Information from the supplier of the SDI equipment (Applied membranes Inc.) used by WRc suggests that SDI_{15} is usually the lowest value for SDI and is recommended for the purpose of filter sizing.

If fouling is substantial (defined in ASTM as when t_0 is $> 110\%$ of t_0 for a “non-plugging” water) it is recommended that smaller volumes – either 250 ml or 100 ml – be used. Furthermore, if $\% P_{30}$ exceeds 75 % for the 15 minute value, then shorter times – either 10 minutes or 5 minutes - should be used. If $\% P_{30}$ still exceeds 75 % for 100 ml volume and 5 minutes, then ASTM recommends that, rather than SDI, other (unspecified) test methods should be used to analyse for particulate matter.

SDI measurements were made using equipment (SDI-2000) supplied by Applied Membranes Inc. with 47mm, 0.45 μm HA membrane filters supplied by Millipore.

B2.2 Modified Fouling Index

The Modified Fouling Index (MFI) is also related to the concentration of suspended matter, and has been reported to be a more reliable index of fouling than the SDI. The method is similar to the SDI, and uses the same equipment, except that the volume passing through the filter is recorded every 30 seconds over a 15 minute filtration period. The MFI is obtained graphically from the slope of the straight part of the curve when t/V is plotted against V , where t is the time in seconds to collect a filtrate volume of V in litres. An example is given in **Figure B2.1**. The first part of the curve is referred to as blocking filtration and is not included in the MFI determination. The second, linear, part of the curve is referred to as cake filtration and this is where the MFI is determined. The third part of the curve is a combination of cake filtration with clogging and/or cake compression and is not part of the MFI determination.

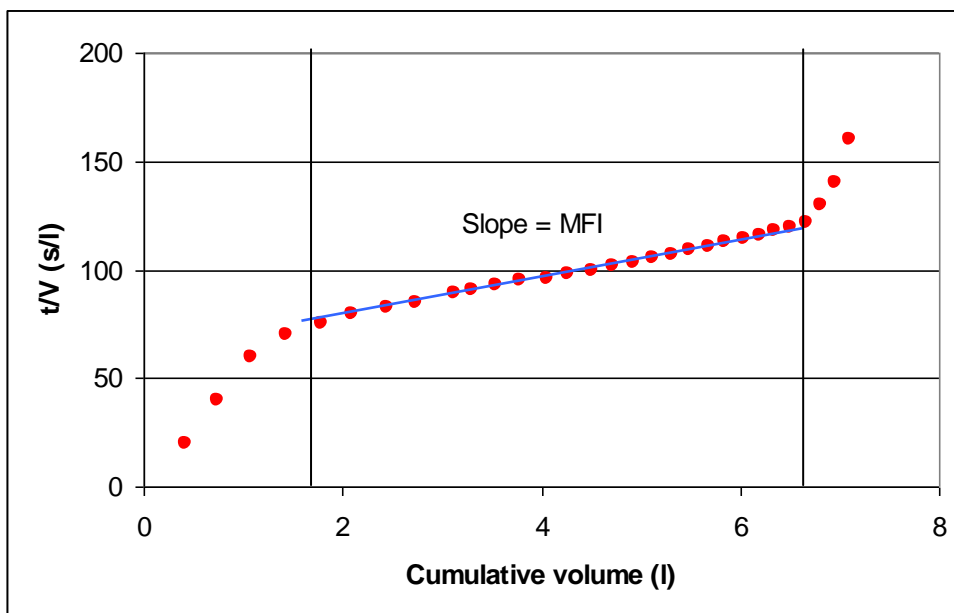


Figure B2.1 Determination of MFI: example of t/V vs volume

B2.3 Method as used for Cefas samples

Temperature during test

The temperature was measured before the samples were transferred to the vessel used to supply sample at 30 psi to the SDI membrane equipment, and after filtration.

According to the ASTM standard, temperature should remain constant (± 1 °C) during a test. In order to process samples quickly, and reduce the rate of any biological activity, filtration was started within 5 minutes of transfer of samples from the chiller and to the pressurised vessel.

Temperature measurements from typical runs showed that sample temperature at the start was in the range 6 to 8 °C, and filtrate temperature ranged between approximately 10 to 15 °C as the sample warmed.

B2.4 MFI analysis

The quantification of a linear part of the t/V vs. volume curves was generally undertaken on all of the whole data set but without the first three data points, so as to obtain a reasonably linear part of the filtrate vs. time curve.

B3 Results

B3.1 Samples received and condition

Batch 1

19 samples of sea water were received at WRc on 12 March 2010, the majority as either 2 or 3, x one litre sub-samples. All measurements of SDI and MFI were made during w/c 15 March.

The samples had previously been frozen and were partially thawed. It was found that a significant quantity of particles had settled out in the sample bottle, and samples were therefore thoroughly mixed before the analysis started. Samples not being measured were stored in one of WRc's chiller cabinets.

Batches 2 and 3

14 samples of sea water were received at WRc on 13 April 2010, as either 1 or 3 x one litre sub-samples. All measurements of SDI and MFI were made between 14 and 16 April.

A further 2 samples, as 2 x one litre sub-samples were received on 23 April and these were measured on 26 April 2010.

Unlike the samples in Batch 1, the samples in Batch 2 had not previously been frozen. A significant quantity of particles had still settled out in the bottles and samples were also thoroughly mixed before the analysis started.

Batches 4 and 5

2 samples were received on 20 May and 10 samples (as 2 x 1 litre sub-samples) were received on 23 July 2010. The samples had not been frozen.

Batches 6 and 7

18 samples were received on 5 January 2011 and 6 samples (as 2 x 1 litre sub-samples) were received on 8 March 2011.

B3.2 Silt Density Index**B3.2.1 Tap water reference**

As a reference, the SDI of a sample of Swindon tap water was previously measured. The results are summarised in Table B3.1. As expected, the SDI is greater at the longer filtration times. Approximately 7.5 l of water had passed through the filter by the end of the test.

Table B3.1 SDI₁₅ values for Swindon tap water

Time/min	t/s	SDI/min
0	30	
5	62	10.3
10	81	6.3
15	100	4.7

The value for SDI₁₅ of 4.7 is consistent with a low fouling rate. The results also indicate the variation in SDI values that occurs with different filtration times.

B3.2.2 Seawater samples**Batch 1**

The samples from Batch 1 were found to block the filters very rapidly and in only in a few cases was it possible to collect > 500 ml of filtrate within 15 minutes. It was therefore not possible to calculate the SDI₁₅ for the samples. The sample volume was therefore reduced to the minimum quoted in ASTM (100 ml) and sample time also reduced to the minimum (5 minutes) suggested in ASTM.

The % P₃₀ was calculated for this volume and time, as described in Section 0, to clarify whether it was suitable to use the SDI as a measure for particulate matter. ASTM states that if % P₃₀ exceeds 75 % after 5 minutes, then other (unspecified) test methods should be used to analyse for particulate matter.

From the results, Table 3.2, it can be seen, only 3 samples have a % P₃₀ < 75 %. Thus, SDI was not suitable method for estimating particulate matter in the majority of the samples in Batch 1. Clearly the rate of fouling of the samples was very high.

Batches 2 and 3

The samples from Batch 2 and 3 were found to block the filters rapidly but not as rapidly as in Batch 1, although it was again not possible to calculate the SDI₁₅ for the samples for 500 ml volumes. In order to compare with previous samples, the sample volume was again reduced to the minimum quoted in ASTM (100 ml) and sample time also reduced to the minimum (5 minutes). For these tests,

the time (generally < 30 s) for the initial 100 ml of filtrate to be collected was measured, as well as the cumulative filtrate volume every 30 s over the duration of the run.

The % P₃₀ was calculated for this volume and time, as described in Section 0, to check whether it was appropriate to use the SDI as a measure for particulate matter.

Table B3.2 SDI₅ for 100 ml sample size, Batch 1

Sample information			Temp at start/ °C	SDI ₅	% P ₃₀
Site	Date	Time			
2	25/2	945	6.5	17.2	86
3	25/2	1038	6.4	16.9	85
3B	25/2	1125	6.5	16.8	84
4	25/2	1220	6.4	17.7	89
5	25/2	1305	6.4	17.5	88
5B	25/2	1325	6.5	17.5	88
5	2/3	1100	6.3	16.9	85
5	2/3	1200	6.5	15.8	79
5	2/3	1300	6.3	15.5	77
5	2/3	1400	6.5	13.3	67
5	2/3	1500	9.0	15.3	76
5	2/3	1600	9.0	13.3	67
5	2/3	1700	7.1	16.4	82
5	2/3	1800	7.5	17.2	86
5	2/3	1900	6.5	14.1	71
5	2/3	1900	7.5	16.9	84
5	2/3	2100	7.5	16.0	80
5	2/3	2200	7.1	17.6	88
5	2/3	2300	9.0	17.6	88

From the results, Table B3.3, it can be seen that no samples have a % P₃₀ < 75 %. Thus, SDI is not suitable method for estimating particulate matter in the majority of the samples. Clearly the rate of fouling as indicated by SDI₅ is still high.

It is noted that even though the related MFI tests confirm a generally lower particulate content for the Batch 2 samples, this is not apparent from the SDI₅ measurements. This seems consistent with the ASTM guidance that SDI – certainly at the minimum volume and time limits - is not a sensitive measure of fouling rate for these samples.

The samples from Site 10 surface and Site 11 surface were supplied as 1 litre samples. As all of the sample from these sites had passed through the filter with 5 minutes, it was not possible to calculate a SDI₅ or % P₃₀ for these two samples.

Table B3.3 SDI₅ for 100 ml sample size, Batches 2 and 3

Sample information			Temp at start/ °C	Temp at end/ °C	SDI ₅	% P ₃₀
Site	Date	Time				
1 bed	7/4		6.9	12.8	18.1	91
1 surface	7/4	1245	6.5	11.3	18.3	91
5 surface	8/4	1830	6.7	13.8	18.4	92
6 surface	7/4	1415	6.8	12.2	17.6	88
7 bed	8/4	1730	7.3	14.5	18.6	93
7 surface	8/4	1715	6.9	14.4	19.0	95
8 surface	8/4	1645	7.8	14.1	17.8	89
9 bed	8/4	1530	7.2	13.7	16.2	81
9 surface	8/4	1500	6.3	15.1	18.2	91
10 bed	7/4	1130	7.8	14.3	18.1	91
10 surface	7/4	1120	6.6	10	N/A*	N/A*
11 surface	7/4	1445	6.5	11.3	N/A*	N/A*
12 bed	8/4	1400	7.5	15.2	19.0	95
12 surface	8/4	1230	7.3	12.8	18.9	94
5 surface	21/4	0945	6.5	10.4	18.9	94
11 surface	21/4	1045	6.3	11.6	18.3	91

* Insufficient sample volume for measurement.

Batches 4 and 5

As before the sample volume was reduced to the minimum quoted in ASTM (100 ml) and sample time also reduced to the minimum (5 minutes) suggested in ASTM.

From the results in Table B3.4 it can be seen that, except for Site 11 20/7, all samples have a % P₃₀ > 75 %. SDI was therefore not a suitable method for estimating particulate matter in the samples.

The entire sample from Site 11 20/7 had passed through the filter within 5 minutes and it was therefore not possible to calculate either SDI₅ or % P₃₀.

Table B3.4 SDI₅ for 100 ml sample size, Batches 4 and 5

Sample information			Temp at start/ °C	Temp at end/ °C	SDI ₅	% P ₃₀
Site	Date	Time				
11	19/5	0945	-	-	18.6	93
5	19/5	0845	-	-	18.9	94
5	7/6	1040	11.2	19.8	19.2	96
5	22/6	0930	9.0	18.1	19.2	96
5	6/7	1230	9.6	18.1	19.2	96
5	20/7		10.1	17.7	18.6	93
11	7/6	1040	12.0	16.0	16.0	80
11	22/6	1000	8.4	18.1	18.7	93
11	6/7	1015	9.7	19.1	18.5	93
11	20/7	1300	8.4	13.1	N/A*	N/A*
13	7/6	0830	9.2	16.1	18.0	90
Harbour	20/7		8.6	16.2	18.2	91

* Insufficient sample volume for measurement.

Batches 6 and 7

As before the sample volume was reduced to the minimum quoted in ASTM (100 ml) and sample time also reduced to the minimum (5 minutes) suggested in ASTM.

From the results in **Table B3.5** it can be seen that, except for Site 11 17/01/2011, all samples have a % P₃₀ > 75 %. SDI was therefore not a suitable method for estimating particulate matter in the samples.

Table B3.5 SDI₅ for 100 ml sample size, Batches 6 and 7

Sample information			Temp at start/ °C	Temp at end/ °C	SDI ₅	% P ₃₀
Site	Date	Time				
5	11/8	0920	6.4	13.6	19.4	97
5	18/8	1205	6.5	14.1	19.1	96
5	9/9	0945	6.9	14.2	17.7	89
5	14/9	1045	6.6	14.5	18.5	92
5	28/9	1050	7.7	15.9	19.0	95
5	14/10	1015	8.4	14.9	18.3	92
5	15/11	1200	7.1	14.7	18.1	91
5	6/12	1008	7.5	14.3	18.7	93
5	15/12	1140	8.4	14.7	16.4	82
5	17/01/2011	?	8.1		13.9	69
5	31/1/2011	1400	6.6	14.5	18.0	90
5	?	?	6.5	17.3	18.6	93
11	11/8	1008	5.9	13.7	19.2	96
11	18/8	1305	7.2	13.5	18.9	94
11	9/9	1040	6.3	13.2	18.7	94
11	14/9	1015	6.1	13.6	19.0	95
11	28/9	1000	7.9	14.1	19.0	95
11	14/10	1115	7.2	13.3	19.3	97
11	15/11	1000	7.5	15.7	18.0	90
11	6/12	0930	7.5	14.6	19.2	96
11	15/12	1032	7.5	15.1	18.4	92
11	17/01/2011	?	6.8	16.2	11.7	58
11	31/1/2011	1010	6.6	14.5	17.5	88
11	?	?	7.8	16.3	19.3	96

B3.3 Modified Fouling Index**B3.3.1 Tap water**

As a reference the MFI of tap water at 8.9 °C was previously measured. Approximately 7.1 l of water passed through the filter during the 15 minute measurement, resulting in a MFI of 9.4 s/l².

B3.3.2 Seawater samples**Batch 1**

The MFI values of Batch 1 samples are summarised in

Table B3.6. As can be seen, the MFI values are very large compared with tap water, and more variable than the SDI measurements and probably more sensitive.

Due to the rapid blocking of the filter, it is not clear whether MFI is being estimated from the linear or the third section of the curve shown in **Figure B2.1**. The results from these and subsequent tests should therefore be treated with caution. The collected data is shown graphically in Figure A3.1; raw data is given in Appendix A, Annex Tables 1 and 2.

The repeatability of the measurements (as judged from the duplicate measurement on sample 5, 2/3, 1900) seems to be relatively poor. This may be due to the small volumes passing through the filter. For the duplicate sample, the difference in total volume passing through the filter over 15 minutes was only 40 ml, but this is enough to give a difference in the MFI of nearly 900 s/l². It is also possible that the sample was slightly different, as it was taken from a different sub-sample.

Table B3.6 MFI of seawater samples, Batch 1

Sample Information			T/ °C	MFI/ s/l ²
Site	Date	Time		
2	25/2	945	6.5	1680
3	25/2	1038	6.4	2120
3B	25/2	1125	6.5	2560
4	25/2	1220	6.4	2430
5	25/2	1305	6.4	3300
5B	25/2	1325	6.5	2900
5	2/3	1100	6.3	1830
5	2/3	1200	6.5	4900
5	2/3	1300	6.3	6260
5	2/3	1400	6.5	7370
5	2/3	1500	9.0	4420
5	2/3	1600	9.0	4130
5	2/3	1700	7.1	5110
5	2/3	1800	7.5	3360
5	2/3	1900	6.5	4860*
5	2/3	1900	7.5	3980*
5	2/3	2100	7.5	5350
5	2/3	2200	7.1	3780
5	2/3	2300	9.0	3890
Tap water			8.9	9.4

*Duplicates

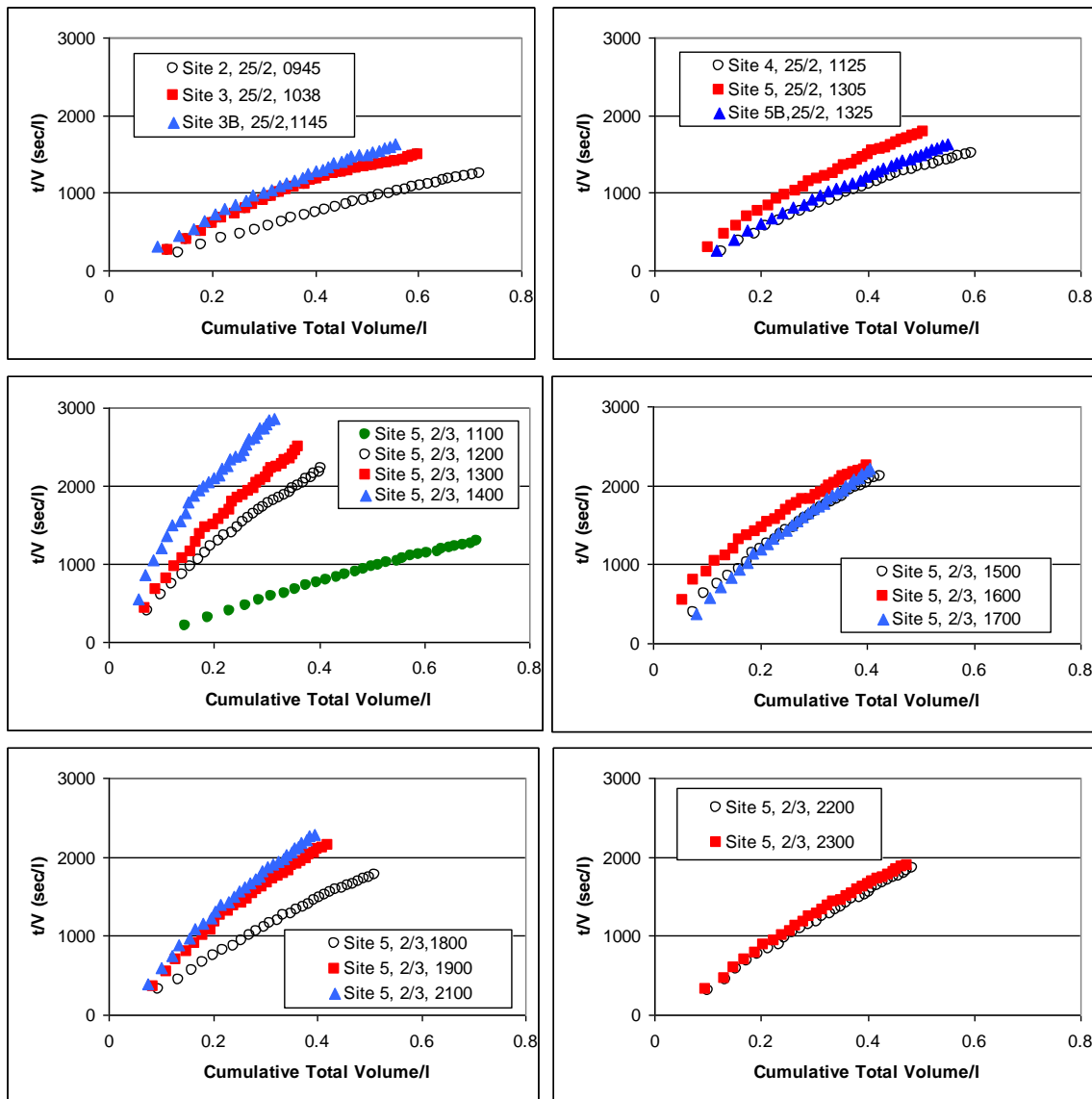


Figure B3.1 Charts of t/V vs volume used to determine MFI: samples in Batch 1

Batches 2 and 3

The MFI values of the Batch 2 and 3 samples are summarised in **Table B3.7**. As can be seen, the MFI values are large compared with tap water and again more variable than the SDI measurements. The surface samples from sites 10 and 11 on 7/4 have particularly low MFI and the surface samples from sites 1 (7/4) and 12 (8/4) and the samples from 21/4 also have relatively low MFI. The collected data is shown graphically in Figure B3.2; raw data is given in Appendix A, Annex Tables 3 to 5.

It is clear from the Batch 2 results of the samples with lowest MFI are from a relatively linear set of data points, and that, at least as a relative measure, the MFI values allow discrimination between the samples whereas the SDI₅ values do not.

Table B3.7 MFI of seawater samples, Batches 2 and 3

Sample Information			T/ °C	T/ °C	MFI/ s/l ²
Site	Date	Time	Start	End	
1 bed	7/4		6.9	12.8	1819
1 surface	7/4	1245	6.5	11.3	532
5 surface	8/4	1830	6.7	13.8	1598
6 surface	7/4	1415	6.8	12.2	1236
7 bed	8/4	1730	7.3	14.5	2611
7 surface	8/4	1715	6.9	14.4	2136
8 surface	8/4	1645	7.8	14.1	2303
9 bed	8/4	1530	7.2	13.7	2896
9 surface	8/4	1500	6.3	15.1	2028
10 bed	7/4	1130	7.8	14.3	1804
10 surface	7/4	1120	6.6	10	170
11 surface	7/4	1445	6.5	11.3	106
12 bed	8/4	1400	7.5	15.2	1585
12 surface	8/4	1230	7.3	12.8	610
5 surface	21/4	0945	6.5	10.4	451
11 surface	21/4	1045	6.3	11.6	581
Tap water			8.9		9.4

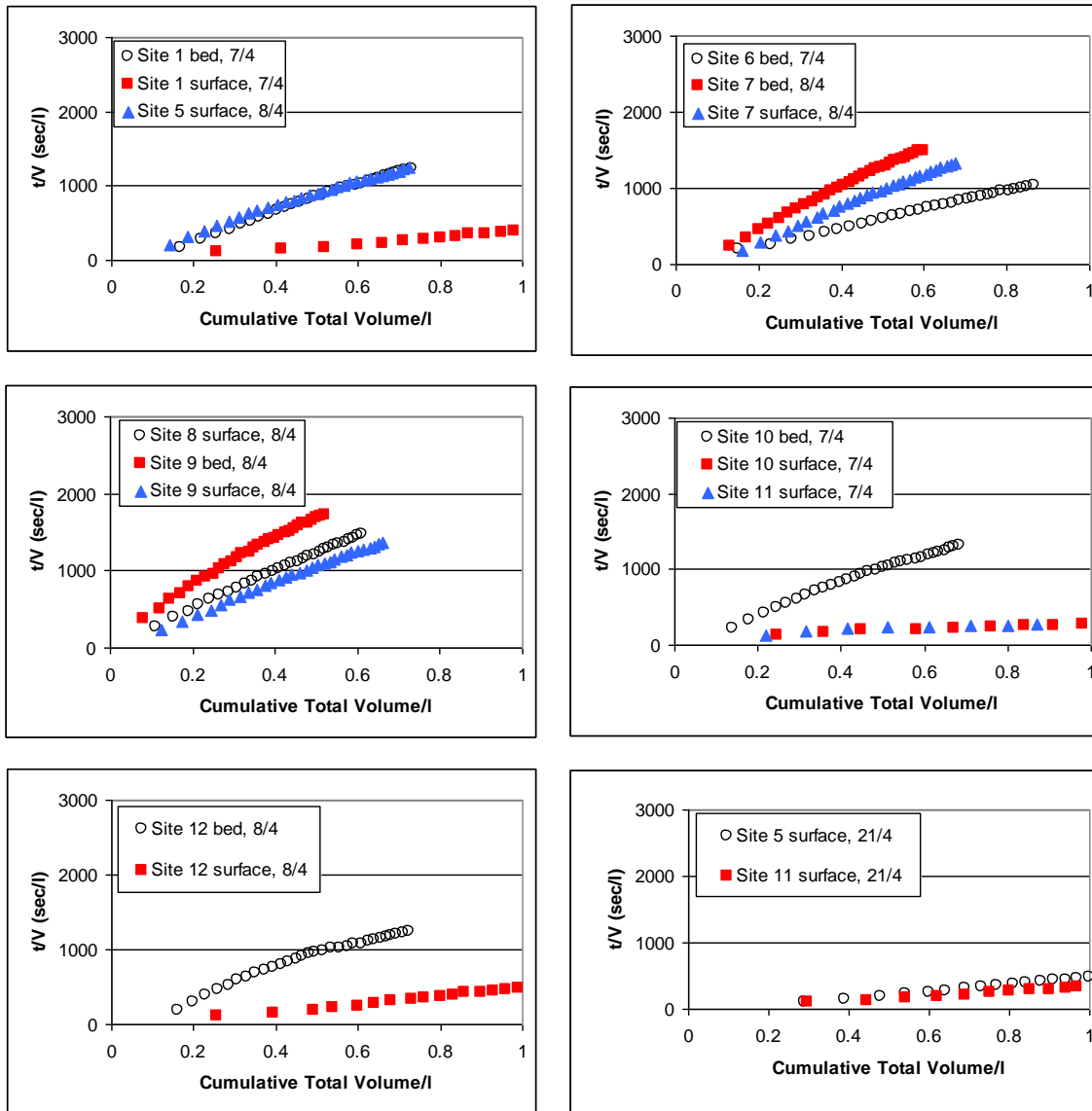


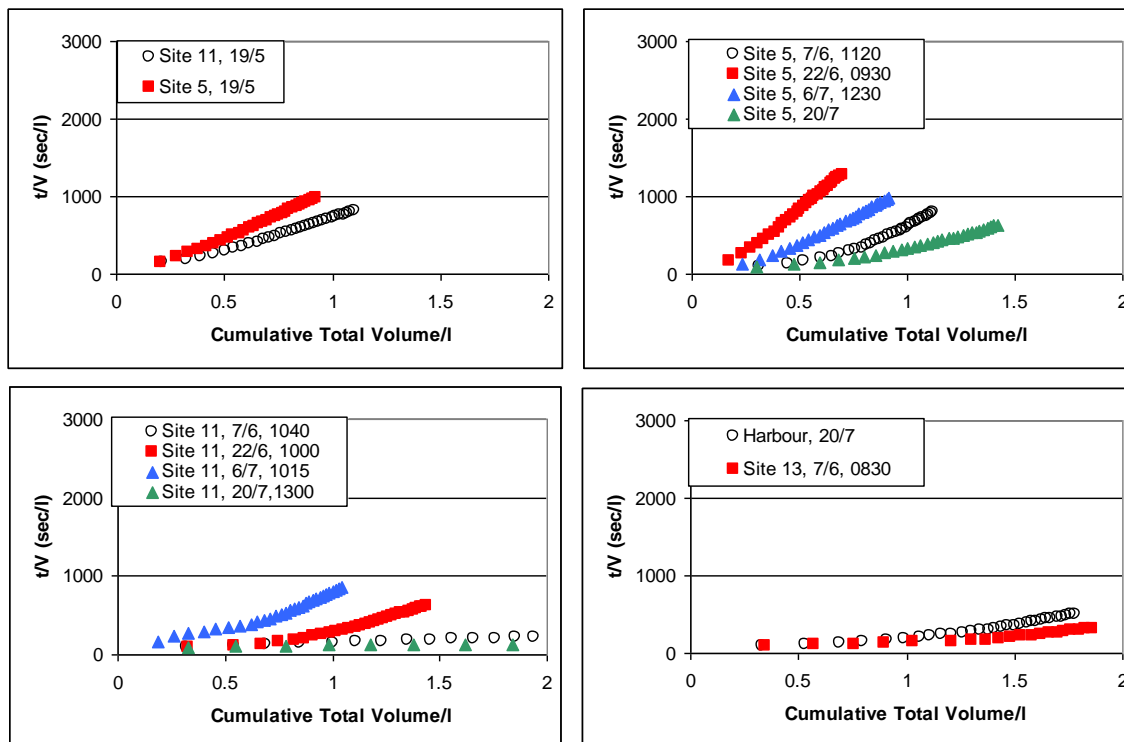
Figure B3.2 Charts of t/V vs volume used to determine MFI for all samples from Batches 2 and 3

Batches 4 and 5

The MFI values of the sea water samples are summarised in **Table B3.8**. The collected data is shown graphically in Figure B3.3; raw data is given in Appendix A, Annex Tables 5 and 6.

Table B3.8 MFI of seawater samples, Batches 4 and 5

Sample Information			T/ °C	T/ °C	MFI/ s/l ²
Site	Date	Time	Start	End	
11	19/5	0945	-	-	869
5	19/5	0845	-	-	1230
5	7/6	1040	11.2	19.8	1255
5	22/6	0930	9.0	18.1	2328
5	6/7	1230	9.6	18.1	1401
5	20/7		10.1	17.7	658
11	7/6	1040	12.0	16.0	75
11	22/6	1000	8.4	18.1	734
11	6/7	1015	9.7	19.1	1154
11	20/7	1300	8.4	13.1	17
13	7/6	0830	9.2	16.1	277
Harbour	20/7		8.6	16.2	420
Tap water			8.9	-	9.4

**Figure B3.3** Charts of t/V vs volume used to determine MFI for sample Batches 4 and 5

Batches 6 and 7

The MFI values of the sea water samples are summarised in **Table B3.9**. Two samples from batch 7 were only labelled with the station name: there was no reference to either time or date. The collected data is shown graphically in Figures B3.5 and B3.6; raw data is given in Appendix A, Annex Tables 7 to 10. The two samples taken on the 17/1/2011 showed an unusual curvature when plotted (Figure B3.5), the reason for this is unknown.

Table B3.9 MFI of seawater samples, Batches 6 and 7

Sample information			Temp/ °C	Temp/ °C	MFI/ s/l ²
Site	Date	Time	Start	End	
5	11/8	0920	6.4	13.6	1115
5	18/8	1205	6.5	14.1	823
5	9/9	0945	6.9	14.2	2030
5	14/9	1045	6.6	14.5	2560
5	28/9	1050	7.7	15.9	1830
5	14/10	1015	8.4	14.9	974
5	15/11	1200	7.1	14.7	1895
5	6/12	1008	7.5	14.3	1205
5	15/12	1140	8.4	14.7	1271
5	17/01/2011	?	8.1		1442
5	31/1/2011	1400	6.6	14.5	1770
5	-	-	6.5	17.3	1405
11	11/8	1008	5.9	13.7	984
11	18/8	1305	7.2	13.5	632
11	9/9	1040	6.3	13.2	875
11	14/9	1015	6.1	13.6	997
11	28/9	1000	7.9	14.1	538
11	14/10	1115	7.2	13.3	661
11	15/11	1000	7.5	15.7	1402
11	6/12	0930	7.5	14.6	2051
11	15/12	1032	7.5	15.1	2199
11	17/01/2011	?	6.8	16.2	654
11	31/1/2011	1010	6.6	14.5	578
11	-	-	7.8	16.3	2218

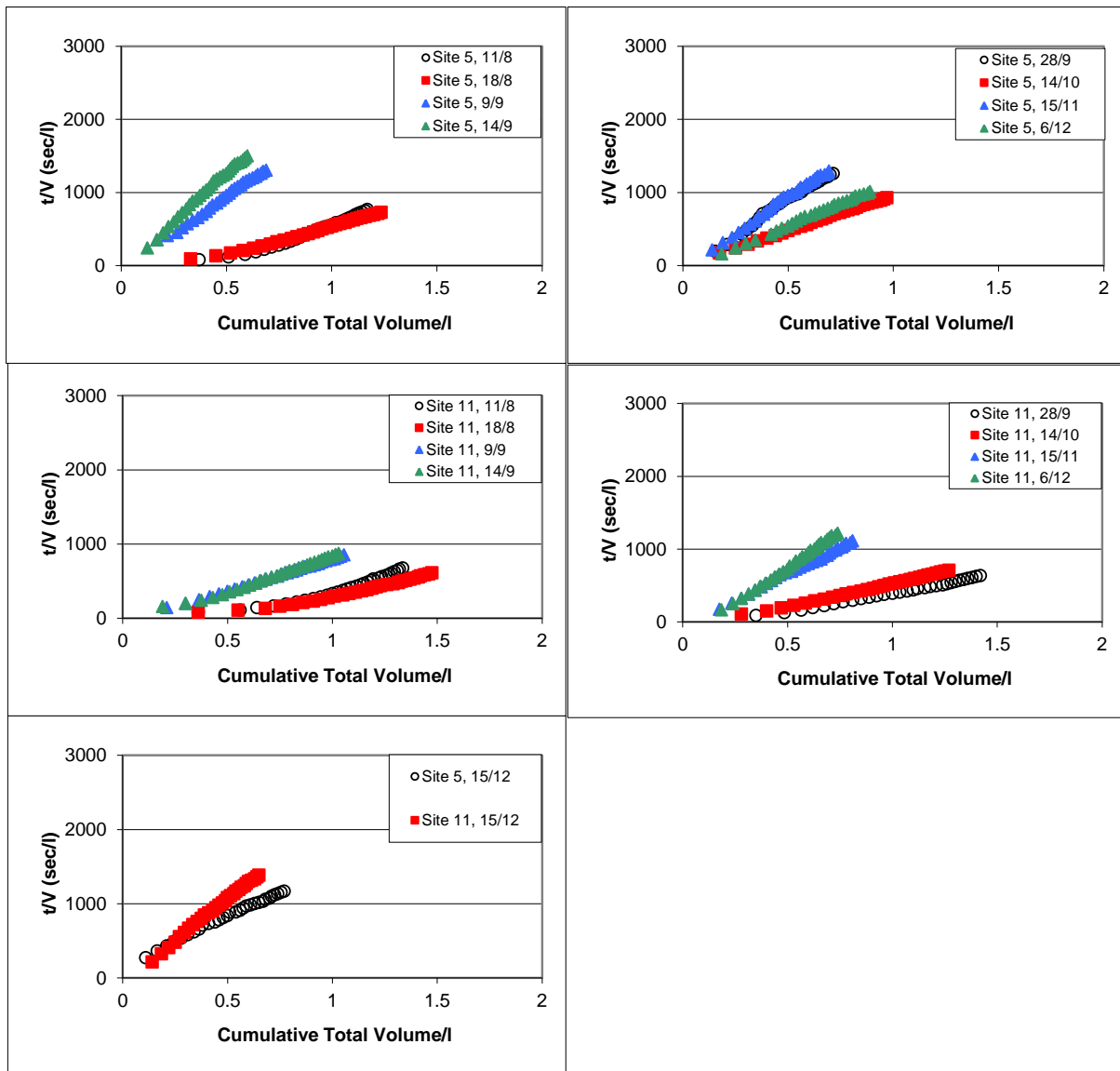


Figure B3.4 Charts of t/V vs volume used to determine MFI for sample Batch 6

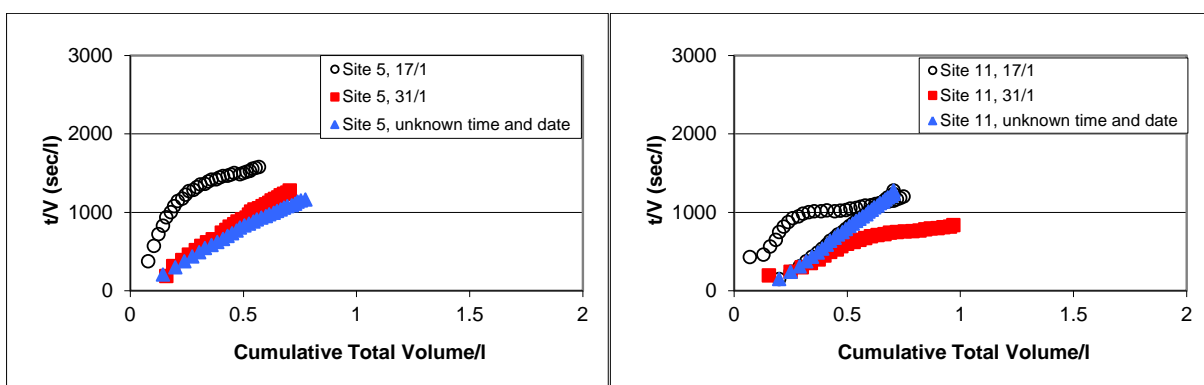


Figure B3.5 Charts of t/V vs volume used to determine MFI for sample Batch 7

ANNEX A CUMULATIVE VOLUME OF FILTRATE WITH TIME FOR ALL SAMPLES

Annex Table 1 Raw data for MFI measurements on Batch 1, Part 1

Site	2	3	3B	4	5	5B	5	5	5	5
Date	25/2	25/2	25/2	25/2	25/2	25/2	2/3	2/3	2/3	2/3
Time	945	1038	1125	1220	1305	1325	1100	1200	1300	1400
Time/s	Cumulative volume/l									
30	0.135	0.115	0.095	0.125	0.100	0.115	0.145	0.075	0.070	0.055
60	0.180	0.150	0.135	0.160	0.130	0.150	0.190	0.100	0.090	0.070
90	0.220	0.180	0.165	0.190	0.155	0.175	0.230	0.120	0.110	0.085
120	0.255	0.200	0.185	0.210	0.175	0.200	0.260	0.140	0.125	0.100
150	0.285	0.220	0.205	0.235	0.195	0.220	0.285	0.155	0.140	0.110
180	0.310	0.245	0.225	0.255	0.215	0.240	0.310	0.170	0.155	0.120
210	0.335	0.265	0.245	0.275	0.230	0.260	0.335	0.185	0.165	0.135
240	0.355	0.280	0.265	0.295	0.245	0.280	0.355	0.195	0.175	0.145
270	0.380	0.300	0.280	0.310	0.265	0.295	0.375	0.210	0.185	0.150
300	0.400	0.315	0.300	0.330	0.280	0.310	0.395	0.220	0.200	0.160
330	0.420	0.330	0.315	0.345	0.290	0.325	0.415	0.235	0.210	0.170
360	0.440	0.345	0.330	0.360	0.305	0.340	0.435	0.245	0.220	0.180
390	0.460	0.360	0.345	0.375	0.320	0.355	0.450	0.255	0.230	0.190
420	0.475	0.380	0.360	0.390	0.335	0.370	0.470	0.265	0.235	0.200
450	0.495	0.390	0.375	0.405	0.345	0.385	0.485	0.275	0.245	0.210
480	0.510	0.405	0.385	0.420	0.355	0.395	0.500	0.285	0.255	0.215
510	0.525	0.420	0.400	0.430	0.370	0.410	0.515	0.295	0.265	0.225
540	0.545	0.435	0.415	0.445	0.380	0.420	0.530	0.305	0.275	0.230
570	0.560	0.450	0.425	0.455	0.390	0.430	0.550	0.315	0.280	0.240
600	0.575	0.465	0.435	0.470	0.400	0.445	0.560	0.325	0.290	0.250
630	0.590	0.480	0.450	0.485	0.410	0.455	0.575	0.335	0.300	0.255
660	0.605	0.495	0.460	0.495	0.425	0.465	0.590	0.345	0.305	0.260
690	0.620	0.510	0.470	0.510	0.435	0.480	0.605	0.350	0.310	0.265
720	0.635	0.525	0.485	0.525	0.445	0.490	0.625	0.360	0.320	0.275
750	0.650	0.540	0.500	0.535	0.455	0.500	0.635	0.370	0.330	0.280
780	0.660	0.555	0.512	0.550	0.465	0.510	0.650	0.375	0.335	0.285
810	0.675	0.570	0.525	0.560	0.475	0.520	0.660	0.385	0.345	0.295
840	0.690	0.580	0.535	0.570	0.485	0.530	0.675	0.390	0.350	0.300
870	0.705	0.590	0.545	0.585	0.495	0.540	0.690	0.400	0.355	0.305
900	0.720	0.600	0.555	0.595	0.505	0.550	0.700	0.405	0.360	0.315

Annex Table 2 Raw data for MFI measurements on Batch 1, Part 2 and tap water reference

Site	5	5	5	5	5	5	5	5	5	Swindon tap water
Date	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	2/3	
Time	1500	1600	1700	1800	1900	1900	2100	2200	2300	
Time/s	Cumulative volume/l									
30	0.075	0.055	0.080	0.095	0.085	0.090	0.075	0.100	0.095	0.420
60	0.095	0.075	0.105	0.135	0.110	0.120	0.100	0.135	0.130	0.740
90	0.120	0.100	0.125	0.160	0.130	0.140	0.120	0.155	0.150	1.080
120	0.140	0.115	0.145	0.180	0.150	0.160	0.135	0.175	0.170	1.440
150	0.160	0.135	0.160	0.200	0.165	0.180	0.155	0.195	0.190	1.790
180	0.175	0.150	0.175	0.220	0.180	0.200	0.165	0.215	0.205	2.100
210	0.185	0.160	0.185	0.240	0.195	0.215	0.180	0.235	0.225	2.440
240	0.200	0.175	0.200	0.255	0.205	0.230	0.195	0.245	0.240	2.740
270	0.215	0.190	0.215	0.270	0.215	0.245	0.205	0.260	0.255	3.120
300	0.230	0.205	0.225	0.285	0.230	0.255	0.215	0.275	0.265	3.300
330	0.240	0.215	0.235	0.300	0.240	0.270	0.230	0.290	0.280	3.540
360	0.250	0.230	0.250	0.310	0.255	0.280	0.240	0.305	0.290	3.790
390	0.265	0.240	0.260	0.325	0.265	0.295	0.250	0.315	0.305	4.050
420	0.275	0.250	0.270	0.335	0.275	0.305	0.260	0.330	0.315	4.270
450	0.285	0.260	0.280	0.350	0.285	0.320	0.270	0.340	0.325	4.500
480	0.295	0.270	0.290	0.360	0.295	0.330	0.280	0.350	0.335	4.720
510	0.305	0.280	0.300	0.375	0.305	0.340	0.290	0.360	0.350	4.920
540	0.315	0.295	0.310	0.385	0.315	0.350	0.295	0.370	0.360	5.120
570	0.325	0.305	0.320	0.395	0.325	0.360	0.305	0.385	0.370	5.310
600	0.335	0.315	0.325	0.405	0.335	0.370	0.315	0.395	0.380	5.490
630	0.345	0.325	0.335	0.415	0.345	0.380	0.325	0.405	0.390	5.680
660	0.355	0.330	0.345	0.425	0.350	0.390	0.335	0.410	0.400	5.850
690	0.360	0.340	0.355	0.435	0.360	0.400	0.340	0.420	0.410	6.040
720	0.370	0.350	0.360	0.450	0.370	0.410	0.350	0.430	0.420	6.195
750	0.380	0.355	0.370	0.460	0.380	0.420	0.355	0.440	0.430	6.350
780	0.390	0.365	0.375	0.470	0.385	0.425	0.365	0.450	0.440	6.510
810	0.400	0.375	0.385	0.480	0.395	0.435	0.370	0.460	0.450	6.670
840	0.405	0.385	0.390	0.490	0.400	0.445	0.380	0.470	0.455	6.810
870	0.415	0.395	0.400	0.500	0.410	0.455	0.385	0.475	0.465	6.950
900	0.425	0.400	0.405	0.510	0.420	0.460	0.395	0.485	0.475	7.100

Annex Table 3 Raw data for MFI measurements, Batch 2, Part 1

Site	1 bed	1 surface	5 surface	6 surface	7 bed	7 surface	8 surface
Date	7/4	7/4	8/4	7/4	8/4	8/4	8/4
Time		1245	1830	1415	1730	1715	1645
Time/s	Cumulative volume/l						
30	0.170	0.255	0.140	0.150	0.130	0.160	0.110
60	0.220	0.415	0.185	0.230	0.170	0.205	0.155
90	0.255	0.520	0.225	0.280	0.200	0.240	0.190
120	0.290	0.600	0.255	0.325	0.225	0.270	0.215
150	0.315	0.660	0.285	0.360	0.250	0.295	0.240
180	0.340	0.710	0.310	0.390	0.270	0.315	0.265
210	0.360	0.760	0.335	0.420	0.290	0.340	0.290
240	0.385	0.800	0.355	0.450	0.310	0.355	0.310
270	0.405	0.840	0.380	0.475	0.330	0.380	0.330
300	0.425	0.870	0.405	0.500	0.345	0.395	0.345
330	0.440	0.910	0.425	0.525	0.360	0.415	0.360
360	0.460	0.950	0.445	0.545	0.375	0.430	0.380
390	0.480	0.980	0.460	0.570	0.390	0.445	0.395
420	0.495	1.010	0.480	0.590	0.405	0.460	0.410
450	0.515		0.500	0.610	0.420	0.475	0.425
480	0.530	1 litre sample	0.515	0.630	0.430	0.495	0.440
510	0.545		0.535	0.650	0.445	0.510	0.455
540	0.560		0.550	0.670	0.455	0.525	0.470
570	0.575		0.565	0.685	0.470	0.540	0.480
600	0.595		0.580	0.705	0.480	0.550	0.495
630	0.610		0.595	0.720	0.495	0.565	0.510
660	0.625		0.615	0.740	0.510	0.580	0.520
690	0.640		0.630	0.755	0.520	0.590	0.530
720	0.650		0.645	0.770	0.530	0.605	0.545
750	0.665		0.660	0.785	0.545	0.615	0.555
780	0.680		0.675	0.805	0.555	0.630	0.570
810	0.690		0.685	0.820	0.565	0.640	0.580
840	0.700		0.700	0.835	0.575	0.655	0.590
870	0.715		0.710	0.850	0.585	0.665	0.600
900	0.730		0.725	0.865	0.600	0.675	0.610

Annex Table 4 Raw data for MFI measurements, Batch 2, Part 2

Site	9 bed	9 surface	10 bed	10 surface	11 surface	12 bed	12 surface
Date	8/4	8/4	7/4	7/4	7/4	8/4	8/4
Time	1530	1500	1130	1120	1445	1400	1230
Time/s	Cumulative volume/l						
30	0.080	0.125	0.140	0.245	0.220	0.160	0.255
60	0.120	0.175	0.180	0.360	0.315	0.200	0.395
90	0.145	0.210	0.215	0.450	0.415	0.230	0.490
120	0.170	0.245	0.245	0.580	0.510	0.260	0.540
150	0.190	0.270	0.270	0.670	0.610	0.285	0.600
180	0.210	0.290	0.295	0.760	0.710	0.305	0.640
210	0.230	0.315	0.315	0.840	0.800	0.330	0.680
240	0.250	0.335	0.340	0.910	0.870	0.350	0.730
270	0.265	0.355	0.360	0.980		0.375	0.760
300	0.280	0.375	0.380			0.395	0.800
330	0.295	0.390	0.400	1 litre	1 litre	0.415	0.830
360	0.310	0.410	0.415	sample	sample	0.430	0.860
390	0.320	0.425	0.435			0.450	0.900
420	0.340	0.440	0.450			0.465	0.930
450	0.350	0.460	0.465			0.480	0.960
480	0.360	0.475	0.485			0.495	0.990
510	0.375	0.490	0.500			0.515	1.010
540	0.385	0.505	0.515			0.535	1.040
570	0.400	0.520	0.530			0.555	1.060
600	0.410	0.535	0.545			0.575	1.080
630	0.425	0.545	0.560			0.590	1.110
660	0.435	0.560	0.580			0.610	1.130
690	0.445	0.575	0.595			0.625	1.150
720	0.455	0.585	0.610			0.640	1.180
750	0.465	0.600	0.625			0.655	1.200
780	0.480	0.615	0.635			0.670	1.230
810	0.490	0.630	0.650			0.680	1.250
840	0.500	0.640	0.660			0.695	1.270
870	0.510	0.650	0.670			0.710	1.290
900	0.520	0.660	0.685			0.725	1.310

Annex Table 5 Raw data for MFI measurements, Batch 3 and 4

Site	5 surface	11 surface	11	5
Date	21/4	21/4	19/5	19/5
Time	0945	1045	0945	0845
Time/s	Cumulative volume/l			
30	0.295	0.290	0.215	0.205
60	0.445	0.390	0.325	0.280
90	0.540	0.480	0.395	0.335
120	0.620	0.540	0.450	0.380
150	0.690	0.600	0.505	0.420
180	0.750	0.640	0.545	0.455
210	0.800	0.690	0.585	0.485
240	0.850	0.730	0.620	0.515
270	0.900	0.770	0.655	0.540
300	0.940	0.810	0.685	0.570
330	0.970	0.840	0.710	0.590
360	1.010	0.880	0.740	0.615
390	1.050	0.910	0.765	0.635
420	1.080	0.940	0.790	0.655
450	1.110	0.970	0.815	0.675
480	1.140	1.000	0.835	0.695
510	1.180	1.020	0.860	0.715
540	1.210	1.050	0.880	0.735
570	1.240	1.080	0.900	0.750
600	1.260	1.100	0.920	0.770
630	1.290	1.130	0.940	0.785
660	1.320	1.150	0.960	0.800
690	1.350	1.170	0.980	0.815
720	1.380	1.200	1.000	0.835
750	1.400	1.220	1.015	0.850
780	1.430	1.240	1.035	0.865
810	1.450	1.270	1.055	0.880
840	1.480	1.290	1.070	0.895
870	1.500	1.310	1.085	0.910
900	1.520	1.330	1.100	0.925

Annex Table 6 Raw data for MFI measurements, Batch 5

Site	5	5	5	5	11	11	11	11	13	Harbour
Date	7/6	22/6	6/7	20/7	7/6	22/6	6/7	20/7	7/6	20/7
Time	1040	930	1230		1040	1000	1015	1300	830	
Time/s	Cumulative volume/l									
30	0.315	0.175	0.235	0.300	0.320	0.330	0.190	0.330	0.345	0.330
60	0.445	0.230	0.315	0.475	0.540	0.540	0.260	0.550	0.570	0.530
90	0.520	0.275	0.370	0.590	0.690	0.670	0.325	0.780	0.760	0.690
120	0.600	0.305	0.415	0.680	0.850	0.750	0.400	0.980	0.900	0.800
150	0.650	0.335	0.450	0.750	1.000	0.820	0.455	1.180	1.030	0.910
180	0.690	0.360	0.485	0.800	1.110	0.870	0.515	1.380	1.210	0.990
210	0.730	0.385	0.510	0.850	1.230	0.910	0.570	1.620	1.300	1.060
240	0.760	0.405	0.540	0.890	1.350	0.950	0.620	1.840	1.370	1.110
270	0.790	0.420	0.565	0.930	1.460	0.990	0.650		1.430	1.160
300	0.810	0.440	0.590	0.970	1.560	1.020	0.680		1.480	1.210
330	0.830	0.460	0.610	1.000	1.660	1.050	0.710		1.530	1.260
360	0.850	0.475	0.630	1.030	1.760	1.080	0.735		1.580	1.300
390	0.870	0.490	0.650	1.060	1.850	1.110	0.760		1.620	1.340
420	0.890	0.500	0.670	1.090	1.940	1.130	0.780		1.660	1.380
450	0.910	0.520	0.690	1.120		1.160	0.800		1.700	1.410
480	0.930	0.530	0.710	1.140		1.180	0.820		1.730	1.440
510	0.950	0.545	0.730	1.160		1.200	0.840		1.760	1.470
540	0.970	0.560	0.745	1.190		1.220	0.860		1.800	1.500
570	0.980	0.570	0.760	1.210		1.240	0.875		1.830	1.530
600	1.000	0.585	0.775	1.230		1.260	0.890		1.860	1.560
630	1.010	0.600	0.790	1.260		1.280	0.910			1.580
660	1.020	0.610	0.805	1.280		1.300	0.925			1.600
690	1.040	0.620	0.820	1.300		1.320	0.940			1.630
720	1.050	0.635	0.835	1.320		1.340	0.955			1.650
750	1.060	0.645	0.850	1.330		1.360	0.970			1.670
780	1.070	0.655	0.860	1.350		1.380	0.985			1.700
810	1.090	0.665	0.875	1.370		1.390	1.000			1.720
840	1.100	0.675	0.890	1.390		1.410	1.015			1.740
870	1.110	0.690	0.905	1.400		1.420	1.030			1.760
900	1.120	0.700	0.915	1.420		1.440	1.045			1.780

Annex Table 7 Raw data for MFI measurements, Batch 6, Part 1

Site	5	5	5	5	5	5	5
Date	11/8	18/8	9/9	14/9	28/9	14/10	15/11
Time	920	1205	945	1045	1050	1015	1200
Time/s	Cumulative volume/l						
30	0.370	0.330		0.125	0.155	0.175	0.140
60	0.510	0.450	0.170	0.170	0.210	0.250	0.190
90	0.590	0.520	0.220	0.200	0.250	0.310	0.235
120	0.640	0.580	0.265	0.225	0.280	0.355	0.265
150	0.680	0.630	0.290	0.250	0.305	0.400	0.295
180	0.715	0.670	0.315	0.270	0.330	0.440	0.320
210	0.750	0.710	0.340	0.290	0.350	0.470	0.345
240	0.780	0.740	0.365	0.310	0.365	0.500	0.360
270	0.805	0.775	0.385	0.325	0.380	0.530	0.385
300	0.830	0.810	0.405	0.340	0.405	0.560	0.400
330	0.850	0.835	0.420	0.360	0.425	0.590	0.420
360	0.870	0.865	0.435	0.375	0.440	0.610	0.430
390	0.890	0.890	0.455	0.390	0.460	0.635	0.450
420	0.910	0.915	0.470	0.405	0.475	0.660	0.465
450	0.925	0.935	0.485	0.420	0.490	0.680	0.480
480	0.945	0.955	0.500	0.430	0.510	0.700	0.500
510	0.965	0.980	0.515	0.440	0.530	0.720	0.520
540	0.990	1.000	0.525	0.455	0.550	0.745	0.540
570	1.010	1.020	0.540	0.470	0.565	0.765	0.550
600	1.020	1.040	0.555	0.485	0.575	0.785	0.560
630	1.045	1.065	0.570	0.500	0.590	0.810	0.580
660	1.060	1.080	0.580	0.510	0.605	0.825	0.590
690	1.075	1.105	0.595	0.520	0.620	0.840	0.605
720	1.090	1.120	0.610	0.530	0.635	0.860	0.620
750	1.105	1.140	0.625	0.540	0.650	0.880	0.630
780	1.115	1.160	0.640	0.555	0.660	0.900	0.640
810	1.130	1.180	0.650	0.570	0.675	0.920	0.655
840	1.145	1.200	0.665	0.580	0.690	0.940	0.675
870	1.160	1.220	0.675	0.590	0.700	0.955	0.690
900	1.170	1.235	0.690	0.600	0.715	0.970	0.695

Annex Table 8 Raw data for MFI measurements, Batch 6, Part 2

Site	5	5	11	11	11	11	11
Date	6/12	15/12	11/8	18/8	9/9	14/9	28/9
Time	1008	1140	1008	1305	1040	1015	1000
Time/s	Cumulative volume/l						
30	0.185	0.110	0.360	0.360	0.210	0.190	0.350
60	0.250	0.165	0.560	0.550	0.300	0.300	0.485
90	0.300	0.210	0.640	0.680	0.365	0.375	0.565
120	0.345	0.245	0.720	0.750	0.415	0.430	0.620
150		0.280	0.780	0.810	0.460	0.475	0.675
180	0.420	0.310	0.830	0.860	0.500	0.510	0.720
210	0.445	0.340	0.870	0.910	0.535	0.545	0.765
240	0.470	0.365	0.910	0.945	0.570	0.580	0.810
270	0.500	0.380	0.945	0.980	0.600	0.605	0.850
300	0.520	0.410	0.975	1.010	0.630	0.635	0.890
330	0.540	0.440	1.000	1.050	0.660	0.655	0.925
360	0.560	0.460	1.025	1.080	0.685	0.680	0.960
390	0.580	0.480	1.050	1.110	0.710	0.710	1.000
420	0.610	0.500	1.070	1.140	0.740	0.735	1.035
450	0.630	0.510	1.090	1.165	0.760	0.755	1.070
480	0.650	0.540	1.115	1.190	0.785	0.775	1.100
510	0.670	0.560	1.135	1.210	0.810	0.795	1.120
540	0.690	0.575	1.150	1.230	0.830	0.820	1.155
570	0.710	0.590	1.170	1.260	0.850	0.840	1.180
600	0.720	0.610	1.185	1.290	0.870	0.860	1.210
630	0.740	0.630	1.195	1.315	0.895	0.880	1.240
660	0.760	0.650	1.220	1.330	0.915	0.895	1.260
690	0.780	0.670	1.235	1.350	0.935	0.915	1.280
720	0.800	0.680	1.255	1.370	0.950	0.935	1.300
750	0.810	0.700	1.270	1.390	0.970	0.950	1.320
780	0.820	0.710	1.280	1.410	0.990	0.965	1.340
810	0.840	0.725	1.295	1.420	1.010	0.980	1.360
840	0.860	0.740	1.310	1.440	1.025	1.000	1.380
870	0.880	0.755	1.320	1.460	1.040	1.015	1.400
900	0.890	0.770	1.335	1.475	1.055	1.030	1.420

Annex Table 9 Raw data for MFI measurements, Batch 6, Part 3

Site	11	11	11	11
Date	14/10	15/11	6/12	15/12
Time	1115	1000	930	1032
Time/s	Cumulative volume/l			
30	0.280	0.175	0.185	0.140
60	0.400	0.235	0.240	0.185
90	0.470	0.280	0.280	0.220
120	0.530	0.315	0.315	0.250
150	0.585	0.345	0.345	0.270
180	0.630	0.375	0.370	0.295
210	0.675	0.400	0.395	0.315
240	0.715	0.425	0.420	0.335
270	0.750	0.445	0.440	0.355
300	0.780	0.465	0.460	0.375
330	0.815	0.490	0.480	0.390
360	0.850	0.520	0.500	0.410
390	0.880	0.540	0.510	0.430
420	0.910	0.560	0.530	0.445
450	0.935	0.580	0.540	0.460
480	0.960	0.600	0.560	0.475
510	0.985	0.620	0.570	0.490
540	1.010	0.640	0.590	0.500
570	1.035	0.660	0.600	0.515
600	1.060	0.670	0.610	0.530
630	1.085	0.690	0.630	0.540
660	1.105	0.700	0.640	0.555
690	1.130	0.710	0.650	0.565
720	1.150	0.730	0.660	0.580
750	1.170	0.740	0.680	0.590
780	1.190	0.760	0.690	0.600
810	1.210	0.770	0.700	0.615
840	1.230	0.780	0.710	0.630
870	1.250	0.800	0.730	0.640
900	1.270	0.810	0.740	0.650

Annex Table 10 Raw data for MFI measurements, Batch 7

Site	5	5	5	11	11	11
Date	17/1	31/1	?	17/1	31/1	?
Time	?	1400	?	?	1010	?
Time/s	Cumulative volume/l					
30	0.080	0.160	0.145	0.070	0.155	0.200
60	0.105	0.190	0.200	0.130	0.250	0.250
90	0.125	0.230	0.240	0.160	0.300	0.290
120	0.145	0.260	0.275	0.185	0.340	0.320
150	0.160	0.290	0.305	0.200	0.375	0.345
180	0.180	0.315	0.330	0.220	0.400	0.370
210	0.195	0.340	0.360	0.240	0.425	0.390
240	0.210	0.365	0.385	0.260	0.455	0.410
270	0.230		0.410	0.285	0.475	0.425
300	0.245	0.405	0.430	0.305	0.500	0.445
330	0.260	0.425	0.450	0.330	0.530	0.460
360	0.280	0.440	0.470	0.355	0.555	0.480
390	0.295	0.460	0.485	0.385	0.580	0.495
420	0.310	0.475	0.505	0.410	0.605	0.510
450	0.330	0.495	0.525	0.445	0.635	0.525
480	0.345	0.515	0.545	0.470	0.665	0.540
510	0.360	0.525	0.560	0.495	0.690	0.555
540	0.380	0.535	0.580	0.515	0.720	0.570
570	0.395	0.550	0.600	0.540	0.755	0.585
600	0.410	0.570	0.615	0.560	0.790	0.595
630	0.430	0.585	0.635	0.580	0.820	0.610
660	0.445	0.600	0.650	0.605	0.845	0.620
690	0.460	0.615	0.665	0.625	0.870	0.635
720	0.485	0.625	0.680	0.645	0.900	0.645
750	0.500	0.640	0.695	0.665	0.925	0.660
780	0.515	0.655	0.715	0.685	0.955	0.670
810	0.530	0.665	0.730	0.705	0.970	0.680
840	0.540	0.680	0.740	0.720		0.695
870	0.555	0.695	0.755	0.735		0.705
900	0.570	0.705	0.775	0.750		0.705

Appendix C Radionuclide analysis results



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RADIOANALYTICAL SERVICE
Test Report

Customer: Dean Foden

From: CEFAS Laboratory
Pakefield Road
Lowestoft
Suffolk
NR33 0HT

Contract / Sub-contract No: C5043H

Type of analysis: Gross Alpha & Beta, Tritium, Gamma Spec and Carbon-14

Description of sample(s): Sizewell Sea waters

Date of receipt of sample(s): 19/05/10

Description of methods of analysis used: various

Date of analysis: Jun-10

Report authorised by: Dr Kins Leonard & Steph Cogan

Date: 02/07/10

The results follow and relate only to the samples as indicated

Sample date	Sample Lsn	Gross Alpha Bq/l	% error	Gross Beta Bq/l	% error	Tritium Bq/l	% error	Cs-134 Bq/l	% error	Cs-137 Bq/l	% error	K-40 Bq/l	% error	Artificial C-14 Bq/l	% error	Natural C-14 Bq/l
19/05/2010	Site 5	< 3.80	*-	< 5.30	*-	4.44	22.90	< 0.107	*-	< 0.105	*-	10.215	10.27	< 2.045	*-	3.570
19/05/2010	Site 11	< 3.80	*-	< 5.30	*-	< 3.19	*-	< 0.109	*-	< 0.107	*-	11.229	9.97	< 0.056	*-	3.330

Comments:

All results are expressed as **Bq/l wet**

< indicates that the result is below the limit of detection of the counting equipment.

% error for Cs-134, Cs-137 & K-40 indicates 1 sigma Total uncertainty

% error for the rest of the results indicates 1 sigma counting statistics only

* inapplicable when result is below detection limit.

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RADIOANALYTICAL SERVICE
Test Report

Customer: Dean Foden

From: CEFAS Laboratory
Pakefield Road
Lowestoft
Suffolk
NR33 0HT

Contract / Sub-contract No: C5043H

Type of analysis: Gross Alpha & Beta, Tritium, Gamma Spec and
Carbon-14

Description of sample(s): Sizewell Sea waters

Date of receipt of sample(s): Jan/Feb-
11

Description of methods of analysis used: various

Date of analysis: Feb & Mar-11

Report authorised by: Dr Kins Leonard & Steph Cogan

Date: 05/04/11

The results follow and relate only to the samples as indicated

Sampled date	Sample Lsn	Site	Gross Alpha Bq/l	% error	Gross Beta Bq/l	% error	Tritium Bq/l	% error	Artificial C-14 Bq/l	% error	Natural C-14 Bq/l
17/01/2011	17	5	< 3.80	*-	< 5.30	*-	1.77	56.50	< 1960	*-	3.84
17/01/2011	18	11	< 3.80	*-	11.13	26.90	2.23	44.90	< 1960	*-	3.63
14/02/2011	100	5	< 3.80	*-	< 5.30	*-	2.46	41.66	< 1960	*-	3.27

All results are
expressed as **Bq/l**
wet

Comments:

< indicates that the result is below the limit of detection of the counting equipment.

% error for Cs-134, Cs-137 & K-40 indicates 1 sigma Total uncertainty

% error for the rest of the results indicates 1 sigma counting statistics only

* inapplicable when result is below detection limit.

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