

Energy from Waste Combined Heat and Power Facility, North Yard, Devonport

Project Specific Air Quality Monitoring Survey – Update Report

July 2011





Revision Schedule

Project Specific Air Quality Monitoring Survey – Update Report July 2011

Rev	Date	Details	Prepared by	Reviewed by	Approved by
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1 Introduction

1.1 Overview

- 1.1.1 URS Scott Wilson was instructed by MVV Environment Devonport Ltd (MVV) to prepare an Environmental Statement (ES) for the proposed Energy from Waste (EfW) Combined Heat and Power (CHP) Facility at North Yard, Devonport, Plymouth. The ES and planning application were submitted in May 2011.
- 1.1.2 In order to supplement existing sources of background air quality data in the vicinity of the application site, a project specific air quality monitoring survey has been undertaken, which has consisted of the following monitoring:
 - a diffusion tube survey for nitrogen dioxide (NO₂) and sulphur dioxide (SO₂) in the vicinity of the application site and the wider area; and
 - operation of a continuous monitoring station within Devonport, a short distance to the west of the application site boundary.
- 1.1.3 The project specific monitoring survey was still ongoing at the time that the air quality assessment work was undertaken. At the time that the ES was compiled, the results of eight months of NO₂ and SO₂ diffusion tube monitoring and six months operation of the continuous monitoring station were reported. This document provides a summary of ten months of NO₂ diffusion tube monitoring and ten months operation of the continuous monitoring station.
- 1.1.4 The contents of this update report should be read in conjunction with the air quality assessment material contained within Chapter 13 and Appendix 13.1 of the ES. This approach was set out in ES paragraph 13.3.17.

2 Project Specific Air Quality Monitoring Results

2.1.1 This section presents further data reported from the project specific monitoring survey that was not available at the time that the ES was compiled. The information has been set out so that a comparison can be made between the data reported in the ES and the revised period mean data taking into account the additional monitoring results.

Diffusion Tube Monitoring Survey

- 2.1.2 A diffusion tube monitoring survey for NO₂ and SO₂ has been carried out in the area surrounding the application site, in order to evaluate the variation in baseline concentrations across the air quality study area. NO₂ is emitted from road traffic, and therefore concentrations of this pollutant are higher in areas nearer to road traffic emission sources. Monitoring of NO₂ has taken place at nineteen locations, with duplicate tubes also placed next to the Devonport continuous monitoring site. The NO₂ diffusion tubes used in the survey are of the 20% TEA in water type, supplied by Gradko, which is the same type of tube as that used by PCC in their monitoring of local air quality.
- 2.1.3 A smaller survey for SO₂ at two sites was also undertaken in residential areas near to Devonport dockyard to evaluate concentrations close to sources of emissions from marine vessels.
- 2.1.4 The survey commenced on 6th July 2010. This report considers data collected between this date and the date that the survey was completed on the 9th May 2011, a period of ten months.
- 2.1.5 The diffusion tube monitoring locations are shown on Figure 4.1 of Appendix A to this report.
- 2.1.6 The survey results for NO_2 and SO_2 are summarised in Tables 2.1 and 2.2 respectively. The complete set of monitoring results is presented in Appendix B to this report.

Location	Description	8 Month Period Mean NO ₂ concentration (μg m ⁻³)	10 Month Period Mean NO ₂ concentration (μg m ⁻³)	10 Month Data Capture (%)
1	St Pancras Avenue	27.5	27.4	80
2	Beacon Down Avenue	20.5	20.5	70
3	Harewood Crescent	25.3	24.1	60
4	Beaumont Street	30.9	31.7	90
5	North Down Gardens	21.9	21.6	100
6	St Leo Place	23.5	23.8	100
7	Wombwell Crescent	21.6	21.6	100
8	Wolseley Road (near Weston Mill Drive)	30.6	31.8	100
9	Ferndown Road (near fire station)	31.9	32.1	90
10	York Road (opposite Tucker Close)	21.0	20.6	100
11	Clearbrook Avenue	20.3	19.9	100
12	Harbour Avenue	28.7	27.7	100
13	Furse Park	17.7	17.8	100
14	Admiralty Road	28.5	28.6	100
15	Roman Way (outside school)	27.2	26.9	100
16	Macey Street off Quarry Street, Torpoint	16.9	17.6	100
17	Jetty at Wilcove	11.5	10.4	86
18	Deacon Close, Saltash	11.6	11.9	90
19	Callington Road / Liskeard Road junction, Saltash	25.4	26.2	100
20	2 tubes co-located with Devonport monitoring station	17.2	17.4	100

Table 2.1: Summary of Monthly Diffusion Tube Monitoring for NO2

- 2.1.7 Long term NO₂ concentrations are higher at locations near to significant road traffic emission sources. The highest concentrations are measured at Beaumont Street (close to the A3064 to the south east of the site), Wolseley Road adjacent to the Camel's Head Junction and Ferndown Road near to the Weston Mill fire station. Concentrations are lower in areas away from main roads.
- 2.1.8 The period mean results from 10 months of monitoring are slightly higher in general than those reported from 8 months of monitoring. However the additional two months of data has not made any notable difference to the results obtained from the monitoring at any of the sampling locations.

- 2.1.9 The mean results obtained from the co-location study are slightly higher than that at the continuous monitoring station at Devonport for the same period, but can be considered to be comparable with the results generated using the reference method. No adjustment of the diffusion tube results for survey bias is therefore considered necessary.
- 2.1.10 Overall, the results indicate that long-term NO₂ concentrations are well within the annual mean EAL for this pollutant at all the monitoring sites.

Location	Description	8 Month Period Mean SO ₂ concentration (μg m ⁻³)	10 Month Period Mean SO ₂ concentration (μg m ⁻³)	10 Month Period Data Capture (%)
6	St Leo Place	3.3	2.9	100
7	Wombwell Crescent	1.6	1.5	100
20	Tube co-located with Devonport monitoring station	3.2	2.9	100

Table 2.2: Summary of Monthly Diffusion Tube Monitoring for SO₂

- 2.1.11 The results of the SO₂ monitoring show that the long-term average concentration is low in close proximity to the monitoring sites, with no significant local sources of this pollutant. It is likely that the short term standards for SO₂ would also be met at these locations.
- 2.1.12 As for the NO₂ monitoring programme, the additional two months of data has not resulted in a notable change in the results obtained from the monitoring at any of the sampling locations.

Devonport Air Quality Monitoring Station

- 2.1.13 An air quality monitoring station was installed by TRL, on behalf of MVV, within the Devonport site. The station has taken the following measurements:
 - continuous monitoring of oxides of nitrogen (NO, NO_X and NO₂);
 - continuous monitoring of SO₂;
 - continuous monitoring of PM₁₀;
 - monthly measurement of PAH and PCBs;
 - monthly measurement of Dioxins and Furans; and
 - monthly measurement of heavy metals.
- 2.1.14 The survey commenced on the 17th August 2010. This report considers data collected between this date and the 16th June 2011, a period of ten months.
- 2.1.15 The location of the monitoring station is shown on Figure 4.1 of Appendix A to this report.
- 2.1.16 Overall data capture rates during the whole survey period were excellent, with greater than 95% capture for continuous monitoring of NO_X, PM₁₀ and SO₂.

- 2.1.17 As the survey has taken place over a ten month period and includes both summer and winter months, it is considered that the average results obtained from the survey are representative of annual mean concentrations.
- 2.1.18 A series of short form summary reports, issued by TRL and describing the findings of the survey to date, is included as Appendix C to this report. A comparison of the six month period mean survey reported in the ES and the ten month period mean reported here in Tables 2.3 to 2.6.

Table 2.3: Summary of Continuous Monitoring for Nitrogen Oxides and Sulphur Dioxide at Devonport (Hourly Average Data, 6 Month Period Mean)

Statistic	NO	NO _x	NO ₂	SO₂
No. exceedances of 1-hr objective	-	-	0	0
Minimum (µg m ⁻³)	0.0	0.9	0.2	0.2
Average (μg m ⁻³)	14.7	30.1	15.3	7.1
Standard deviation ($\mu g m^{-3}$)	36.7	48.1	14.6	4.2
Median (µg m⁻³)	3.7	15.6	10.9	5.8
Maximum (µg m ⁻³)	563.0	664.3	107.2	36.0
% Data capture	97.8	97.8	97.8	95.1

Table 2.4: Summary of Continuous Monitoring for Nitrogen Oxides and Sulphur Dioxide atDevonport (Hourly Average Data, 10 Month Period Mean)

Statistic	NO	NOx	NO ₂	SO ₂
No. exceedances of 1-hr objective	-	-	0	0
Minimum (μg m ⁻³)	0.0	0.9	0.2	0.0
Average (µg m ⁻³)	12.3	26.4	14.2	5.8
Standard deviation (µg m ⁻³)	31.5	42.0	13.8	4.0
Median (µg m ⁻³)	3.3	14.0	9.9	4.6
Maximum (µg m ⁻³)	563.0	664.3	107.2	36.0
% Data capture	96.1	96.1	96.1	96.7

- 2.1.19 The data in Tables 2.3 and 2.4 show that the ten month period mean is slightly lower than the six month mean values reported in the ES. This is likely to be due to the reduced influence of winter months in the ten month dataset, when higher NO_X and SO₂ concentrations are generally reported.
- 2.1.20 There were no exceedances of the hourly NO₂ objective of 200 μ g m⁻³ and the period mean concentration was well within the annual mean EAL for this pollutant. The variation in hourly values at the monitoring site compared well with the AURN network site in Plymouth Urban Centre over the same period.

Statistic	Adjusted PM ₁₀	VCM Corrected PM ₁₀
No. exceedances of 24-hr objective	0	0
Minimum (µg m⁻³)	5.0	3.8
Average (µg m ⁻³)	16.3	13.3
Standard deviation (µg m ⁻³)	6.6	6.7
Median (µg m ⁻³)	15.2	11.8
Maximum (µg m ⁻³)	42.0	33.4
% Data capture	100.0	96.0

Table 2.5: Summary of Continuous Monitoring for PM_{10} (24-hour Average Data, 6 Month Period Mean)

Table 2.6: Summary of Continuous Monitoring for PM_{10} (24-hour Average Data, 10 Month Period Mean)

Statistic	Adjusted PM ₁₀	VCM Corrected PM ₁₀
No. exceedances of 24-hr objective	0	5
Minimum (μg m ⁻³)	5.0	3.8
Average (μg m ⁻³)	17.7	16.4
Standard deviation (µg m ⁻³)	7.0	10.6
Median (µg m ⁻³)	16.1	14.2
Maximum (μg m ⁻³)	42.0	72.8
% Data capture	99.7	97.0

- 2.1.21 The period mean has remained well below the annual mean EAL over the ten month period. A number of peaks in PM₁₀ concentration were also seen at the Plymouth Urban Centre site. Unlike the initial six months of monitoring, however, the four months from March to June 2011 saw five days when the VCM corrected 24-hour PM₁₀ concentration exceeded 50 μg m⁻³. During the spring of 2011, periods of elevated particulate matter concentrations were widely reported across the UK, and the peaks recorded during this time were also experienced at the Plymouth Urban Centre monitoring site.
- 2.1.22 Mean concentrations of PAH, PCBs, Dioxins, Furans and Heavy Metals were found to be generally low, and well within the respective long term EAL values set for these pollutants. The ten month period mean values for metals have, however, in most cases increased in comparison to the six month mean concentrations. It is likely the higher results recorded have been affected by the adverse meteorological conditions experienced across the whole of the UK during the spring of 2011.

Substance	6 Month Average (μg m ⁻³)	10 Month Average (μg m ⁻³)	Long-Term EAL (μg m ⁻³)
Arsenic	0.00041	0.00041	0.006
Cadmium	0.00009	0.00009	0.005
Cobalt	0.00014	0.00015	-
Chromium (total)	0.00052	0.00131	5
Copper	0.00299	0.00392	10
Mercury	0.00001	0.00002	0.25
Manganese	0.00201	0.00290	0.15
Nickel	0.00196	0.00240	0.02
Lead	0.00426	0.00477	0.5
Antimony	0.00074	0.00066	5
Thallium	0.00002	0.00002	-
Vanadium	0.00068	0.00102	5
Zinc	0.00917	0.01244	-

Table 2.7: Summary of Monthly Monitoring for Heavy Metals

Table 2.8: Summary of Monthly Monitoring for PAH

Substance	6 Month Average (ng m ⁻³)	10 Month Average (ng m ⁻³)	Long-Term EAL (ng m ⁻³)
Acenaphthene	<lod< td=""><td>0.00221</td><td>-</td></lod<>	0.00221	-
Acenaphthylene	<lod< td=""><td><lod< td=""><td>-</td></lod<></td></lod<>	<lod< td=""><td>-</td></lod<>	-
Anthracene	<lod< td=""><td>0.01425</td><td>-</td></lod<>	0.01425	-
Benzo(a)anthracene	<lod< td=""><td>0.01045</td><td>-</td></lod<>	0.01045	-
Benzo(a)pyrene	0.000121	0.01159	0.25
Benzo(b/k)fluoranthene	<lod< td=""><td>0.06424</td><td>-</td></lod<>	0.06424	-
Benzo(ghi)perylene	0.000179	0.01938	-
Chrysene	0.000259	0.02311	-
Dibenzo(ah)anthracene	0.000025	0.00119	-
Fluoranthene	0.001067	0.16106	-
Fluorene	0.000406	0.01030	-
Indeno(1,2,3-cd)pyrene	0.000113	0.01411	-
Naphthalene	0.000137	0.00597	-
Phenanthrene	0.001403	0.20577	-
Pyrene	0.000792	0.12865	-

Substance	6 Month Average (ng m ⁻³)	10 Month Average (ng m ⁻³)
PCB-77	0.000039	0.000023
PCB-81	0.000009	0.000005
PCB-105	0.000404	0.000331
PCB-114	0.000020	0.000012
PCB-118	0.000929	0.000758
PCB-123	0.000055	0.000033
PCB-126	0.000057	0.000034
PCB-156	0.000105	0.000063
PCB-157	0.000020	0.000012
PCB-167	0.000035	0.000021
PCB-169	0.000050	0.000030
PCB-189	0.000001	0.000001
Total	0.001724	0.001324

Table 2.9: Summary of Monthly Monitoring for PCBs

Substance	6 Month Average (ng m ⁻³)	10 Month Average (ng m ⁻³)
2378-TCDF	4.53 x 10 ⁻⁸	2.00 x 10 ⁻⁷
12378-PCDF	2.59 x 10 ⁻⁸	8.35 x 10 ⁻⁸
23478-PCDF	7.77 x 10 ⁻⁷	1.36 x 10 ⁻⁶
123478-HxCDF	1.66 x 10 ⁻⁷	3.62 x 10 ⁻⁷
123678-HxCDF	7.61 x 10 ⁻⁷	6.74 x 10 ⁻⁷
234678-HxCDF	5.33 x 10 ⁻⁷	6.18 x 10 ⁻⁷
123789-HxCDF	2.67 x 10 ⁻⁷	2.65 x 10 ⁻⁷
1234678-HpCDF	3.92 x 10 ⁻⁷	3.32 x 10 ⁻⁷
1234789-HpCDF	2.41 x 10 ⁻⁷	2.18 x 10 ⁻⁸
OCDF	1.57 x 10 ⁻⁷	1.62 x 10 ⁻⁸
2378-TCDD	1.49 x 10 ⁻⁷	8.93 x 10 ⁻⁸
12378-PCDD	1.28 x 10 ⁻⁷	7.67 x 10 ⁻⁷
123478-HxCDD	5.01 x 10 ⁻⁷	3.01 x 10 ⁻⁷
123678-HxCDD	1.59 x 10 ⁻⁷	9.86 x 10 ⁻⁷
123789-HxCDD	8.7 x 10 ⁻⁷	7.46 x 10 ⁻⁷
1234678-HpCDD	8.93 x 10 ⁻⁷	5.78 x 10 ⁻⁷
OCDD	2.52 x 10 ⁻⁷	3.54 x 10 ⁻⁷
Total	8.54 x 10 ⁻⁶	7.76 x 10 ⁻⁶

 Table 2.10: Summary of Monthly Monitoring for Dioxins and Furans (I-TEQ)

3 Conclusion

- 3.1.1 The additional two months of diffusion tube data for NO₂ and SO₂ has not resulted in a notable change to the results obtained from the monitoring at any of the sampling locations.
- 3.1.2 Monitoring of oxides of nitrogen and SO_2 at the continuous monitoring station show that the ten month period mean is slightly lower than the six month mean values reported in the ES. This is likely to be due to the reduced influence of winter months in the ten month dataset, when higher NO_x and SO_2 concentrations are generally reported.
- 3.1.3 The PM₁₀ period mean has remained well below the annual mean EAL over the ten month period. During the spring of 2011, periods of elevated particulate matter concentrations were widely reported across the UK, and the peaks recorded at the continuous monitoring station during this time were also experienced at the Plymouth Urban Centre monitoring site.
- 3.1.4 Mean concentrations of PAH, PCBs, Dioxins, Furans and Heavy Metals remain generally low, and well within the respective long term EAL values set for these pollutants. An observed increase in metal concentrations could be influenced by the adverse meteorological conditions experienced across the whole of the UK during the spring of 2011.

Appendix A: Map of Diffusion Tube Sampling Locations



	THIS DRAWING MAY BE USED FOR THE PURPOSE INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED								
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Appendix B: Diffusion Tube Monitoring Data

Table B1: Raw Monthly Diffusion Tube Monitoring Results for NO2 in 2010-2011

Diffusion	Location	NO ₂ Concentrations (μg/m ³)									
Tube		Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	St Pancras Avenue	-	24	17	-	34	29	28	34	28	26
2	Beacon Down Avenue	11	-	17	20	27	26	21	-	20	-
3	Harewood Crescent	-	-	-	-	26	24	20	31	24	19
4	Beaumont Street	17	28	-	26	45	37	31	33	40	28
5	North Down Gardens	10	14	23	20	29	32	23	23	22	19
6	St Leo Place	14	17	21	24	31	32	24	26	28	21
7	Wombwell Crescent	12	17	18	20	25	28	25	29	24	19
8	Wolseley Road (near Weston Mill Drive)	24	27	16	31	38	32	34	42	41	32
9	Ferndown Road (near fire station)	-	25	27	30	37	34	30	40	35	31
10	York Road (opposite Tucker Close)	13	14	16	22	27	24	22	30	22	16
11	Clearbrook Avenue	12	13	22	17	25	23	23	27	21	16
12	Harbour Avenue	15	20	30	28	35	32	33	37	24	23
13	Furse Park	9	11	21	14	19	21	18	29	19	18
14	Admiralty Road	17	25	24	25	39	36	30	33	31	27
15	Roman Way (outside school)	20	22	25	28	35	28	28	31	29	23
16	Macey Street off Quarry Street, Torpoint	9	12	12	18	21	22	17	23	23	18
17	Jetty at Wilcove	4	-	7	11	15	17	13	14	2	11
18	Deacon Close, Saltash	5	8	8	11	15	17	13	15	14	-
19	Callington Road / Liskeard Road junction, Saltash	18	25	26	25	34	30	29	18	32	27
20	2 tubes co-located with Devonport monitoring station	11	11	14	17	19	21	21	27	21	15
20		11	11	14	6	20	22	22	30	19	16

Raw monthly data, not corrected for laboratory bias. This cannot de directly compared with the annual mean NO₂ standard.

Table B2: Raw Monthly Diffusion Tube Monitoring Results for SO_2 in 2010-2011

	Location	SO₂ Concentration (μg/m³)									
Diffusion Tube		Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
6	St Leo Place	1.48	12.55	2.51	1.03	0.98	5.63	1.03	0.95	1.27	1.79
7	Wombwell Crescent	2.79	2.56	2.15	1.39	0.57	0.69	0.98	<lod< td=""><td>1.02</td><td>1.09</td></lod<>	1.02	1.09
20	Tube co-located with Devonport monitoring station	1.8	1.4	2.74	11.46	0.58	<lod< td=""><td>1.24</td><td><lod< td=""><td>1.00</td><td>3.34</td></lod<></td></lod<>	1.24	<lod< td=""><td>1.00</td><td>3.34</td></lod<>	1.00	3.34

<LOD – result was below the limits of laboratory detection

Appendix C: TRL Short Form Reports