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**The Environmental Permitting (England
and Wales) Regulations 2010**

**Permit: EPR/LP3030XA
Cardiff Energy Recovery Facility**

**Environmental Monitoring Report
3rd Quarter 2015: 1st July – 30th September 2015**

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Version: 1.0
Issue Date: 28/10/2015



Quality Assurance

This report has been prepared with all reasonable skill, care and diligence. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

Report Details

Report Title:	Cardiff Energy Recovery Facility – 3 rd Quarter 2015 Environmental Report
Report Date:	28 th October 2015
Version:	1

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1. Introduction

Cardiff Energy Recovery Facility is located immediately north of Cardiff Docks. The facility has a design capacity to process 350,000 tonnes per year of residual municipal and C&I waste and has the capability of exporting approximately 30MW of electrical power.

In accordance with the requirements of Condition 4.2.3, Schedule 4 and Table S4.1 of Permit EPR/LP3030XA issued by National Resources Wales to Viridor Waste Management Limited (Viridor) on 4th November 2010, Viridor is required to submit a summary of the environmental monitoring works undertaken at the site on a quarterly basis. Such reports will form the basis of the annual environmental review report, which is to be submitted to National Resources Wales by the 30th April as agreed in writing with the National Resources Wales of each year in accordance with Condition 4.2.2 of the Permit.

Viridor took over full operation of the Plant on 31st January 2015.

This report summarises the environmental data collected at the site during the third quarter calendar period of 2015, between 1st July and 30th September.

The report will cover the following areas of environmental monitoring:

- Section 2 – Point Source Emissions to Air
- Section 3 – Point Source Emissions to Water
- Section 4 – Residue Quality Monitoring Requirements

2. Point Source Emissions to Air

2.1. Introduction

Permit Condition 3.5.1(a) and Tables S3.1 and S3.1(a) require Viridor to undertake performance monitoring of the point source emissions to air arising at sample points A1 and A2.

A summary of the point source emissions to air monitoring data at sample point A1 and A2 for the period is included as Table 1 and 2.

2.2 Commentary on Data

Due to the challenges with plant process detailed in the previous report, periodic analysis was not returned in time for submission of the Q2 report. Therefore, periodic monitoring for Q2 is included in this report as Table 3. Viridor note, as a consequence of unstable operation during Q2, periodic monitoring recorded a slightly elevated dioxin value. However Q3 analysis undertaken on 14th and 15th September documented a low compliant value, which is more representative of normal operation at the plant.

2.3 Schedule Notices Issued

05/07/2015 & 06/07/2015 - Schedule notification Part C was submitted for an abnormal operation occurrence, as a result of a disturbance in the abatement system on Line 1.

10/07/2015 - Schedule notification Part C was submitted for an abnormal operation occurrence, as a result of a disturbance in the abatement system on Line 2.

02/08/2015 - Schedule notification Part C was submitted for an abnormal operation occurrence, as a result of a disturbance in the abatement system on Line 1.

11/08/2015 - Schedule notification Part C was submitted for an abnormal operation occurrence, as a result of a disturbance in the abatement system on Line 2.

26/09/2015 - Schedule notification Part C was submitted for an abnormal operation occurrence, as a result of a disturbance in the abatement system on Line 1.

Table 1: Emissions to Air from A1 and A2 (CEMS)

Emissions to Air from ERF – Continuous Monitoring								
Parameter	Limit	Reference Period	A1		A2		Test Method	Uncertainty**
			Max	Avg	Max	Avg		
Oxides of nitrogen	200 mg/m ³	Daily mean	199	177	196	175	BS EN 15267-3	
	400 mg/m ³	½ hourly mean	400	179	355	174		
Particulate Matter	10 mg/m ³	Daily mean	1	1	0	0		
	30 mg/m ³	½ hourly mean	1	1	1	0		
Total Organic Carbon (TOC)	10 mg/m ³	Daily mean	3	0	0	0		
	20 mg/m ³	½ hourly mean	15	1	17	0		
Hydrogen chloride	10 mg/m ³	Daily mean	10	6	9	7		
	60 mg/m ³	½ hourly mean	48	7	39	7		
Sulphur dioxide	50 mg/m ³	Daily mean	30	11	18	6		
	200 mg/m ³	½ hourly mean	163	14	107	7		
Carbon monoxide	50 mg/m ³	Daily mean	36	11	40	12		
	100 mg/m ³	½ hourly mean*	-	-	-	-		
Ammonia	No limit set	Daily mean	2	1	7	2		

*Note. ½ hourly monitoring for CO is no longer required in the latest version of the permit

**Note. CEMS data figures are adjusted for the method uncertainty

Table 2: Emissions to Air from A1 and A2 (Periodic Q3)

Substance / Parameter	Emission Limit Value	Ref. Period	A1 Result	Uncertainty	A1 Result minus Uncertainty	Sample Date / Time	A2 Result	Uncertainty	A2 Result minus Uncertainty	Sample Date / Time	Test Method
Nitrous oxide	-	Periodic over 30 minutes. Maximum 8 hours	18.5	1.4	17.1	03/09/2015 15:00–16:00	13.7	1.4	12.3	04/09/2015 16:00–17:00	TGN M22
Hydrogen fluoride	2 mg/m ³		0.17	0.01	0.16	08/09/2015 08:42-09:42	0.051	0.004	0.047	09/09/2015 13:10-14:10	ISO 15713
Cd and Th and their compounds	0.05 mg/m ³		<0.00079	0.00013	0.00066	09/09/2015 08:40–09:10; 09:12-09:42	<0.0009	0.0001	<0.0008	07/09/2015 13:19-13:49; 13:51-14:21	EN 14385
Hg and its compounds	0.05 mg/m ³		0.0016	0.0002	0.0014		0.002	0.0003	0.0017		EN 13211
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	0.5 mg/m ³		0.010	0.002	0.008		0.010	0.001	0.009		EN 14385
Dioxins & Furans (I-TEQ)	0.1 ng/m ³	Mean over period minimum 6 hours, maximum 8 hours	0.055	0.011	0.044	14/09/2015 09:15–12:15; 12:18-15:18	0.058	0.012	0.046	15/09/2015 08:05-11:05; 11:09-14:09	EN 1948 1-3
PCBs (WHO-TEQ Humans / Mammals)	None set ng/m ³		0.0038	0.0008	0.0030		0.0066	0.0014	0.0052		EN 1948 1-3
PCBs (WHO-TEQ Fish)	None set ng/m ³		0.00021	0.00004	0.00017		0.0003	0.0001	0.0002		EN 1948 1-3
PCBs (WHO-TEQ Birds)	None set ng/m ³		0.0093	0.0019	0.0074		0.012	0.002	0.010		EN 1948 1-3
Dioxins/Furans (WHO-TEQ Humans/Mam)	None set ng/m ³		0.051	0.011	0.040		0.055	0.011	0.044		EN 1948 1-3
Dioxins/Furans (WHO-TEQ Fish)	None set ng/m ³		0.058	0.012	0.046		0.06	0.012	0.048		EN 1948 1-3
Dioxins/Furans (WHO-TEQ Birds)	None set ng/m ³		0.10	0.02	0.08		0.10	0.021	0.079		EN 1948 1-3

Anthanthrene	None set µg/m ³	Mean over period minimum 6 hours, maximum 8 hours	0.012	0.002	0.010	08/09/2015 08:24–11:24; 11:25-14:25	<0.012	0.002	<0.010	04/09/2015 08:05-11:05; 11:08-14:08	ISO 11338
Benzo(a)anthracene	None set µg/m ³		0.012	0.002	0.010		0.023	0.005	0.018		
Benzo(a)pyrene	None set µg/m ³		0.024	0.005	0.019		0.023	0.005	0.018		
Benzo(b)fluoranthene	None set µg/m ³		<0.012	0.002	<0.010		0.070	0.014	0.056		
Benzo(b)naptho(2,1-d)thiophene	None set µg/m ³		<0.012	0.002	<0.010		<0.012	0.002	<0.010		
Benzo(c)phenanthrene	None set µg/m ³		<0.012	0.002	<0.010		<0.012	0.002	<0.010		
Benzo(ghi)perylene	None set µg/m ³		0.012	0.002	0.010		<0.012	0.002	<0.010		
Benzo(k)fluoranthene	None set µg/m ³		<0.012	0.002	<0.010		0.012	0.002	0.010		
Cholanthrene	None set µg/m ³		0.036	0.007	0.029		0.035	0.007	0.028		
Chrysene	None set µg/m ³		0.012	0.002	0.010		0.023	0.005	0.018		
Cyclopenta(cd)pyrene	None set µg/m ³		<0.012	0.002	<0.010		<0.012	0.002	<0.010		
Dibenzo(ai)pyrene	None set µg/m ³		<0.012	0.002	<0.010		<0.012	0.002	<0.010		
Dibenzo(ah)anthracene	None set µg/m ³		<0.012	0.002	<0.010		<0.012	0.002	<0.010		
Fluoranthene	None set µg/m ³		0.071	0.015	0.056		0.117	0.024	0.093		
Indeno(123-cd)pyrene	None set µg/m ³		<0.012	0.002	<0.010		<0.012	0.002	<0.010		
Naphthalene	None set µg/m ³		0.80	0.16	0.064		1.6	0.34	1.26		

Table 3: Emissions to Air from A1 and A2 (Periodic Q2)

Substance / Parameter	Emission Limit Value	Ref. Period	A1 Result	Uncertainty	A1 Result minus Uncertainty	Sample Date / Time	A2 Result	Uncertainty	A2 Result minus Uncertainty	Sample Date / Time	Test Method
Nitrous oxide	-	Periodic over 30 minutes. Maximum 8 hours	2.0	3.6	0.00	06/07/2015 13:35-14:35	17.6	4	13.6	21/07/2015 11:01-12:01	TGN M22
Hydrogen fluoride	2 mg/m ³		0.054	0.004	0.05	06/07/2015 12:00-13:00	0.23	0.02	0.21	30/06/2015 10:19-11:19	ISO 15713
Cd and Th and their compounds	0.05 mg/m ³		0.00099	0.00016	0.00083	06/07/2015 11:25-11:55; 11:57-12:27	0.00087	0.00014	0.00073	07/08/2015 11:00-11:30; 11:33-12:03	EN 14385
Hg and its compounds	0.05 mg/m ³		0.0041	0.0005	0.0036		0.0063	0.0008	0.05		EN 13211
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	0.5 mg/m ³		0.033	0.005	0.028		0.035	0.005	0.030		EN 14385
Dioxins & Furans (I-TEQ)	0.1 ng/m ³	Mean over period minimum 6 hours, maximum 8 hours	0.16	0.034	0.126	05/08/2015 09:56-12:56; 12:58-15:58	0.12	0.025	0.095	30/06/2015 09:30-12:30; 12:35-15:35	EN 1948 1-3
PCBs (WHO-TEQ Humans / Mammals)	None set ng/m ³		0.015	0.003	0.012		0.0064	0.001326	0.005074		EN 1948 1-3
PCBs (WHO-TEQ Fish)	None set ng/m ³		0.00073	0.00015	0.00058		0.00031	0.000064	0.000246		EN 1948 1-3
PCBs (WHO-TEQ Birds)	None set ng/m ³		0.027	0.006	0.021		0.012	0.0026	0.0094		EN 1948 1-3
Dioxins/Furans (WHO-TEQ Humans/Mam)	None set ng/m ³		0.16	0.032	0.128		0.11	0.023	0.087		EN 1948 1-3
Dioxins/Furans (WHO-TEQ Fish)	None set ng/m ³		0.18	0.037	0.0143		0.13	0.026	0.104		EN 1948 1-3
Dioxins/Furans (WHO-TEQ Birds)	None set ng/m ³		0.27	0.056	0.0214		0.22	0.046	0.174		EN 1948 1-3

Anthanthrene	None set µg/m ³	Mean over period minimum 6 hours, maximum 8 hours	0.090	0.019	0.071	07/07/2015 08:43-11:43; 11:45-14:45	0.11	0.02	0.09	01/07/2015 08:40-10:28; 11:00-11:12; 12:14-15:14	ISO 11338
Benzo(a)anthracene	None set µg/m ³		0.026	0.005	0.021		<0.014	0.003	<0.011		
Benzo(a)pyrene	None set µg/m ³		<0.013	0.003	<0.010		<0.014	0.003	<0.011		
Benzo(b)fluoranthene	None set µg/m ³		0.039	0.008	0.031		<0.014	0.003	<0.011		
Benzo(b)naphtho(2,1-d)thiophene	None set µg/m ³		<0.013	0.003	0.010		<0.014	0.003	<0.011		
Benzo(c)phenanthrene	None set µg/m ³		<0.013	0.003	0.010		<0.014	0.003	<0.011		
Benzo(ghi)perylene	None set µg/m ³		0.039	0.008	0.031		<0.014	0.003	<0.011		
Benzo(k)fluoranthene	None set µg/m ³		<0.013	0.003	0.010		0.055	0.011	0.044		
Cholanthrene	None set µg/m ³		0.12	0.02	0.010		0.082	0.017	0.065		
Chrysene	None set µg/m ³		0.051	0.011	0.040		<0.014	0.003	<0.011		
Cyclopenta(cd)pyrene	None set µg/m ³		<0.013	0.003	0.010		<0.014	0.003	<0.011		
Dibenzo(ai)pyrene	None set µg/m ³		0.026	0.005	0.021		<0.014	0.003	<0.011		
Dibenzo(ah)anthracene	None set µg/m ³		0.013	0.003	0.010		<0.014	0.003	<0.011		
Fluoranthene	None set µg/m ³		0.12	0.02	0.10		0.068	0.014	0.054		
Indeno(123-cd)pyrene	None set µg/m ³		0.026	0.005	0.021		<0.014	0.003	<0.011		
Naphthalene	None set µg/m ³		1.9	0.40	1.5		2.0	0.42	1.58		

3. Point Source Emissions to Water

3.1. Introduction

Permit Condition 3.5.1(a) and Table S3.2 requires Viridor to ensure sample point W1 is free of oil, grease and visible solids

3.2 Commentary on Data

During the quarter monitoring point W1 has remained free of oil and grease.

Suspended solids were observed on a couple of occasions during the period; however the samples were taken significantly after the preceding discharge. Therefore, the samples consisted of standing water and were not representative of the normal surface water discharge.

3.3 Schedule Notices Issued

No Permit limit exceedances were recorded during the review period for emissions to water.

4. Residue Quality Monitoring Requirements

4.1. Introduction

Permit Condition 3.5.1(c) and Table S3.5 require Viridor to undertake residue quality monitoring at minimum monthly intervals for both bottom ash and air pollution control residues.

4.2 Commentary on Data

Incinerator Bottom Ash

Figures shown in Table 4 detail the monthly analysis undertaken in line with the criteria laid out in the ESA protocol.

Air Pollution Control Residues

Figures shown in Table 4 detail the monthly analysis undertaken for each line during the quarter.

Table 4: Residue Quality

Residue quality													
Parameter	Limit	Normal Operation											
		Bottom ash						APC Residues					
		Line 1			Line 2			Line 1			Line 2		
		Jul	Aug	Sept	Jul	Aug	Sept						
Total Organic Carbon	3%	0.53	0.51	0.76	1.10	0.68	0.68						
		Composite											
		July		Aug		Sept		July		Aug		Sept	
Antimony (mg/kg)	---	122		114		128		523		625		876	
Cadmium (mg/kg)	---	10.7		46.3		10.6		168		226		270	
Thallium (mg/kg)	---	0.03		0.09		0.07		0.7		0.9		1.1	
Mercury (mg/kg)	---	<0.5		<0.43		<1		4.5		3.3		3.1	
Lead (mg/kg)	---	627		758		719		1689		1988		2410	
Chromium (mg/kg)	---	127		101		93.8		16.2		20.6		29.3	
Copper (mg/kg)	---	2475		2377		2654		414		472		560	
Manganese (mg/kg)	---	1066		697		1022		394		377		365	
Nickel (mg/kg)	---	77.1		63.0		77.9		<10		<10		11.1	
Arsenic (mg/kg)	---	13.3		10.7		16.2		29.9		53.9		32.4	
Cobalt (mg/kg)	---	30.7		32.5		25.1		2.6		3.0		4.2	
Vanadium (mg/kg)	---	22.4		21.5		26.6		<10		<10		<10	

Zinc (mg/kg)	---	2386	2234	3142	6801	9786	11987	8276	7323	9903
Dioxins / Furans I-TEQ (ng/kg)	---	2.73	6.47	1.6	2410	1046	683	738	633	427
PCB (WHO-TEQ) Humans (ng/kg)	---	0.84	7.04	1.66	311	1092	516	75.8	665	333
PCB (WHO-TEQ) Birds (ng/kg)	---	1.26	10.7	27	499	1834	925	113	1092	650
PCB (WHO-TEQ) Fish (ng/kg)	---	0.04	6.89	1.4	14.6	1195	571	3.48	718	375