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

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

**Environmental Monitoring Report
4th Quarter 2016: 1st October – 31st December 2016**

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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

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1. Introduction

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

In accordance with the requirements of Condition 4.2.3, Schedule 4 and table S4.1 of Permit EPR/LP3030XA issued by Natural 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 Natural Resources Wales by the 30th April as agreed in writing with Natural Resources Wales of each year in accordance with Condition 4.2.2 of the Permit.

Viridor took over the operation of the Plant on 31st January 2015; therefore 2016 is the second year of operations at the Facility.

This report summarises the environmental data collected at the site during the fourth quarter calendar period of 2016, between 1st October and 31st December.

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 on a continuous and periodic basis.

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

The measurement frequency for periodic point source emissions to air monitoring data at sample point A1 and A2 is on a bi-annual basis, after 12 months of operation.

2.2 Commentary on Data

The concentrations recorded under normal operation during the review period remained compliant with the limits set out in the Permit.

Line 1 was in operation for 84.2% of the quarter and Line 2 for 78.4%.

2.3 Schedule Notices Issued

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

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

| Releases to Air from Incinerators – Continuous Monitoring – Air 2 | | | | | | | | |
|---|-----------------------|------------------|-----|-----|-----|-----|---------------|---------------|
| Parameter | Limit | Reference Period | A1 | | A2 | | Test Method | Uncertainty** |
| | | | Max | Avg | Max | Avg | | |
| Oxides of nitrogen | 200 mg/m ³ | Daily mean | 186 | 170 | 194 | 184 | BS EN 15267-3 | |
| | 400 mg/m ³ | ½ hourly mean | 307 | | 321 | | | |
| Particulate Matter | 10 mg/m ³ | Daily mean | 1 | 1 | 0 | 0 | | |
| | 30 mg/m ³ | ½ hourly mean | 12 | | 1 | | | |
| Total Organic Carbon (TOC) | 10 mg/m ³ | Daily mean | 1 | 0 | 1 | 0 | | |
| | 20 mg/m ³ | ½ hourly mean | 8 | | 3 | | | |
| Hydrogen chloride | 10 mg/m ³ | Daily mean | 9 | 8 | 9 | 8 | | |
| | 60 mg/m ³ | ½ hourly mean | 21 | | 25 | | | |
| Sulphur dioxide | 50 mg/m ³ | Daily mean | 33 | 12 | 18 | 5 | | |
| | 200 mg/m ³ | ½ hourly mean | 89 | | 53 | | | |
| Carbon monoxide | 50 mg/m ³ | Daily mean | 16 | 6 | 8 | 5 | | |
| | 100 mg/m ³ | ½ hourly mean* | | | | | | |
| Ammonia | No limit set | Daily mean | 2 | 0 | 3 | 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

| Substance / Parameter | Emission Limit Value | Reference Period | A1 Result | Uncertainty | Sample Date / Time | A2 Result | Uncertainty | Sample Date / Time | Test Method |
|---|----------------------------|---|-----------|-------------|---|-----------|-------------|---|-------------|
| Nitrous oxide | None set mg/m ³ | Periodic over 30 minutes. Maximum 8 hours | 18.3 | 1.6 | 25/11/2016 00:00 – 01:00 | 17.3 | 1.7 | 24/11/2016 00:00 – 01:00 | TGN M22 |
| Hydrogen fluoride | 2 mg/m ³ | | 0.040 | 0.003 | 01/09/2016 11:50 – 12:50 | <0.018 | 0.001 | 23/11/2016 09:11 – 10:11 | ISO 15713 |
| Cd and Th and their compounds | 0.05 mg/m ³ | | 0.00094 | 0.00017 | 02/09/2016 08:14 – 08:44; 08:50 – 09:20 | 0.00068 | 0.00012 | 30/08/2016 13:47 – 14:17; 14:20 – 14:50 | EN 14385 |
| Hg and its compounds | 0.05 mg/m ³ | | 0.0030 | 0.0004 | | 0.00052 | 0.00008 | | MID 14385 |
| Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds | 0.5 mg/m ³ | | 0.063 | 0.011 | | 0.42 | 0.07 | | EN 14385 |
| Dioxins & Furans (I-TEQ) | 0.1 ng/m ³ | Mean over period minimum 6 hours, maximum 8 hours | 0.0030 | 0.0007 | 01/09/2016 08:10 – 11:10; 11:15 – 14:15 | 0.024 | 0.005 | 23/11/2016 07:33 – 10:33; 10:37 – 13:37 | EN 1948 1-3 |
| PCBs (WHO-TEQ Humans / Mammals) | None set ng/m ³ | | 0.00034 | 0.00008 | | 0.00068 | 0.00015 | | EN 1948 1-3 |
| PCBs (WHO-TEQ Fish) | None set ng/m ³ | | 0.000016 | 0.000004 | | 0.000038 | 0.000009 | | EN 1948 1-3 |
| PCBs (WHO-TEQ Birds) | None set ng/m ³ | | 0.0012 | 0.0003 | | 0.0032 | 0.00072 | | EN 1948 1-3 |
| Dioxins/Furans (WHO-TEQ Humans/Mammals) | None set ng/m ³ | | 0.0021 | 0.0005 | | 0.023 | 0.005 | | EN 1948 1-3 |
| Dioxins/Furans (WHO-TEQ Fish) | None set ng/m ³ | | 0.0022 | 0.0005 | | 0.023 | 0.005 | | EN 1948 1-3 |
| Dioxins/Furans (WHO-TEQ Birds) | None set ng/m ³ | | 0.0035 | 0.0008 | | 0.032 | 0.007 | | EN 1948 1-3 |

| | | | | | | | | | |
|-------------------------------------|--------------------------------------|--|--------|-------|--|--------|-------|---|-----------|
| Anthanthrene | None set $\mu\text{g}/\text{m}^3$ | Mean over period minimum 6 hours, maximum 8 hours | <0.013 | 0.003 | 31/08/2016 08:37 – 11:37; 11:38 – 14:38 | <0.012 | 0.003 | 31/08/2016 08:03 – 11:03; 11:05 – 14:05 | ISO 11338 |
| Benzo(a)anthracene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Benzo(a)pyrene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Benzo(b)fluoranthene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Benzo(b)naphtho(2,1- d)thiophene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Benzo(c)phenanthrene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Benzo(ghi)perylene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Benzo(k)fluoranthene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Cholanthrene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Chrysene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Cyclopenta(cd)pyrene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Dibenzo(ai)pyrene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Dibenzo(ah)anthracene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Fluoranthene | None set $\mu\text{g}/\text{m}^3$ | | 0.039 | 0.009 | | <0.012 | 0.003 | | |
| Indeno(123-cd)pyrene | None set $\mu\text{g}/\text{m}^3$ | | <0.013 | 0.003 | | <0.012 | 0.003 | | |
| Naphthalene | None set $\mu\text{g}/\text{m}^3$ | | 3.2 | 0.74 | | 2.1 | 0.48 | | |

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.

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 quarterly intervals following the first year of operation. This applies for both bottom ash and air pollution control residues.

4.2 Commentary on Data

Incinerator Bottom Ash

Figures shown in Table 3 detail the quarterly analysis undertaken in line with the criteria laid out in the ESA protocol.

Air Pollution Control Residues

Figures shown in Table 3 detail the analysis undertaken during the quarter.

Table 3: Residue Quality

| Residue quality | | | | | |
|----------------------|-------|------------------|-----------|--------------|-----------|
| Parameter | Limit | Normal Operation | | | |
| | | Bottom ash | | APC Residues | |
| | | Line 1 | Line 2 | Line 1 | Line 2 |
| | | Quarter 4 | Quarter 4 | | |
| Total Organic Carbon | 3% | 1.4 | 1.0 | | |
| | | Composite | | | |
| Quarter | | Quarter 4 | | Quarter 4 | Quarter 4 |
| Antimony (mg/kg) | --- | 132 | | 931 | 916 |
| Cadmium (mg/kg) | --- | 10.7 | | 279 | 281 |
| Thallium (mg/kg) | --- | <0.1 | | 1.0 | 1.0 |
| Mercury (mg/kg) | --- | <0.5 | | 6.91 | 6.15 |
| Lead (mg/kg) | --- | 417 | | 1855 | 1874 |
| Chromium (mg/kg) | --- | 137 | | 31.1 | 30.1 |
| Copper (mg/kg) | --- | 1656.3 | | 536 | 527 |
| Manganese (mg/kg) | --- | 916 | | 317 | 314 |
| Nickel (mg/kg) | --- | 71.4 | | 9.0 | 9.0 |
| Arsenic (mg/kg) | --- | 15.1 | | 51.9 | 52.4 |
| Cobalt (mg/kg) | --- | 28.7 | | 4.0 | 3.9 |
| Vanadium (mg/kg) | --- | 45.7 | | <10 | <10 |

| | | | | |
|---|-----|--------|--------|---------|
| Zinc (mg/kg) | --- | 2657.7 | 13420 | 13560 |
| Dioxins / Furans (WHO 2005 TEQ) (ng/kg) | --- | 2.285 | 278.06 | 246.136 |
| PCB (WHO 2005 TEQ) (ng/kg) | --- | 0.424 | 7.84 | 11.766 |