Annual Performance Report 2022

Permit EPR/BK0825UI

Riverside Resource Recovery Facility

Cory

Year:	2022		
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Distribution

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1	Mark Greenwood, Director Health, Safety, Environment & Quality Assurance	
1	David Crawford, Plant Manager	

This report is required under the Industrial Emissions Directive's Article 55(2) requirements on reporting and public information on waste incineration plants and co-incineration plants, which require the operator to produce an annual report on the functioning and monitoring of the plant and make it available to the public.

Plant Description and Design

The Riverside Resource Recovery Energy from "The Riverside Resource Recovery Energy from Waste facility at Belvedere in the London Borough of Bexley, uses the waste that would otherwise have gone to landfill as feedstock to generate electricity. As one of the largest operations of its kind in the UK, the facility generates c.580,000 MWh of electricity each year from processing up to 850,000 tonnes of waste through its three operating combustion lines. What's more, we use the River Thames as a green highway to move the waste from the city to the facility on our fleet of tugs and barges, removing around 100,000 truck movements a year off our capital's congested roads. By generating electricity from domestic and commercial residual waste, after recycling, we are improving resource efficiency, avoiding London's use on landfill, and achieving greater sustainability as part of London's circular economy.
With the Riverside Resource Recovery facility continuing to be fully operational, the Environment Agency has renewed the facility R1 certification; this means that the facility is classified as a recovery operation. The facility is permitted to process 850,000 tonnes of waste from across London and exports up to 610,000 Mega Watt hours of electricity to the National Grid.

Summary of Operational Processes and Procedures

The Riverside Energy from Waste facility is a 24/7 operation which is operated from a continuously manned control room. The control room operator shall ensure that the site's operations are performed to the facility design and to the strict requirements of the environmental permit.

The river operations are a key aspect of the process for Riverside, with over 85% of the waste being brought to the plant on barges along the River Thames. From the jetty, the waste containers are removed from the barges and are transported using dock tractors into the site tipping hall.

In the tipping hall the waste is tipped into one of 12 tipping bays. Each bay has a hydraulically operated door designed to minimise noise and odour during tipping. Lights on each tipping bay indicate to the drivers of the vehicles which bay is available to receive waste. The tipping bays open into a waste bunker 30m deep, 61m long and 16m wide. It can hold up to circa. 10,000 tonnes of waste, enough to fuel the plant at full capacity for five days.

The plant runs three combustion lines. The waste cranes feed each combustion line ensuring that the boilers have the required feedstock for 24 hour operation. The waste travels down the feed chutes and onto a horizontal feeder table where hydraulically operated ram feeders push the waste onto the moving grate. The grate is made up of alternate rows of fixed and moving cast steel bars that are arranged on a slope. The forward movement of these bars tumbles the waste slowly down the burning waste bed.

Primary heated combustion air is drawn from above the waste bunker and fed into the waste bed through orifices in each grate bar. This process dries the waste and provides the correct amount of air to allow good combustion of the waste. Secondary swirling air is introduced above the grate. This ensures that the gases given off by the burning waste are thoroughly mixed, resulting in a fully optimised combustion process and lower levels of toxicity in the gases leaving the combustion chamber. Ammonia is injected into the flue gas to reduce the level of Oxides of Nitrogen.

The resulting sub-product, from processing the waste, is known as Incinerator Bottom Ash (IBA) and this falls from the end of the grate into a quench bath. The IBA is collected in an ash bunker and loaded into containers by cranes and hoppers. Any oversized metal is removed and recycled and the remainder is transported on the river (circa 200,000 tonnes per annum) to our partner plant at Tilbury Docks for processing and recycling into aggregate that is primarily used within the construction industry.

The energy from the flue gases is utilised to convert water into steam via the steam drum. The steam is then further super-heated and drives the turbine/generator, producing electricity which is used to power the facility and exported to the National Grid.

Flue gases leave the boiler and pass through a reactor tower where hydrated lime, powdered activated carbon and water are injected into the swirling gas flow. These neutralise acids and capture heavy metals.

Gases from the reactor tower are then drawn into the fabric filter baghouse. The clean gases pass through the

Summary of Plant Operations and Maintenance during the reporting year

Planned Plant Shutdowns:

During 2022, each of the three boilers have undergone major inspections together with a common plant outage which was undertaken in July of 2022. The major inspection scope of works included Grate Maintenance and rectification of defects, refractory refurbishment, Boiler cleaning and Fabric filter maintenance. The driver for the common outage is to perform the required inspections under the Pressure Systems Safety Regulations 2000 (PSSR) all items registered on the written scheme were inspected, tested, and witnessed by our competent body. 2022 improvements as follows:

The Boiler improvement project continued, now being in the 2nd year of the 3-year project to replace refractory tiles with Alloy 625 weld overlay. The modification provides benefits in condition monitoring as well as reducing the temperature of the flue gas around the superheater stages, thus reducing corrosion in the long term. Two thirds of each lines furnace have now been completed. Line 2 Fabric bags were fully changed out as part of the maintenance strategy for the Bag House. The 10-year LV board maintenance and testing was completed with no issues found. Stack gas flow monitors have been replaced, and the automation of the QAL3 calibrations has also been implemented on the CEMS equipment.

Summary of Residue Handling for the reporting year

100% of the Incinerator Bottom Ash and Recovered Metals were transported via the River Thames to Blue Phoenix Ltd at their premises at Tilbury Docks.
The Air Pollution Control residue (APCr) was sent to three main destinations throughout 2022:

1) OCO Ltd at Brandon, Suffolk where it was treated by Accelerated Carbonation Technology (ACT) to produce a stabilised product that is used as a component of breeze blocks.
2) Veolia Minosis in Cheshire where the APCr is stored in an underground storage facility within the Winsford salt mine. The unique geology in this area of Cheshire creates an impermeable cavity which is ideal for the storage of APCr.
3) Augean's in East Northants Resource Management Facility (ENRMF) is based at Kings Cliffe near Peterborough which operates and is monitored under strict EPR permits to ensure full compliance with all current legislation.

Operational Data

Plant Size		850,000	tonnes pa	270	MWth	85	MWe
No. of combustion lines	3		No. of Turbines:		1		

Waste types received	Unit	Q1	Q2	Q3	Q4	**Year Total**	%
Household / Local Authority	tonnes	100,058	103,026	103,154	103,947	**410,185**	51.1%
Commercial & Industrial		109,194	88,959	99,221	95,228	**392,602**	48.9%
Hazardous						**-**	-
Clinical						**-**	-
Waste wood (biomass)						**-**	-
Refuse Derived Fuel * - H'hold/LA						**-**	-
Refuse Derived Fuel * - C&I						**-**	-
River Storage annual start/end		485			237	**248**	0.0%
Other [Please specify]							
Other [Please specify]							
Total waste received		**209,736**	**191,985**	**202,375**	**199,413**	**802,787**	100.0%
Rejected Waste						**-**	-
Unprocessed waste transferred out			9,967	6,763	791	**17,520**	2.2%
Storage bunker annual start/end bal		10,780			7,000	**- 3,780**	
Total waste combusted		**209,736**	**182,018**	**195,613**	**198,622**	**789,295**	98.3%

Energy Useage / Export	Unit	Q1	Q2	Q3	Q4	**Year Total**	KWh/te
Power Generated	MWh	170,746	141,623	153,397	163,612	**629,377**	797
Power Exported		154,097	126,445	137,429	146,970	**564,941**	716
Power Used on site		16,649	15,178	15,968	16,642	**64,436**	82
Power Imported			29	203	67	**299**	0
Parasitic Load	%	9.8%	10.7%	10.5%	10.2%	10.3%	
Thermal Energy Produced **	MWh					**-**	-
Thermal Energy Exported **						**-**	-
R1 value (if applicable)							0.77

Waste Disposal & Recovery	Unit	Q1	Q2	Q3	Q4	**Year Total**	% inputs
APC Residues - produced	tonnes	4,529	4,135	4,346	4,592	**17,602**	2.2%
IBA - produced		43,394	39,593	41,674	44,399	**169,061**	21.4%
Metals recycling		167	146	158	192	**663**	0.1%
Other		-	-	-	-	**-**	-
Other		-	-	-	-	**-**	-
Other		-	-	-	-	**-**	-

Raw Material Usage	Unit	Q1	Q2	Q3	Q4	**Year Total**	kg or Ltr /te
Mains Water	ltrs	20,360,000	45,040,000	37,800,000	33,860,000	**137,060,000**	173.65
Other Water	ltrs					**-**	-
Ammonia	ltrs	98,236	68,892	104,671	125,379	**397,178**	0.50
Urea	kgs					**-**	-
Activated Carbon	kgs	104,860	104,460	102,740	113,820	**425,880**	0.54
Hydrated lime	kgs	2,034,840	1,765,360	1,837,340	1,797,640	**7,435,180**	9.42
Fuel oil	ltrs	215,311	413,488	332,444	291,705	**1,252,948**	1.59
Gas	cf	-	-	-	-	**-**	
Other		-	-	-	-	**-**	

Summary	Line/Unit	Q1	Q2	Q3	Q4	**Year Total**	
Availability of waste combustion by line, hrs	1	1,986	2,057	1,701	1,840	**7,584**	87.0%
	2	2,152	1,728	2,006	2,201	**8,087**	92.0%
	3	2,119	1,635	2,093	2,096	**7,943**	91.0%
Overall Availability, mean avg. of all lines, hrs		2,086	1,808	1,937	2,057	**7,871**	**90.0%**
Hours of turbine operations, hrs	1	2,160	2,181	2,093	2,196	**8,630**	98.5%
Hours of heat / steam export		-	-	-	-	**-**	n/a
Net Calorific Value of waste	MJ/kg	9.57	9.45	9.66	9.45	**9.53**	-
Abnormal Events	qty.	-	-	-	-	**-**	no
Abnormal operation	hours	-	-	-	-	**-**	0.00%

Permit Breaches	qty.	-	-	-	-	-	no

2022 Annual Reporting Performance Form 1

Permit EPR/BK0825UI
Operator: Cory
Facility: Riverside Resource Recovery Facility
Form: Performance 1

Reporting Period from: 01 January 2022 to: 31 December 2022

2022 Annual Reporting of Waste Disposal and Recovery

Waste Description	Disposal Route(s)	Disposal Tonnes	Recovery Tonnes	% / tonne of waste incinerated
1) Hazardous Wastes				
APC Residues	R05, D05	7,479.1	10,139.5	2.2%
IBA				-
				-
				-
Total Hazardous Waste		7,479.1	10,139.5	2.2%
2) Non-Hazardous Wastes				
IBA	R04		169,612.7	21.5%
Ferrous Metal				-
Process Water				-
				-
				-
Total Non-Hazardous Waste		0.0	169,612.7	21.5%
TOTAL WASTE		**7,479.1**	**179,752.2**	23.7%

Operator's comments :

2022 Annual Reporting of Water and Other Raw Material Usage

Raw Material	Usage	Unit	Specific Useage	Unit
Mains Water	137060	m^3	0.17	m^3/te
Total Water	137060	m^3	0.17	m^3/te
Urea / Ammonia	397180	kg	0.50	kg/te
Activated Carbon	425880	kg	0.54	kg/te
Lime / hydrated lime / Sodium Bicarb.	7435180	kg	9.42	kg/te

Operator's comments :

2022 Annual Reporting of other performance indicators

Parameter	Results by Line							
	A1	A2	A3	A4	A5		Turbine 1	Turbine 2
Operating hours for the year, hours	7624	8088.5	7949.5					
Number of periods of abnormal operation, qty.	0	0	0					
Cumulative hours of abnormal operation for this year, hours	0	0	0					

Operator's comments :

Signed: _____ Date: _____

2022 Annual Reporting of Energy Usage/Export

Permit EPR/BK0825UI Operator: Cory

Facility: Riverside Resource Recovery Facility Form: Energy 1

Reporting Period from: 01 January 2022 to: 31 December 2022

Energy Source	Energy Usage	Unit	Specific Useage (KWh/tonne incinerated
Electricity Produced	629,443	MWh	797
Electricity Imported	298.78	MWh	0
Electricity Exported	564,941	MWh	716
Gas Oil	1087.5	tonnes	
Steam/hot water exported	0	GWh	-

Operator's comments :

Signed: _____ Date: _____

Summary of Permit Compliance

Compliance with permit limits for continuously monitored pollutants

The plant met its emission limits as shown in the table below:

Substance	Percentage time compliant during operation	
	Half-hourly limit	Daily limit
Particulates	100%	100%
Oxides of nitrogen	100%	100%
Sulphur dioxide	100%	100%
Carbon monoxide	100% 95% of 10-min averages	100%
Total organic carbon	100%	100%
Hydrogen chloride	100%	100%

Summary of any notifications or non-compliances under the permit

Date	Summary of notification or non-compliance [including Line/Reference]	Reason	Measures taken to prevent reoccurrence

Summary of any complaints received and actions to taken to resolve them.

Date	Summary of complaint [including Line/Reference]	Reason *	Measures taken to prevent reoccurrence

*** including whether substantiated by the operator or the EA**

Summary of Plant Improvements

Summary of any efficiency improvements that have been completed within the year.

Summary of any permit improvement conditions that have been completed within the year and the resulting environmental benefits.

Summary of any changes to the plant or operating techniques which required a variation to the permit and a summary of the resulting environmental impact.

Summary of any other improvements made to the plant or planned to be made and a summary of the resulting environmental benefits.

Details of Public & Stakeholder Liasion

Summary of events held during the reporting year.	
Date	**Description**
10th February	Reading University Environmental Management Students - Presentation & Site Tour
25th - 29th October	School/Collge Work Experience event.

List of events planned for next year	
Date	**Description**
1st March	Reading University Environmental Management Students - Presentation & Site Tour

If you wish to be involved in the public liasion programme, please contact _____

Carbon dioxide emissions and biogenic content of waste inputs

Carbon dioxide emissions (all types of plant)		
Annual mass of carbon dioxide released	x tonnes	829221
Annual mass of carbon dioxide released per tonne of waste burned	x tonnes	1.05
Annual mass of carbon dioxide released per MWh of energy exported	x tonnes	1.47
Description of how annual carbon dioxide mass emission has been calculated	*Where available, data from CO2 CEMS should be used; otherwise, a suitable emissions factor should be used based on the tonnage of waste burned e.g.0.992 tCO2/t waste as per Tolvik report 2021, or other justified emissions factor - refer to adjacent Environment Agency guidance note or updated version for example descriptive text.*	

Nitrous oxide emissions (only plants which use ammonia or urea to abate NOx emissions)		
Total annual mass emissions of nitrous oxide	x tonnes	0.65
Description of how annual nitrous oxide mass emission has been calculated	*Where available, data from N2O CEMS or periodic monitoring data should be used; otherwise, a suitable emissions factor should be used based on the tonnage of waste burned e.g. 0.0981 kgN20/t waste as per 2021 Pollution Inventory data for plants with urea-based SNCR - refer to adjacent Environment Agency guidance note or updated version for example descriptive text.*	
Total annual carbon dioxide and nitrous oxide emissions as carbon dioxide equivalent (whereby 1 kg nitrous oxide is equivalent to 298 t carbon dioxide)	x tonnes CO2e	

Biogenic fraction of the waste and biogenic CO2 emissions (only plants burning residual municipal waste, refuse derived fuel or solid recovered fuel)		
Yearly average biogenic percentage of the waste by mass	48.46%	
Description of how biogenic percentage has been calculated	*Where available, data from waste sampling should be used; otherwise, an estimated figure with justification can be used, or a figure assumed on the basis of a national average e.g. 2017 WRAP data for residual waste of 51.8% biogenic energy content - refer to adjacent Environment Agency guidance note or updated version for example descriptive text.*	
Percentage of total carbon dioxide emissions arising from biogenic waste	x %	
Description of how percentage biogenic carbon dioxide emissions have been calculated	*Examples include direct measurement via C14 method, BIOMA software or other method based on measured or assumed waste biogenic content - refer to adjacent Environment Agency guidance note or updated version for example descriptive text.*	

Comments:

Residue Quality Monitoring Requirements

Summary of monitoring undertaken and compliance
In 2022, the Incinerator Bottom of Ash, of each line, was tested monthly for Total Organic Carbon (TOC) & Quarterly for Heavy Metals suite, Dioxins/Furans and Dioxin-like PCBs in line with the site permit requirements.
In 2022, The Air Pollution Control residue (APCr) was tested for Heavy Metals suite, Dioxins/Furans and Dioxin-like PCBs in line with the site permit requirements.
In 2022, the facility continued to adopt the the ESA Sampling & Testing Protocol to Assess the Status of Incinerator Bottom Ash, for the hazard assessment of IBA. The IBA remained classified as non-hazardous throughout 2022.

Commentary on any specific events

Date & Event	Description

Residue Quality Monitoring Results

Parameter (unit)	Limit	Normal Operation	
		Bottom ash	APC Residues
Total Organic Carbon (average %)	<3%	1.01	
No. of Assessments Undertaken	---	36	12
No. of Hazardous Results	---	0	

Comments :

Emissions to Water

Summary of monitoring undertaken and compliance
Monthly visual assessment for visible oil or grease at three emission points for uncontaminated roof and surface water. No visible signs of oil or grease seen throughout 2022.

Commentary on any specific events	
Date & Event	**Description**

Emissions to Water / Sewer

Parameter	Monitoring Frequency	Limit	Target	Max.	Average

Emissions to Air (periodically monitored)

Summary of monitoring undertaken, standards used and compliance

Results of emissions to air that are periodically monitored					
Substance	**Ref. Period**	**Emission Limit Value**	**Average**		
			A1	**A2**	**A3**
Hydrogen fluoride	1 hr	2 mg/m^3	0.024	0.021	0.022
Cd and Th and their compounds	6-8hrs	0.05 mg/m^3	0.0009	0.001	0.0009
Hg and its compounds	6-8hrs	0.05 mg/m^3	0.0004	0.0008	0.0006
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	6-8hrs	0.5 mg/m^3	0.017	0.013	0.012
Dioxins & Furans (I-TEQ)	6-8hrs	0.1 ng/m^3	0.016	0.003	0.002
PCBs (WHO-TEQ Humans / Mammals)	6-8hrs	None set ng/m^3	0.001	0.0001	0.0002
PCBs (WHO-TEQ Fish)	6-8hrs	None set ng/m^3	0.00007	0.000008	0.00001
PCBs (WHO-TEQ Birds)	6-8hrs	None set ng/m^3	0.002	0.0003	0.0005
Dioxins & Furans (WHO-TEQ Humans / Mammals)	6-8hrs	None set ng/m^3	0.016	0.003	0.002
Dioxins & Furans (WHO-TEQ Fish)	6-8hrs	None set ng/m^3	0.016	0.002	0.002
Dioxins & Furans (WHO-TEQ Birds)	6-8hrs	None set ng/m^3	0.021	0.003	0.003
Anthanthrene	6-8hrs	None set µg/m^3	0.0013	0.011	0.0012
Benzo(a)anthracene	6-8hrs	None set µg/m^3	0.0013	0.036	0.0012
Benzo(a)pyrene	6-8hrs	None set µg/m^3	0.0013	0.031	0.0012
Benzo(b)fluoranthene	6-8hrs	None set µg/m^3	0.0013	0.016	0.0012
Benzo(b)naptho(2,1-d) thiophene	6-8hrs	None set µg/m^3	0.0013	0.0013	0.0056
Benzo(c)phenanthrene	6-8hrs	None set µg/m^3	0.0013	0.011	0.0012
Benzo(ghi)perylene	6-8hrs	None set µg/m^3	0.0013	0.071	0.0012
Benzo(k)fluoranthene	6-8hrs	None set µg/m^3	0.0013	0.036	0.0012
Cholanthrene	6-8hrs	None set µg/m^3	0.0013	0.0013	0.0012
Chrysene	6-8hrs	None set µg/m^3	0.0013	0.046	0.0012
Cyclopenta(cd)pyrene	6-8hrs	None set µg/m^3	0.0013	0.121	0.0012
Dibenzo(ai)pyrene	6-8hrs	None set µg/m^3	0.0013	0.006	0.0012
Dibenzo(ah)anthracene	6-8hrs	None set µg/m^3	0.0013	0.007	0.0056
Fluoranthene	6-8hrs	None set µg/m^3	0.02	0.54	0.015
Indeno(123-cd) pyrene	6-8hrs	None set µg/m^3	0.0013	0.051	0.0012
Naphthalene	6-8hrs	None set µg/m^3	0.135	12.05	0.06
Comments :					

Emissions to Air (continously monitored)

Summary of monitoring undertaken, standards used and compliance

All substances listed below are continuously monitored in line with the requirements of the Environmental permit. Oxides of Nitrogen (ISO 10849), Particulate Matter (BS EN 13284-2), Total Organic Carbon (BS EN 12619), Hydrogen Chloride, Sulphur Dioxide (BS 6069-4.4)

Results of emissions to air that are continuously monitored (maximum and average values for each line)

Substance	Reference Period	Emission Limit Value	A1		A2		A3	
			Max.	Avg.	Max.	Avg.	Max.	Avg.
Oxides of nitrogen	Daily mean	200 mg/m^3	169.8	168.8	168.5	160.9	165.5	155
	½ hourly mean	400 mg/m^3	169.8	168.9	168.4	160.9	165.5	154.9
Particulates	Daily mean	10 mg/m^3						
	½ hourly mean	30 mg/m^3						
Total Organic Carbon	Daily mean	10 mg/m^3	0.2	0.16	0.9	0.76	0.3	0.27
	½ hourly mean	20 mg/m^3	0.2	0.2	0.9	0.77	0.4	0.3
Hydrogen chloride	Daily mean	10 mg/m^3	1.7	1.43	2.2	1.19	2.3	1.36
	½ hourly mean	60 mg/m^3	1.7	1.48	2.2	1.22	2.3	1.39
Sulphur dioxide	Daily mean	50 mg/m^3	2.7	1.79	10.1	7.95	10	8.98
	½ hourly mean	200 mg/m^3	2.8	1.83	10.1	7.97	10.1	8.99
Carbon monoxide	Daily mean	50 mg/m^3	12.3	9.63	13.2	10.83	14.9	11.68
	95%ile 10-min avg *	150 mg/m^3 *	12.2	9.72	13.1	10.89	14.9	11.8
Ammonia	Daily mean	No limit set	0.5	0.43	0.4	0.3	0.5	0.45

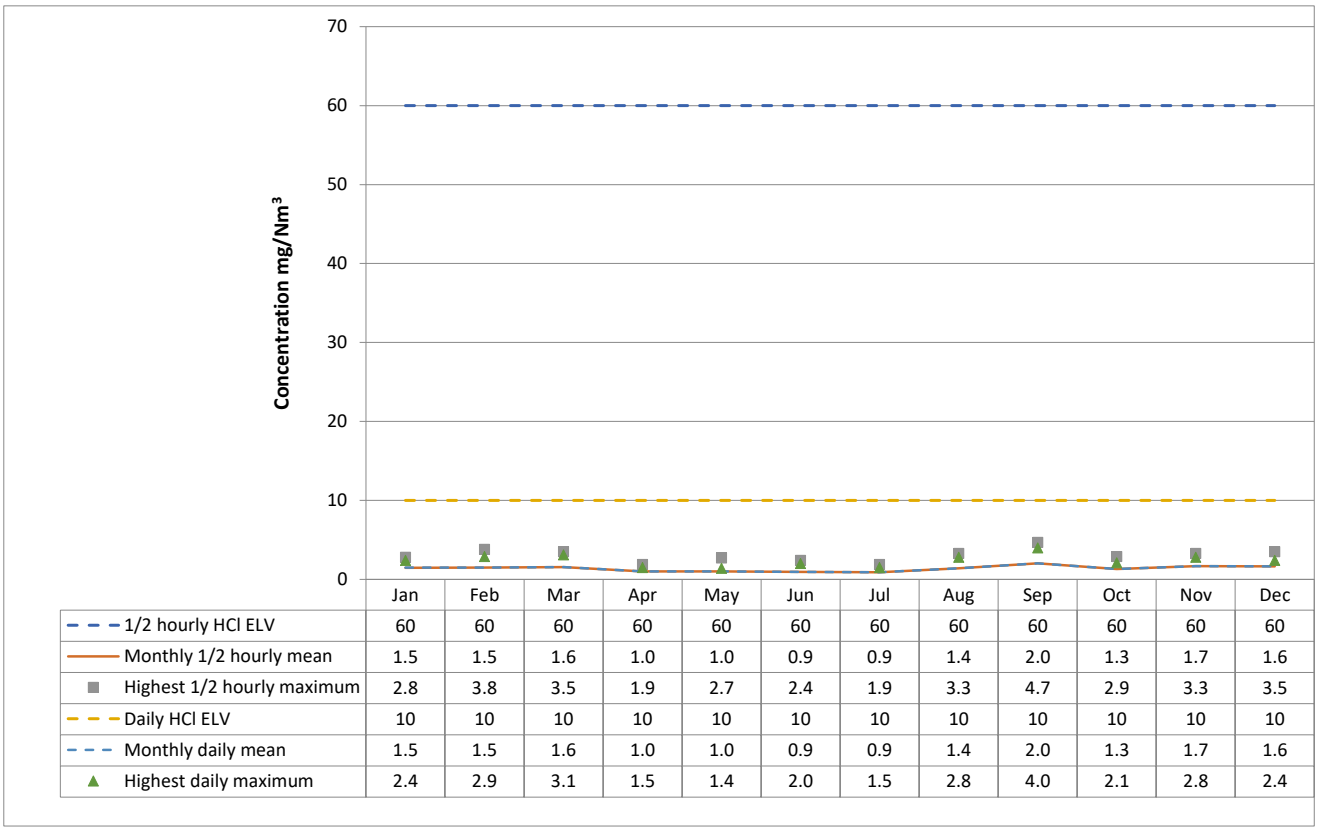
* = delete or amend as appropriate

Comments :

Following EA guidance and approval in July 2015, RRRL now monitor particulate emissions qualitatively as opposed to quantitatively. The particulate data is now reported in mA (milliamps) and the reporting range of the instrument is 4mA to

Monitoring of Hydrogen Chloride emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2022	**1/2 hourly HCl ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily HCl ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	60	1.5	2.8	10	1.5	2.4
Feb	60	1.5	3.8	10	1.5	2.9
Mar	60	1.6	3.5	10	1.6	3.1
Apr	60	1.0	1.9	10	1.0	1.5
May	60	1.0	2.7	10	1.0	1.4
Jun	60	0.9	2.4	10	0.9	2.0
Jul	60	0.9	1.9	10	0.9	1.5
Aug	60	1.4	3.3	10	1.4	2.8
Sep	60	2.0	4.7	10	2.0	4.0
Oct	60	1.3	2.9	10	1.3	2.1
Nov	60	1.7	3.3	10	1.7	2.8
Dec	60	1.6	3.5	10	1.6	2.4

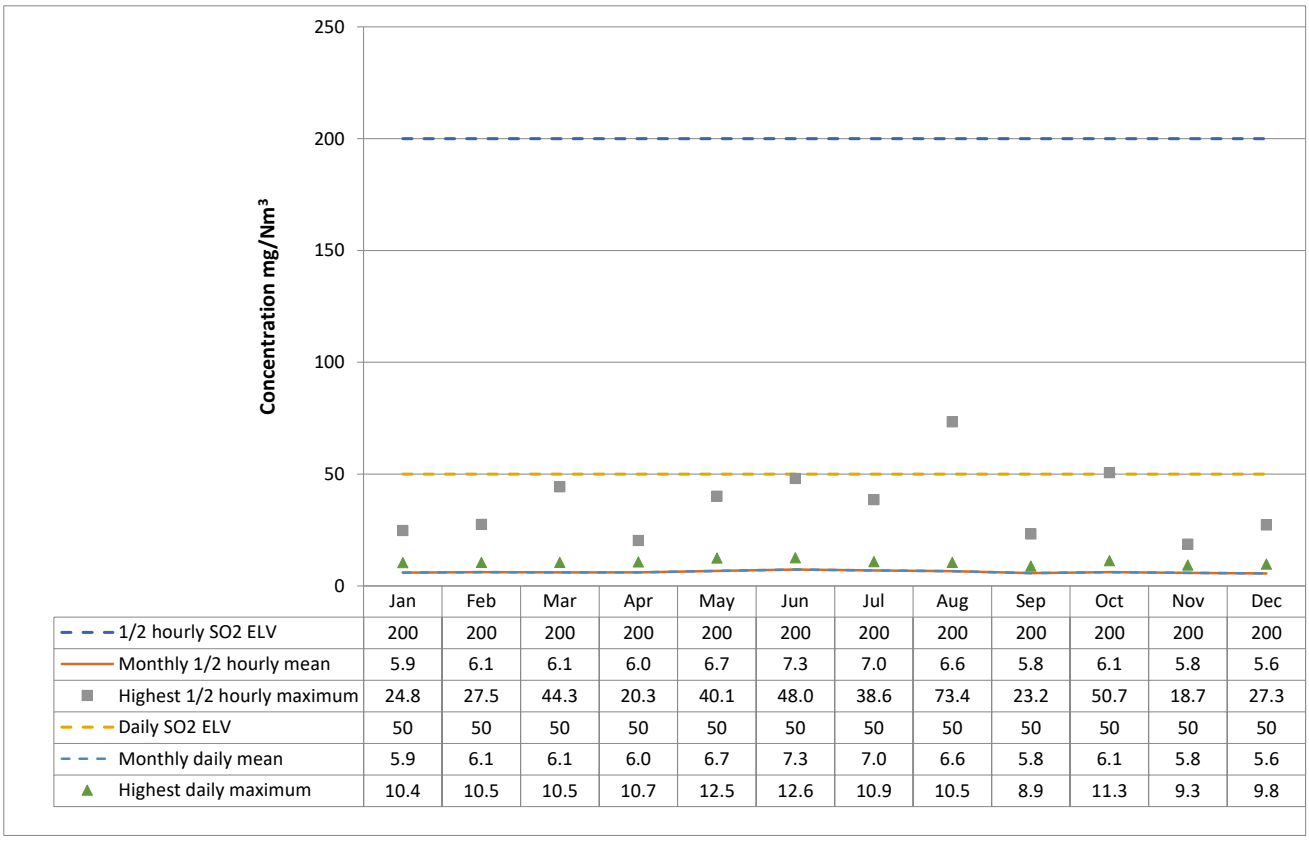


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly HCl ELV	60	60	60	60	60	60	60	60	60	60	60	60
Monthly 1/2 hourly mean	1.5	1.5	1.6	1.0	1.0	0.9	0.9	1.4	2.0	1.3	1.7	1.6
Highest 1/2 hourly maximum	2.8	3.8	3.5	1.9	2.7	2.4	1.9	3.3	4.7	2.9	3.3	3.5
Daily HCl ELV	10	10	10	10	10	10	10	10	10	10	10	10
Monthly daily mean	1.5	1.5	1.6	1.0	1.0	0.9	0.9	1.4	2.0	1.3	1.7	1.6
Highest daily maximum	2.4	2.9	3.1	1.5	1.4	2.0	1.5	2.8	4.0	2.1	2.8	2.4

Comments :

Monitoring of Sulphur dioxide emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2022	**1/2 hourly SO2 ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily SO2 ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	200	5.9	24.8	50	5.9	10.4
Feb	200	6.1	27.5	50	6.1	10.5
Mar	200	6.1	44.3	50	6.1	10.5
Apr	200	6.0	20.3	50	6.0	10.7
May	200	6.7	40.1	50	6.7	12.5
Jun	200	7.3	48.0	50	7.3	12.6
Jul	200	7.0	38.6	50	7.0	10.9
Aug	200	6.6	73.4	50	6.6	10.5
Sep	200	5.8	23.2	50	5.8	8.9
Oct	200	6.1	50.7	50	6.1	11.3
Nov	200	5.8	18.7	50	5.8	9.3
Dec	200	5.6	27.3	50	5.6	9.8

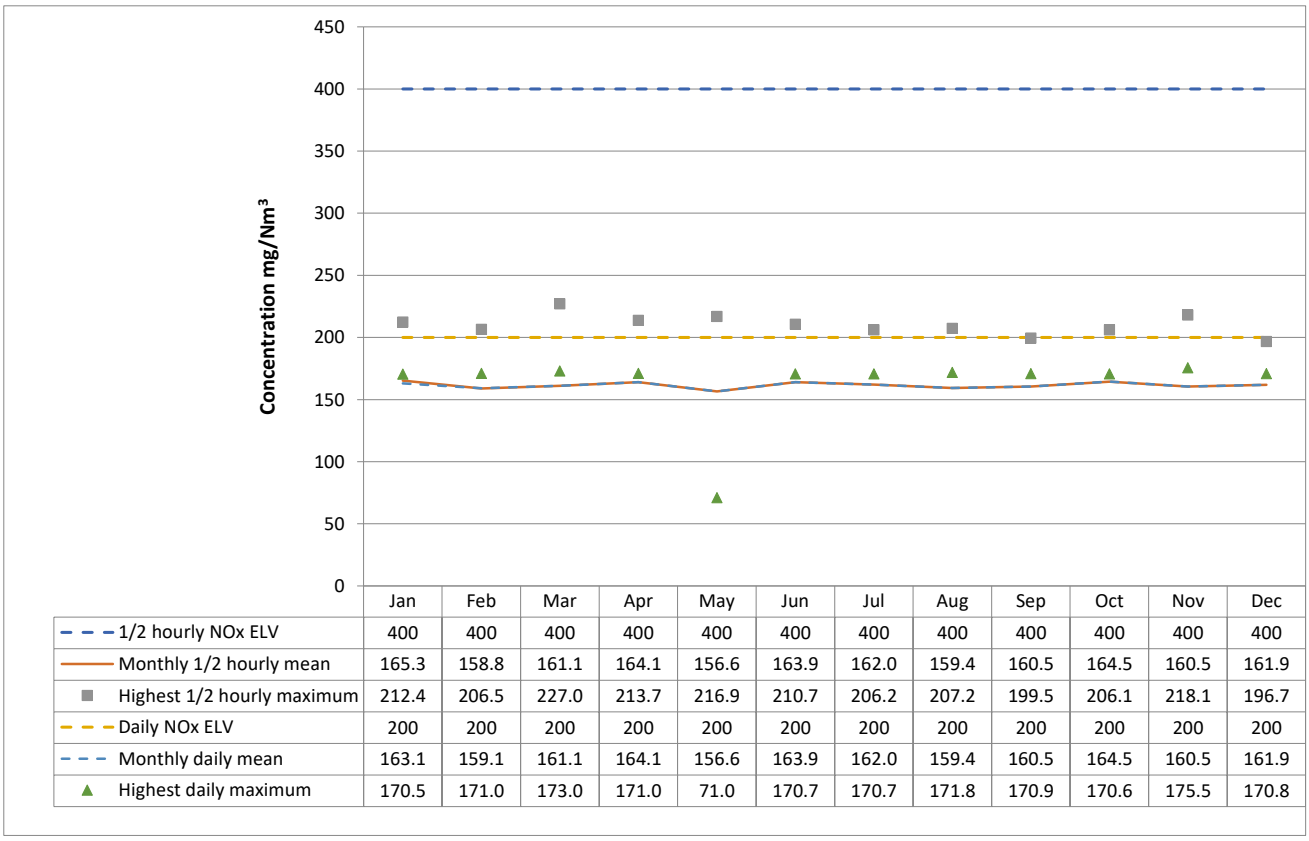


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly SO2 ELV	200	200	200	200	200	200	200	200	200	200	200	200
Monthly 1/2 hourly mean	5.9	6.1	6.1	6.0	6.7	7.3	7.0	6.6	5.8	6.1	5.8	5.6
Highest 1/2 hourly maximum	24.8	27.5	44.3	20.3	40.1	48.0	38.6	73.4	23.2	50.7	18.7	27.3
Daily SO2 ELV	50	50	50	50	50	50	50	50	50	50	50	50
Monthly daily mean	5.9	6.1	6.1	6.0	6.7	7.3	7.0	6.6	5.8	6.1	5.8	5.6
Highest daily maximum	10.4	10.5	10.5	10.7	12.5	12.6	10.9	10.5	8.9	11.3	9.3	9.8

Comments :

Monitoring of Oxides of Nitrogen emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2022	**1/2 hourly NOx ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily NOx ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	400	165.3	212.4	200	163.1	170.5
Feb	400	158.8	206.5	200	159.1	171.0
Mar	400	161.1	227.0	200	161.1	173.0
Apr	400	164.1	213.7	200	164.1	171.0
May	400	156.6	216.9	200	156.6	71.0
Jun	400	163.9	210.7	200	163.9	170.7
Jul	400	162.0	206.2	200	162.0	170.7
Aug	400	159.4	207.2	200	159.4	171.8
Sep	400	160.5	199.5	200	160.5	170.9
Oct	400	164.5	206.1	200	164.5	170.6
Nov	400	160.5	218.1	200	160.5	175.5
Dec	400	161.9	196.7	200	161.9	170.8

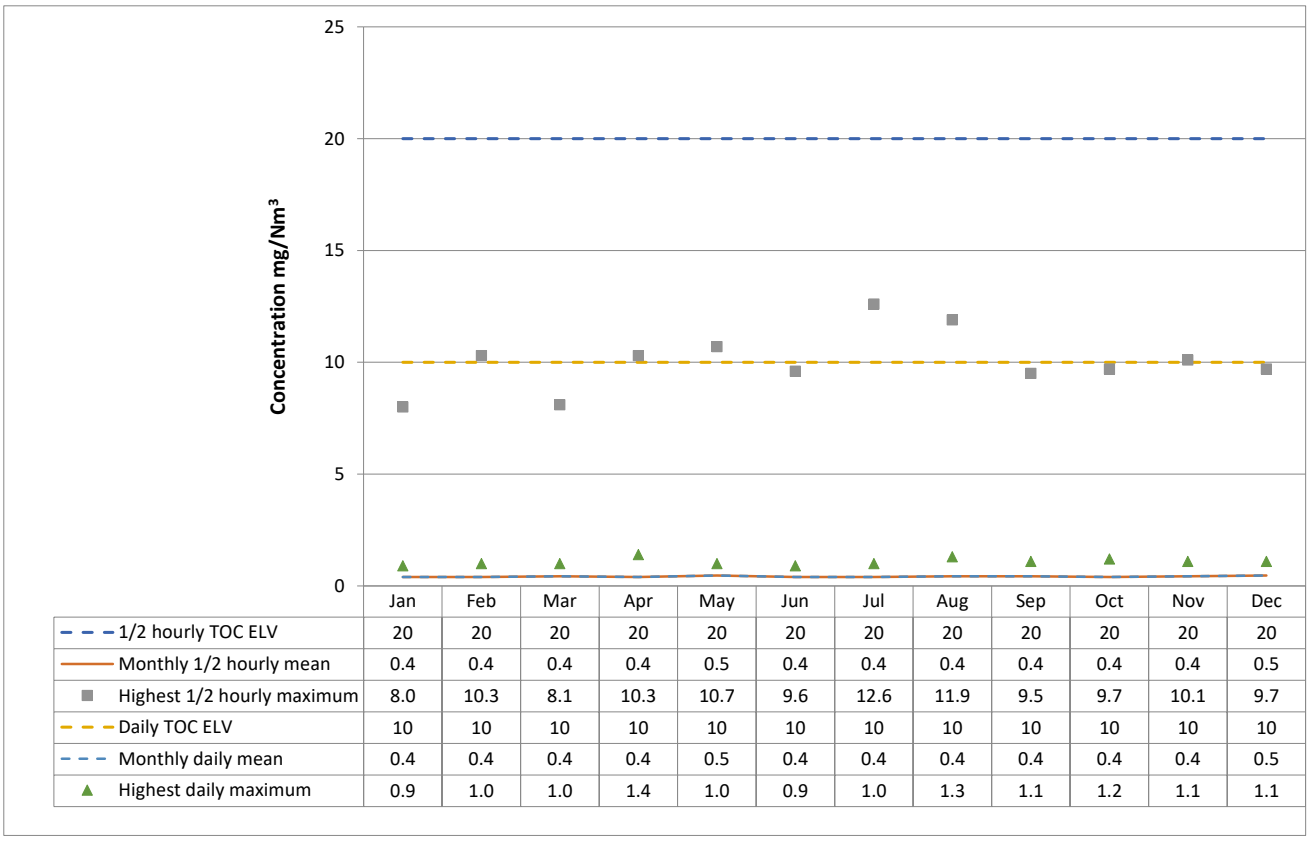


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly NOx ELV	400	400	400	400	400	400	400	400	400	400	400	400
Monthly 1/2 hourly mean	165.3	158.8	161.1	164.1	156.6	163.9	162.0	159.4	160.5	164.5	160.5	161.9
Highest 1/2 hourly maximum	212.4	206.5	227.0	213.7	216.9	210.7	206.2	207.2	199.5	206.1	218.1	196.7
Daily NOx ELV	200	200	200	200	200	200	200	200	200	200	200	200
Monthly daily mean	163.1	159.1	161.1	164.1	156.6	163.9	162.0	159.4	160.5	164.5	160.5	161.9
Highest daily maximum	170.5	171.0	173.0	171.0	71.0	170.7	170.7	171.8	170.9	170.6	175.5	170.8

Comments :

Monitoring of Total organic carbon emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2022	**1/2 hourly TOC ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily TOC ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	20	0.4	8.0	10	0.4	0.9
Feb	20	0.4	10.3	10	0.4	1.0
Mar	20	0.4	8.1	10	0.4	1.0
Apr	20	0.4	10.3	10	0.4	1.4
May	20	0.5	10.7	10	0.5	1.0
Jun	20	0.4	9.6	10	0.4	0.9
Jul	20	0.4	12.6	10	0.4	1.0
Aug	20	0.4	11.9	10	0.4	1.3
Sep	20	0.4	9.5	10	0.4	1.1
Oct	20	0.4	9.7	10	0.4	1.2
Nov	20	0.4	10.1	10	0.4	1.1
Dec	20	0.5	9.7	10	0.5	1.1

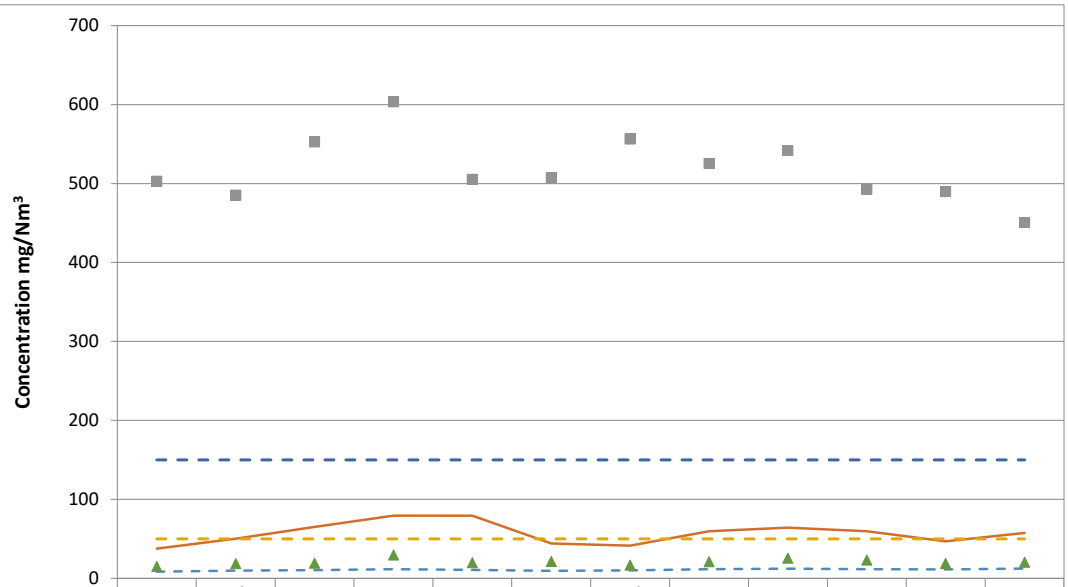


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly TOC ELV	20	20	20	20	20	20	20	20	20	20	20	20
Monthly 1/2 hourly mean	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5
Highest 1/2 hourly maximum	8.0	10.3	8.1	10.3	10.7	9.6	12.6	11.9	9.5	9.7	10.1	9.7
Daily TOC ELV	10	10	10	10	10	10	10	10	10	10	10	10
Monthly daily mean	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5
Highest daily maximum	0.9	1.0	1.0	1.4	1.0	0.9	1.0	1.3	1.1	1.2	1.1	1.1

Comments :

Monitoring of Carbon Monoxide (10-minute avg) **Whole Installation** *See Notes in Cell S3*

mg/Nm^3	10-minute Reference Periods				Daily Reference Periods		
2022	**95%ile 10-min avg CO ELV**	**95%ile 10-min avg maximum**	**Monthly CO 10-min avg mean**	**10-min avg maximum**	**Daily CO ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	150	37.6	8.4	502.9	50	8.4	15.1
Feb	150	50.3	9.7	485.4	50	9.7	18.5
Mar	150	65.1	10.4	552.9	50	10.4	19.1
Apr	150	79.3	11.6	603.6	50	11.6	29.4
May	150	79.4	10.6	505.4	50	10.6	19.8
Jun	150	44.1	9.5	507.1	50	9.5	21.2
Jul	150	41.3	10.2	556.5	50	10.2	16.9
Aug	150	59.6	11.6	525.5	50	11.6	21.1
Sep	150	64.3	12.4	541.7	50	12.4	25.6
Oct	150	59.5	11.7	493.0	50	11.7	23.1
Nov	150	47.0	11.2	489.9	50	11.2	19.0
Dec	150	57.6	12.4	450.5	50	12.4	20.3



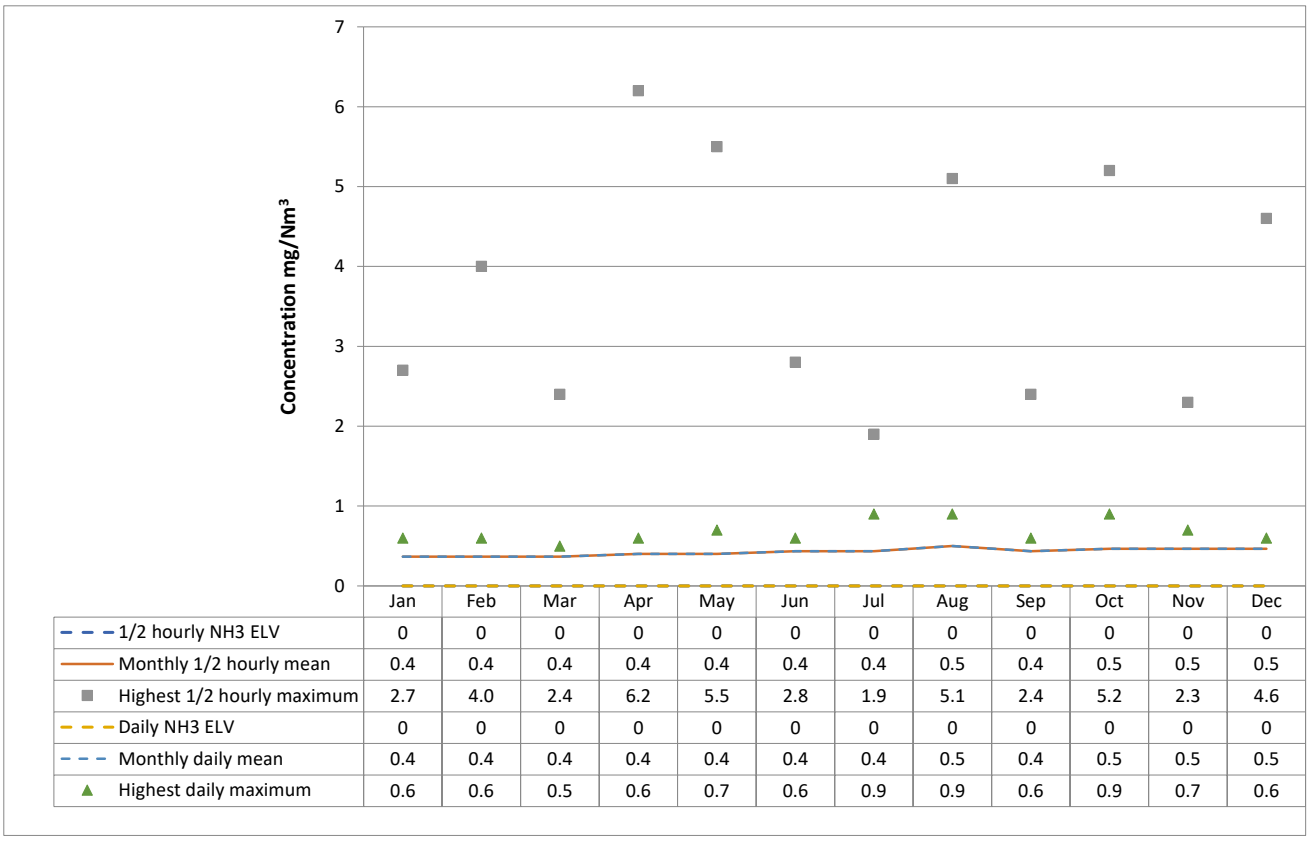
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
95%ile 10-min avg CO ELV	150	150	150	150	150	150	150	150	150	150	150	150
95%ile 10-min avg maximum	37.6	50.3	65.1	79.3	79.4	44.1	41.3	59.6	64.3	59.5	47.0	57.6
10-min avg maximum	502.9	485.4	552.9	603.6	505.4	507.1	556.5	525.5	541.7	493.0	489.9	450.5
Daily CO ELV	50	50	50	50	50	50	50	50	50	50	50	50
Monthly daily mean	8.4	9.7	10.4	11.6	10.6	9.5	10.2	11.6	12.4	11.7	11.2	12.4
Highest daily maximum	15.1	18.5	19.1	29.4	19.8	21.2	16.9	21.1	25.6	23.1	19.0	20.3

Comments :

Environment Agency explanatory note: The 10-minute average ELV is based on the “95th percentile”. In this case this means that 95% of the 10 minute averages in the relevant 24-hour period (i.e. 137) must be below 150 mg/Nm3, and 5% (i.e. 7) are allowed to be any value above 150 mg/Nm3. Whilst we expect operators to minimise CO emissions at all times, it is perfectly acceptable for the value of the maximum 10-minute average to be above 150 mg/Nm3, provided the 95th percentile ELV has been met for that period.

Monitoring of Ammnonia emissions **Whole Installation** *See Notes in Cell Q3*

mg/Nm^3	1/2 Hourly Reference Periods			Daily Reference Periods		
2022	**1/2 hourly NH3 ELV**	**Monthly 1/2 hourly mean**	**Highest 1/2 hourly maximum**	**Daily NH3 ELV**	**Monthly daily mean**	**Highest daily maximum**
Jan	0	0.4	2.7	0	0.4	0.6
Feb	0	0.4	4.0	0	0.4	0.6
Mar	0	0.4	2.4	0	0.4	0.5
Apr	0	0.4	6.2	0	0.4	0.6
May	0	0.4	5.5	0	0.4	0.7
Jun	0	0.4	2.8	0	0.4	0.6
Jul	0	0.4	1.9	0	0.4	0.9
Aug	0	0.5	5.1	0	0.5	0.9
Sep	0	0.4	2.4	0	0.4	0.6
Oct	0	0.5	5.2	0	0.5	0.9
Nov	0	0.5	2.3	0	0.5	0.7
Dec	0	0.5	4.6	0	0.5	0.6



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/2 hourly NH3 ELV	0	0	0	0	0	0	0	0	0	0	0	0
Monthly 1/2 hourly mean	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.5
Highest 1/2 hourly maximum	2.7	4.0	2.4	6.2	5.5	2.8	1.9	5.1	2.4	5.2	2.3	4.6
Daily NH3 ELV	0	0	0	0	0	0	0	0	0	0	0	0
Monthly daily mean	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.5
Highest daily maximum	0.6	0.6	0.5	0.6	0.7	0.6	0.9	0.9	0.6	0.9	0.7	0.6

Comments :

An indicated ELV value of zero in the table above means that no ammonia limit is set in the permit.