

# Annual performance report for: Welland Bio Power Ltd

**Permit Number:** EPR/AP3432QC

**Year:** 2018

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.

## 1. Introduction

<b>Name and address of plant</b>	Nexterra Operations Limited Welland Bio Power Pebble Hall Farm Theddingworth Northamptonshire LE17 6NJ
<b>Description of waste input</b>	Whilst the plant is permitted to receive a variety of wastes since the plant commenced generation it has processed a single feedstock; shredded pre-sorted waste wood otherwise destined for landfill.
<b>Operator contact details if members of the public have any questions</b>	Hannah Reynolds (Renewable Compliance Manager) M: 07717767435 E: hannahreynolds@cogenuk.com T: 01782 384898 A: Welland Bio Power Ltd C/O CoGen Ltd, Blythe House, Blythe Park Cresswell, Stoke on Trent, ST11 9RD

## 2. Plant description

Welland Bio Power Ltd (WBPL), operates an energy from waste (EfW) plant utilising Advanced Thermal Conversion (ATC) technology, located in Leicester.

The plant comprises of 4 gasification units which produce syngas that is fed into a single combustion chamber. The resultant combustion gases are subsequently ignited and used as a heat medium for a boiler. In the boilers the temperature is rapidly reduced through transfer of the heat energy in the gas to form steam, steam from the boiler then drives a steam turbine to generate renewable electricity which provided enough power to supply 10,252 homes in 2018.

The plant has a single stack release point and uses established and proven abatement techniques to clean the combustion gases before being released to

atmosphere. The plant and the abatement techniques utilised at the facility produce several residues totalling <5% (by tonnage) of the waste input, thus reducing landfill by 95%. The primary residue is bottom ash which is approximately 3%.

### 3. Summary of Plant Operation

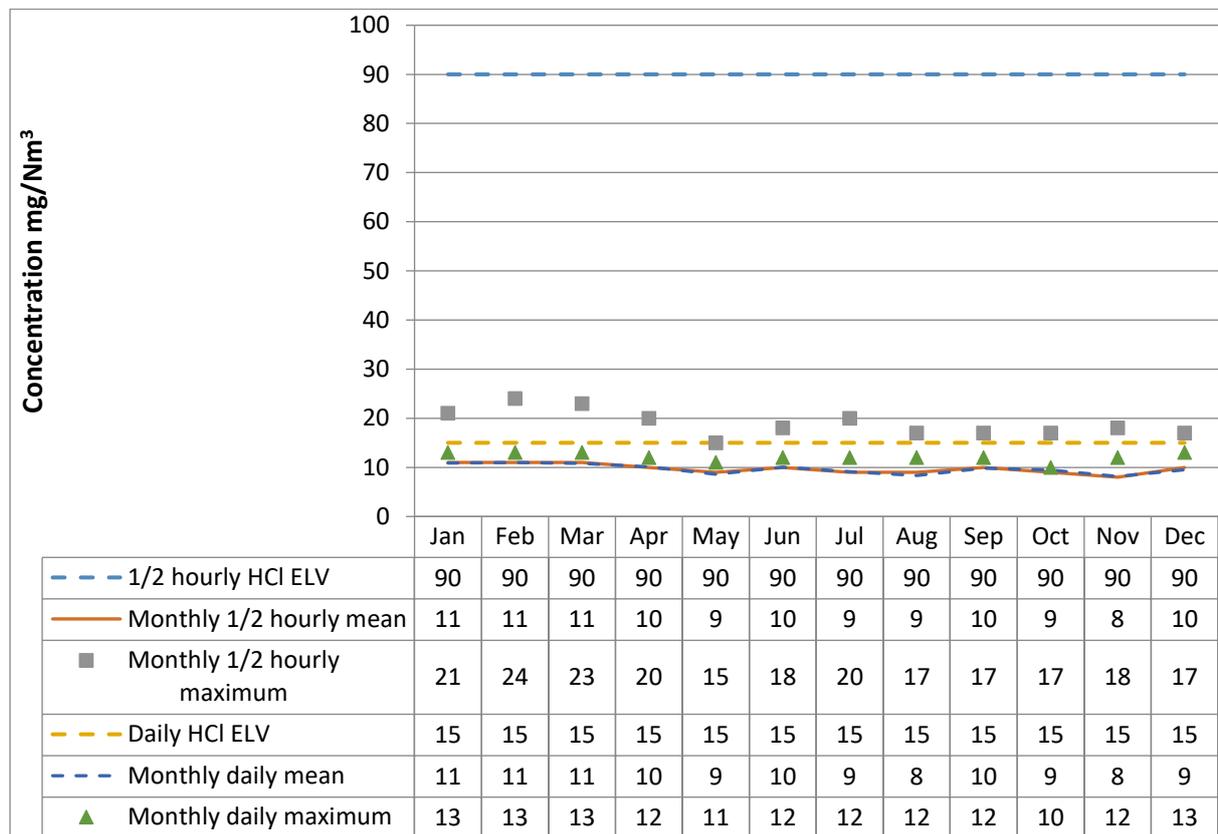
Waste wood (biomass) received	54,715 tonnes
Total waste received	54,715 tonnes
Total waste processed	53,765 tonnes
Total boiler operational hours	6,579 hours
Total turbine operational hours	5,681 hours
Total hours of "abnormal operation" (see permit for definition)	4 hours
Total quantity of incinerator bottom ash (IBA) produced	1,783 tonnes
Disposal or recovery route for IBA	As most of the containments within the waste feedstock are concentrated into the IBA it is a hazardous waste. As such there is not currently a recycling route available for the IBA. The current disposal route is hazardous landfill.
Did any batches of IBA test as hazardous? If yes, state quantity	Yes, all IBA produced by the facility is hazardous.
Total quantity of air pollution control (APC) residues produced	604 tonnes
Disposal or recovery route for APC residues	Air Pollution Control residue is a bi-product of Hydrogen Chloride and Sulphur emissions abatement. As such the residue has a high pH and contains very high levels of chloride and sulphate making it hazardous. The residue is treated and is then disposed of in landfill.
Total electricity generated for own-use, and export to the National Grid	52,275 MWh
Total electricity generated for export to the National Grid only.	47,158 MWh

## 4. Summary of Plant Emissions

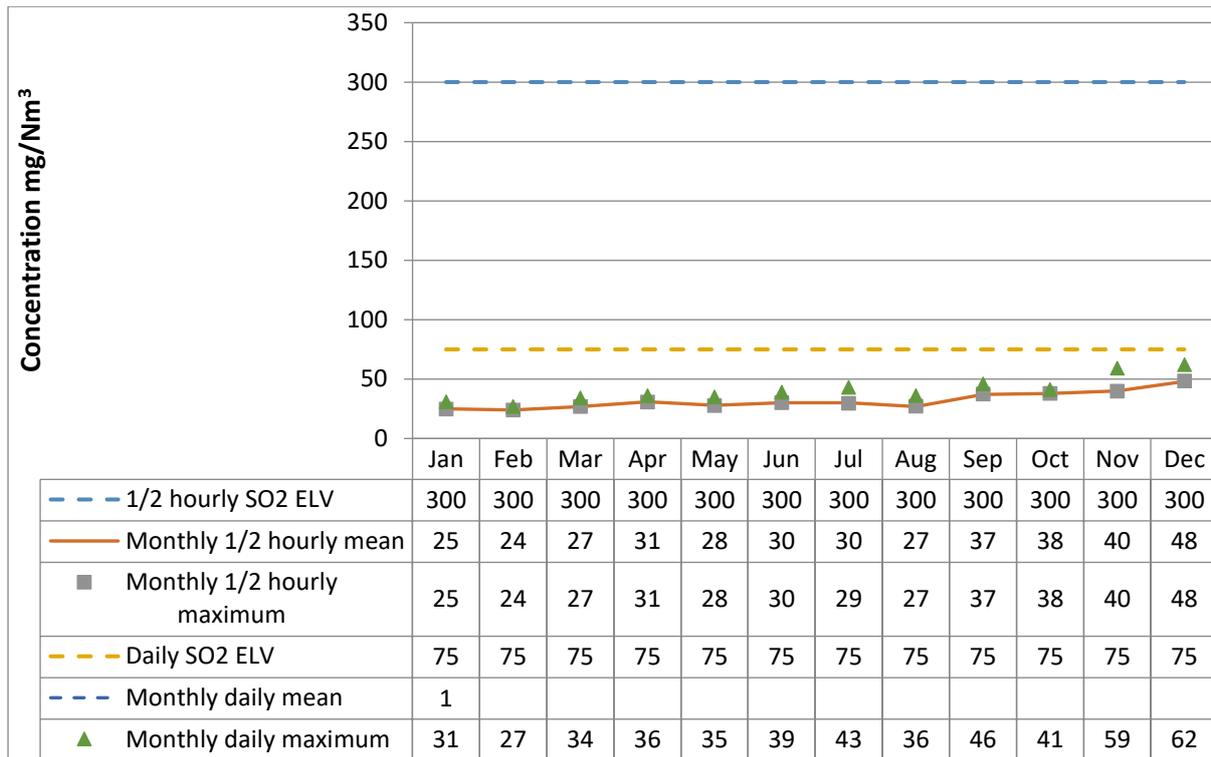
### 4.1 Summary of continuous emissions monitoring results for emissions to air

The following charts show the performance of the plant against its emission limit values (ELVs) for substances that are continuously monitored.

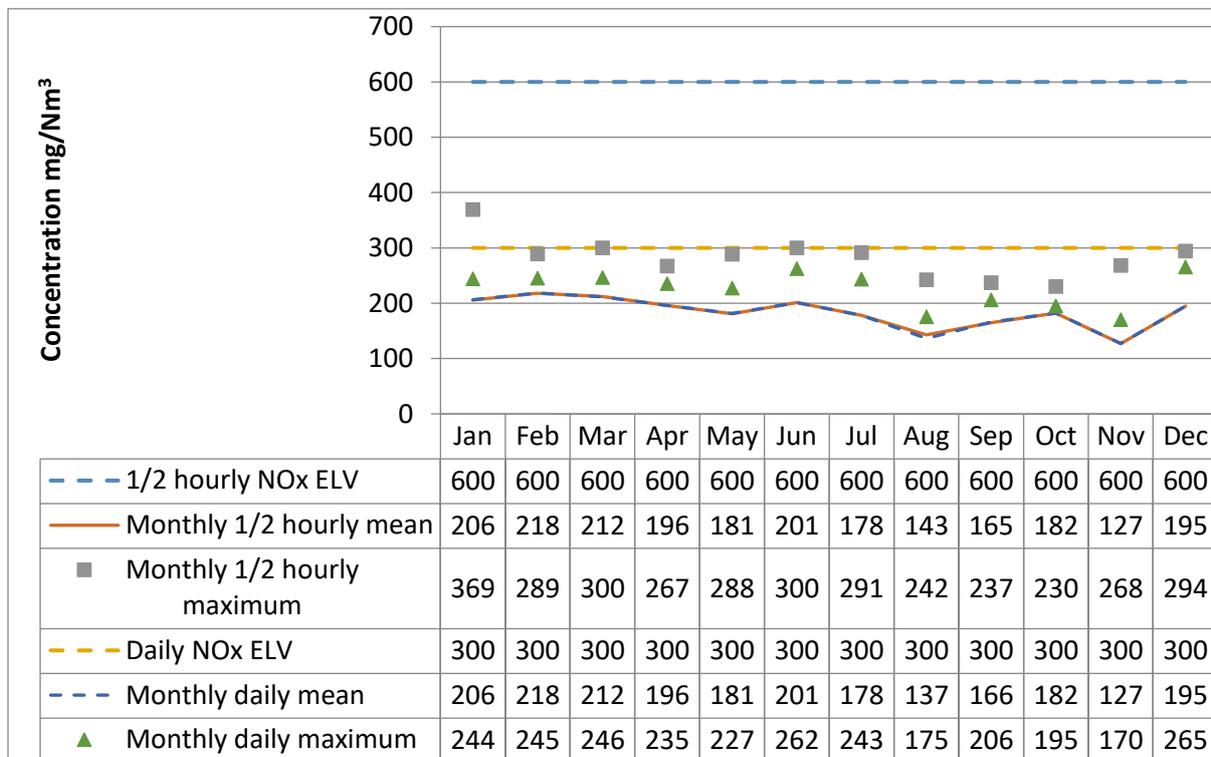
Line 1 - Hydrogen chloride



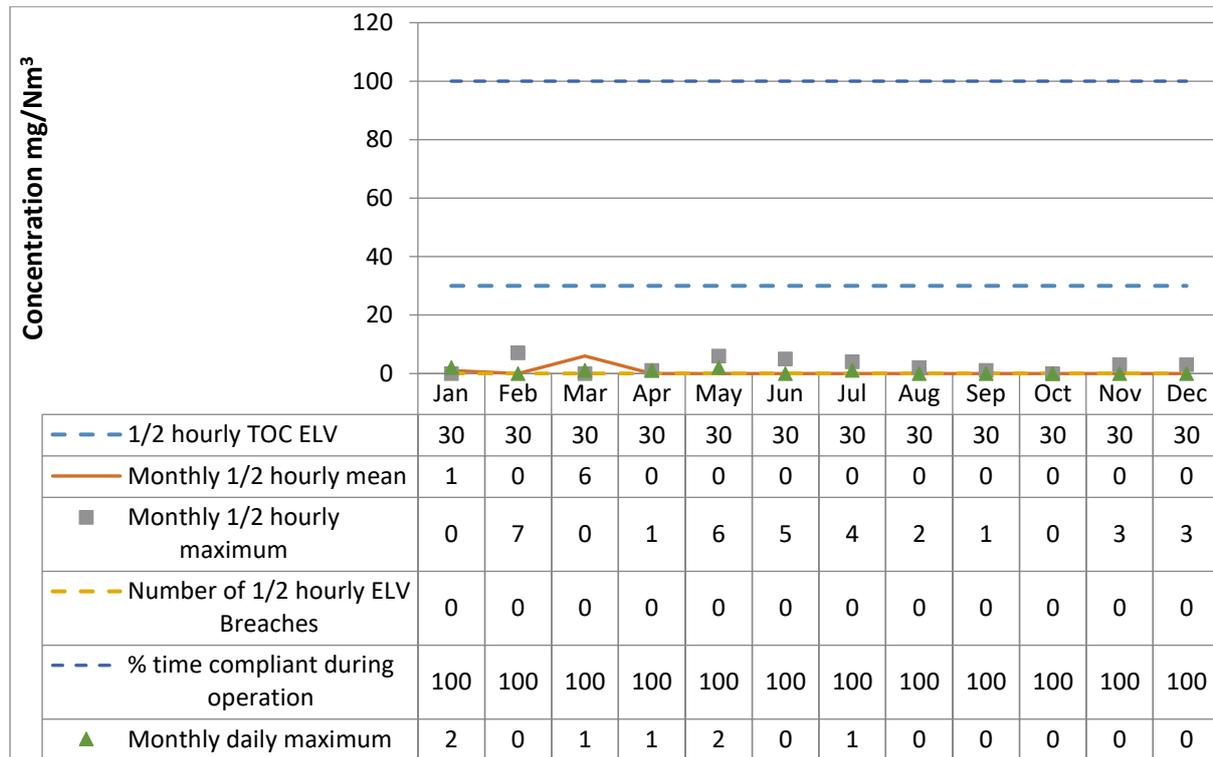
### Line 1 – Sulphur dioxide



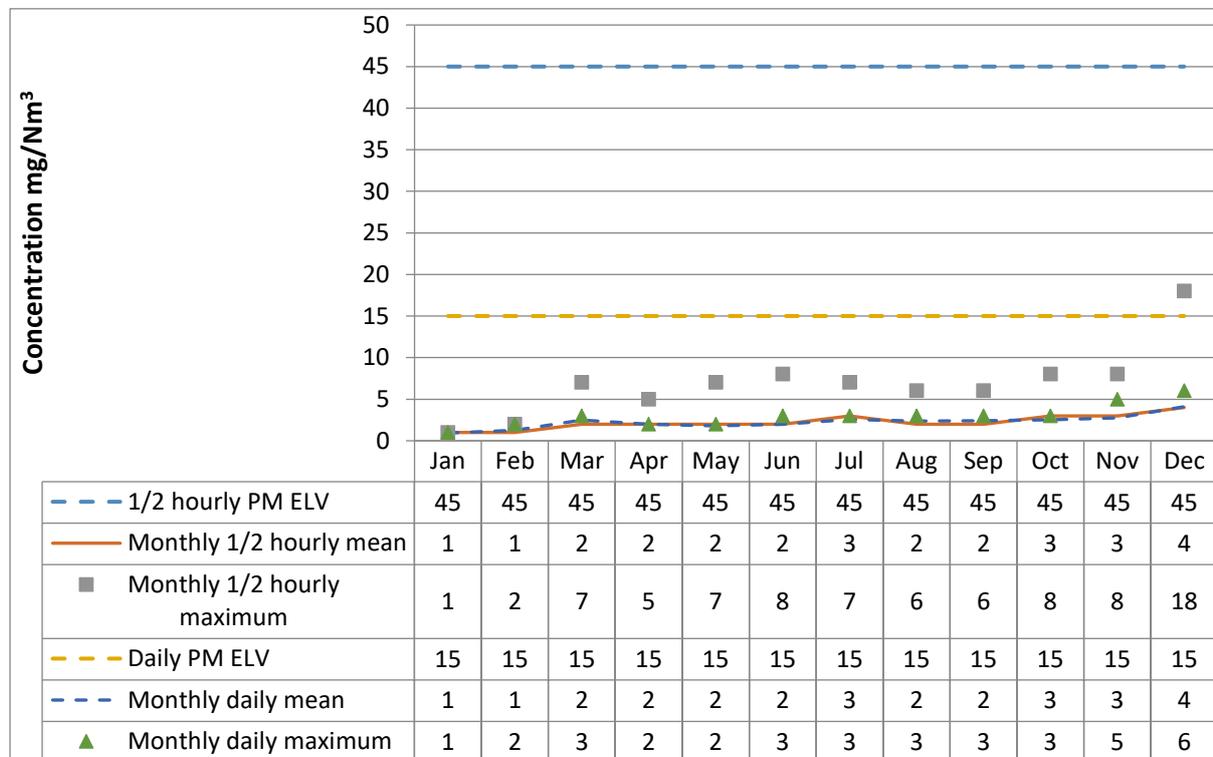
### Line 1 – Oxides of nitrogen



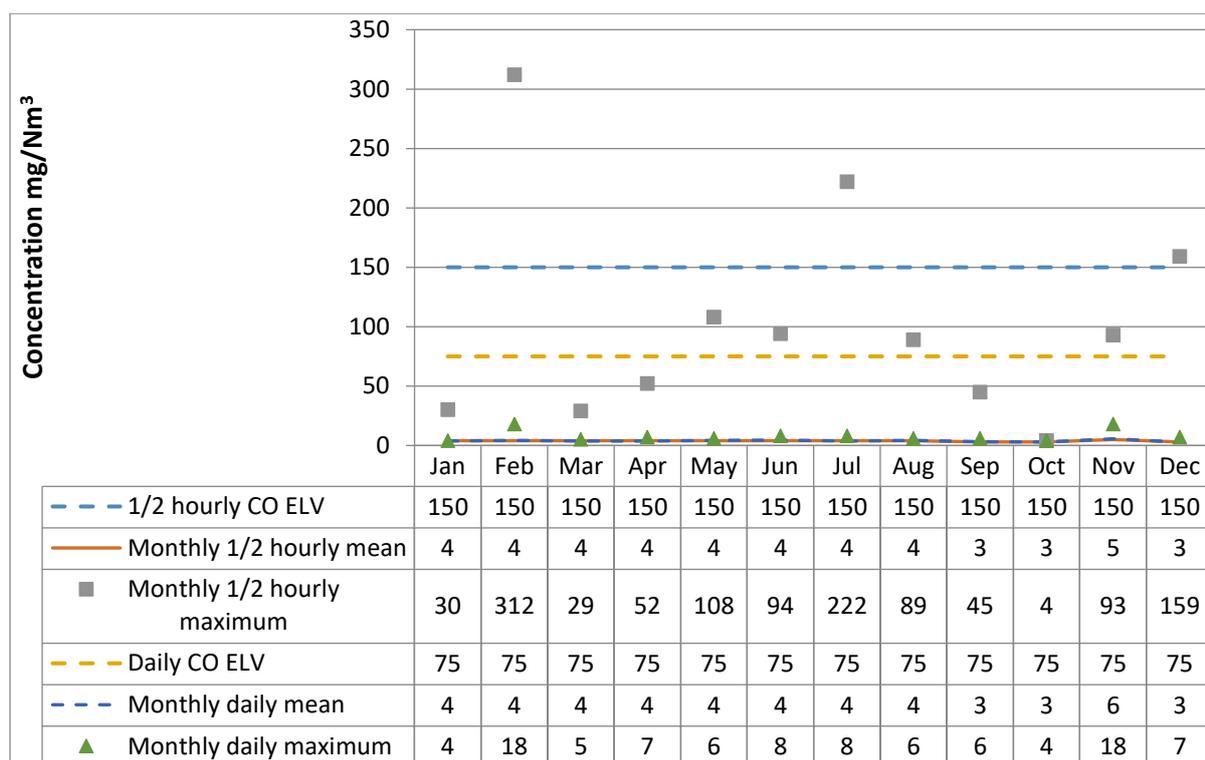
### Line 1 – Total organic carbon



### Line 1 – Particulates



## Line 1 – Carbon monoxide



## 4.2 Summary of periodic monitoring results for emissions to air

The table below shows the results of periodically monitored substances.

Substance	Emission limit value	Results (Dates of monitoring campaign)	
		3-5/09/2018	5-6/11/2018
Mercury and its compounds	0.05 mg/m <sup>3</sup>	0.003 mg/m <sup>3</sup>	0.011
Cadmium & thallium and their compounds (total)	0.05 mg/m <sup>3</sup>	0.001 mg/m <sup>3</sup>	0.001
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m <sup>3</sup>	0.26 mg/m <sup>3</sup>	0.075
Dioxins and furans (I-TEQ)	0.1 ng/m <sup>3</sup>	0.05 ng/m <sup>3</sup>	0.097
Hydrogen Fluoride	2 mg/m <sup>3</sup>	1.06 mg/m <sup>3</sup>	<0.03

### 4.3 Summary of monitoring results for emissions to water

All waste water produced by the WBPL facility throughout the 2018 period was collected in an external tank and removed from site for external processing by a licensed waste carrier. The water results in the table below are applicable to the site lagoon which is a storage facility for the collection of the surface water run-off from the buildings and site hardstanding's. Discharge from the lagoon is on batch release basis after receipt of satisfactory laboratory results which fall within the permit emission limits.

The following tables summarise the results of monitoring of emissions to water for each month:

#### Total suspended solids

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily/monthly ELV (mg/m <sup>3</sup> )	30 mg/l											
Monthly maximum	87	108	49	27	44	132	5	21	9	36	52	101
Monthly average	70.5	108	49	27	44	132	5	21	6	36	52	101

#### pH

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily/monthly ELV (mg/m <sup>3</sup> )	6-9											
Monthly maximum	7.9	7.6	7.6	7.3	7.4	7.5	8	7.7	8.1	7.6	7.3	7.8
Monthly average	7.75	7.6	7.6	7.3	7.4	7.5	8	7.7	8.1	7.6	7.3	7.8

#### Ammoniacal nitrogen

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily/monthly ELV (mg/m <sup>3</sup> )	5 mg/l											
Monthly maximum	0.4	0.4	0.02	0.5	0.19	1.2	3.0	0.9	0.8	0.8	4.9	18
Monthly average	0.35	0.4	0.02	0.5	0.19	1.2	3.0	0.9	0.8	0.8	4.9	18

#### Total Nitrogen

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily/monthly ELV (mg/m <sup>3</sup> )	20 mg/l											
Monthly maximum	5	4	5	7	6	11	6	6	3	7	12	68
Monthly average	3.5	4	5	7	6	11	6	6	3	7	12	68

## Phosphate

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily/monthly ELV (mg/m <sup>3</sup> )	2 mg/l											
Monthly maximum	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.05
Monthly average	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.05

## BOD

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily/monthly ELV (mg/m <sup>3</sup> )	20 mg/l											
Monthly maximum	2.9	2.8	9.0	5.7	2.3	6.4	3.3	8.3	9.5	5.9	3.8	5.5
Monthly average	2.4	2.8	9.0	5.7	2.3	6.4	3.3	8.3	9.5	5.9	3.8	5.5

## 5. Summary of Permit Compliance

### 5.1 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 (3.s.f.)	
	Half-hourly limit	Daily limit
Particulates	100 %	100 %
Oxides of nitrogen	100 %	100 %
Sulphur dioxide	100 %	100 %
Carbon monoxide	100 %	100 %
Total organic carbon	100 %	100 %
Hydrogen chloride	100 %	100 %
Hydrogen fluoride	100 %	100 %

### 5.2 Summary of any notifications or non-compliances under the permit

Date	Summary of notification or non-compliance	Reason	Measures taken to prevent reoccurrence
10/01/2018	CDAS system period of non-recording for TOC.	Following a QAL2 the FID analyser period of not recording on the TOC parameter.	Report ID GP3432WP/0300682
13/02/2018	Notification for two half-hourly	Gasification fan speed unstable resulting in two plant trips. CO spikes	Report ID GP3432WP/0312311

	CO ELV exceedance	were experienced on both plant trips.	
09/04/2018	Notification for a breakdown of the FID analyser	Interruption in the hydrogen/helium, gas supply to the FID analyser defective solenoid found on the gas supply panel.	The firing rate was reduced during the defect investigation period. Staff attended re-training following the incident.
07/07/2018	Notification for a half-hourly CO ELV exceedance	Gasification system trip due to oxidation fan high vibration. Upon plant re-start and re-installing the gasification air system a CO spike was experienced.	When bringing the system back online the ID fan rate will be reduced, and the oxidation fan airflow will be increased. This will allow for maximum combustion of the syngas to occur before being pulled through the exhaust gas system.
18/12/2018	Notification for a half-hourly CO ELV exceedance	The plant had been put into hot state to deal with a mechanical issue on a feedstock supply conveyor. Hot state is a short-term holding state to keep the gasifiers hot and maintain the oxidiser combustion temperature above 850°C using gas burners. Upon plant reversion to normal operating state the operator experienced a period of unstable air flow control to the oxidiser which dropped the oxygen level and momentarily increased the CO which resulted in a spike being registered by the CEMs system. Once the gasification and oxidiser air flows balanced the system CO values came back into range.	Operating procedures for plant re-start from hot state were reviewed.

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

<b>Date of complaint</b>	<b>Summary of complaint</b>	<b>Reason for complaint including whether substantiated by the operator or the EA</b>	<b>If substantiated, measures to prevent reoccurrence</b>
December 2018	The plant received a neighbour complaint regarding the loading shovel operating at night, with particular reference to the reversing beacon sound.		The beacon was replaced with a noise white noise beacon and efforts have been made to muffle the sound of the reversing signal during the silent hours. It should be noted that it is a mandatory H&S requirement that the beacon must be audible at 10 Metres by personnel.

## 6. Summary of plant improvements

Summary of any permit improvement conditions that have been completed within the year and the resulting environmental benefits.		
Ref.	Improvement Condition	Result
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System and the progress made in the certification of the system by an external body or if appropriate submit a schedule by which the EMS will be certified.	ISO 14001 audit undertaken and certification achieved.
IC2	The Operator shall submit a written proposal to the Environment Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission point A1, identifying the fractions within the PM10, and PM2.5 ranges. The proposal shall include a timetable for approval by the Environment Agency to carry out such tests and produce a report on the results.	A written proposal was submitted to the Environment Agency and was accepted. Upon acceptance Exova Catalyst (MCERTs Accredited Stack Testers) were commissioned to carry out stack emissions testing on the stack (A1). Results - without correction for water vapour content PM10 = 4.1mg/nm <sup>3</sup> PM2.5 = 3.4 mg/nm <sup>3</sup>
	On receipt of written agreement by the Environment Agency to the proposal and the timetable, the Operator shall carry out the tests and submit to the Environment Agency a report on the results.	Results = dry gas, 6% oxygen PM10 = 3.2 mg/nm <sup>3</sup> PM2.5 = 3.6mg/nm <sup>3</sup>

IC3	<p>The Operator shall submit a written report to the Environment Agency on the commissioning of the installation – in line with the commissioning plan as agreed under pre-operational condition PO3. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application, this includes validation of the noise assessment that was provided with the application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions.</p>	<p>A report summarising the environmental performance of the plant as installed against the design parameters has been submitted to the Environment Agency. The report showed that even throughout commissioning the plant operated largely within the permit limits.</p>
IC4	<p>The Operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency.</p>	<p>The aim of the monitoring campaign was to measure the temperature at multiple points at the exit of the secondary combustion chamber to confirm that this temperature was &gt; 850°C and also to confirm the residence time within the Qualifying Secondary Combustion Zone (QSCZ) was &gt; 2 seconds. These tests were performed by Exova Catalyst an independent consultant under 2 test conditions: 1. Maximum Load (100% of Capacity) and 2. Design Load (65% of Capacity). The results showed that the residence time at full load and at 65% load was above the 2 second requirement. The results also demonstrated that the average temperature of the QSCZ was far higher than the required 850°C at an average of 1001° even at 65% load.</p>

IC5	<p>The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of the Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx) emissions within the emission limit values described in this permit with the minimisation of nitrous oxide emissions. The report shall include an assessment of the level of NOx and N2O emissions that can be achieved under optimum operating conditions.</p> <p>The report shall also provide details of the optimisation (including dosing rates) for the control of acid gases and dioxins</p>	<p>The operator conducted a full review of the SNCR system, NOx emissions and ammonia slip. Overall it could be seen that the SNCR system is functioning very well at controlling NOx emission levels and that these are well beneath the allowable limits specified in the environmental permit. Running the system in manual allows the operator close control over the NOx emissions levels and with increased operational experience and feedback from the collected data the small amounts of ammonia slip show should be minimised further.</p>
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**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.**

Not applicable.

The only changes to the permit have been administrative variations to change the Operating company.

*Note: whilst the operating company has changed the on-site staff have remained the same (under TUPE processes).*

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

None

**7. Details of any public liaison held in 2018 and planned for 2019:**

<b>Date and time</b>	<b>Description</b>	<b>Location</b>
19 July 2018	Welland liaison Group	Local parish hall
February 2019	Local Liaison Group	Local Threddingworth Village Hall