CiNER Glass Ltd.

Dragon Glass Bottle Manufacturing Facility

Air Quality Clarification Note

Issue

Issue | 14 January 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Contents

1 Introduction

This report provides a response to questions raised by the local authority following the submission of the air quality assessment for a proposed glass bottle manufacturing facility (the site) in Rassau, Wales (planning ref C/2021/0278).

The questions raised which this document responds to are as follows:

- Provide a stack height report (section 0);
- Provide a report detailing the abatement equipment proposed and how that will achieve the proposed Emission Limit Values (ELVs) (section 3);
- Provide a report detailing how in the absence of emissions monitoring for some pollutants from the Turkey glass plant the emissions from the proposed development were calculated (section 4);
- Provide a description of the HGV traffic emissions modelled and justify the modelled extent (section 5); and
- Provide a response to the report review carried out on behalf of Blaenau Gwent County Borough Council (section 6).

2 Stack height assessment

A stack height assessment was carried out at two phases of the design phase for the proposed development. The first stack height calculations were based on a proposed design which included two furnace lines (one with 500 tonnes of daily output the other with 700 tonnes) (design option 1). The details of this design option were provided in the methodology note sent to Blaenau Gwent County Borough Council (see Environmental Statement Volume II Appendix B1.1 for the full method note). The second set of calculations were provided for the final design submitted for planning with two furnaces both at 500 tonnes (details of the modelled parameters are provided in Environmental Statement Volume II Table B2.11).

2.1 Method

2.1.1 Pollutants included in the stack height assessment

The pollutants included in the assessment were nitrogen dioxide (NO_2), particulate matter (PM_{10}) and sulphur dioxide (SO_2), they are selected to be part of the stack height assessment as they cover all the averaging periods considered in the assessment:

- Annual mean NO_2;
- 99.79th percentile hourly NO_2;
- 90.41th percentile 24-hour mean PM_{10}; and
- 99.9th percentile 15-minute mean SO_2.

2.1.2 Furnace parameters

As noted above the furnace parameters changed during the design process and each of the two stack height assessments included the relevant furnace parameters as detailed in the Environmental Statement Volume II.

2.1.3 Dispersion model set up

The dispersion model set up, confirmed that both sets of stack height assessment were similar and both included proposed buildings, terrain and the wind turbine. 2018 meteorological data for Sennybridge was used.

Full details of the model set up are provided in the Environmental Statement Volume II.

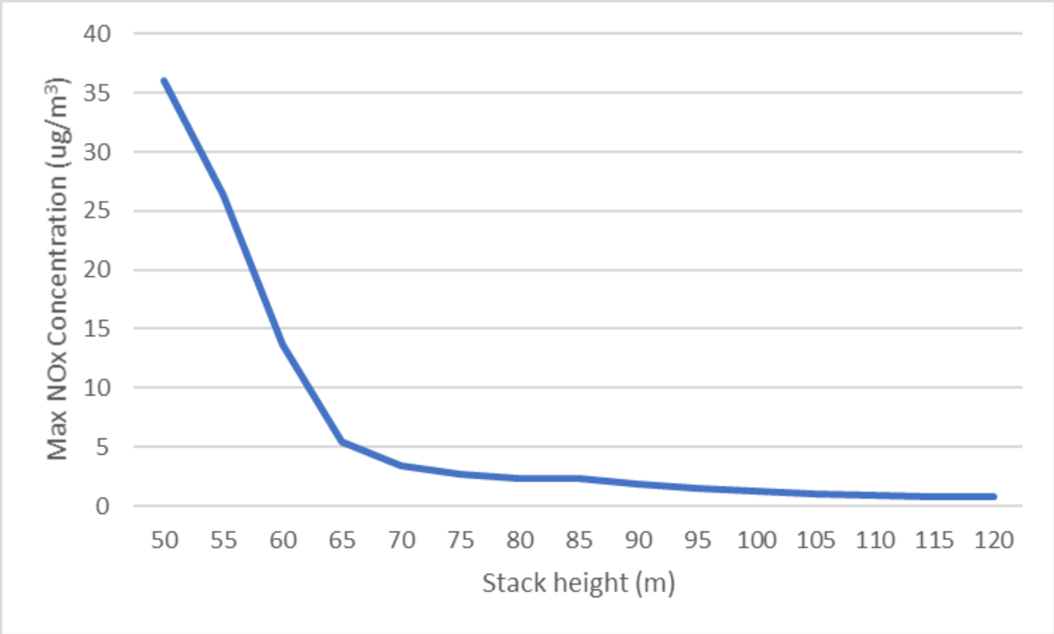
2.1.4 Results

Design option 1

The results of the stack height assessment are presented in knee plots[1] for the pollutants assessed, where the maximum ground level concentrations are plotted against the modelled stack heights (from 50m to 120m, with a 5m interval).

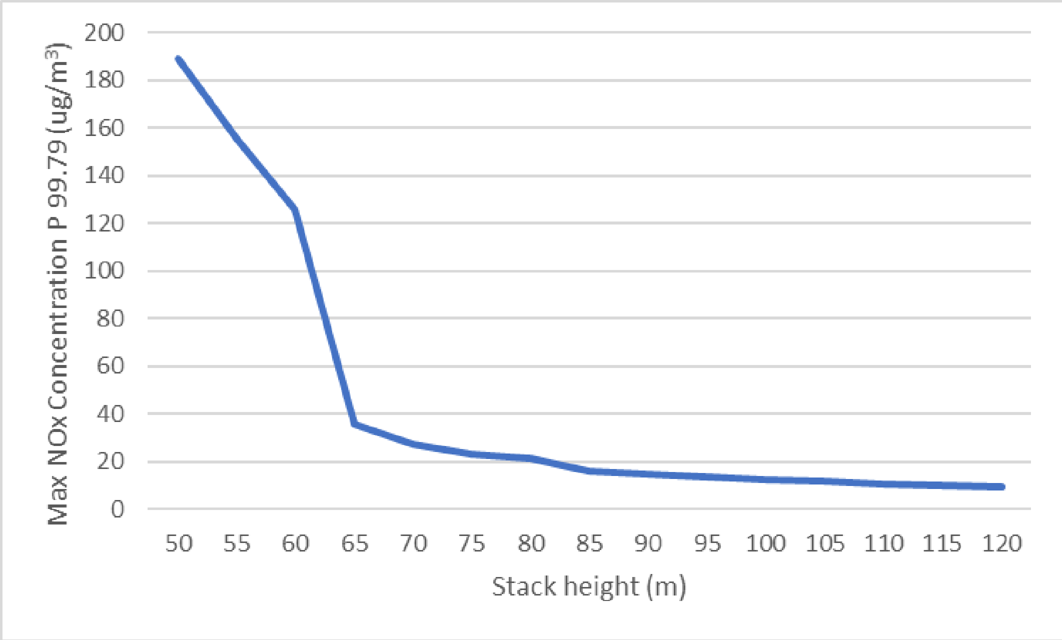
NOx

Knee plot for annual mean NOx concentration against modelled stack heights at 50m-120m



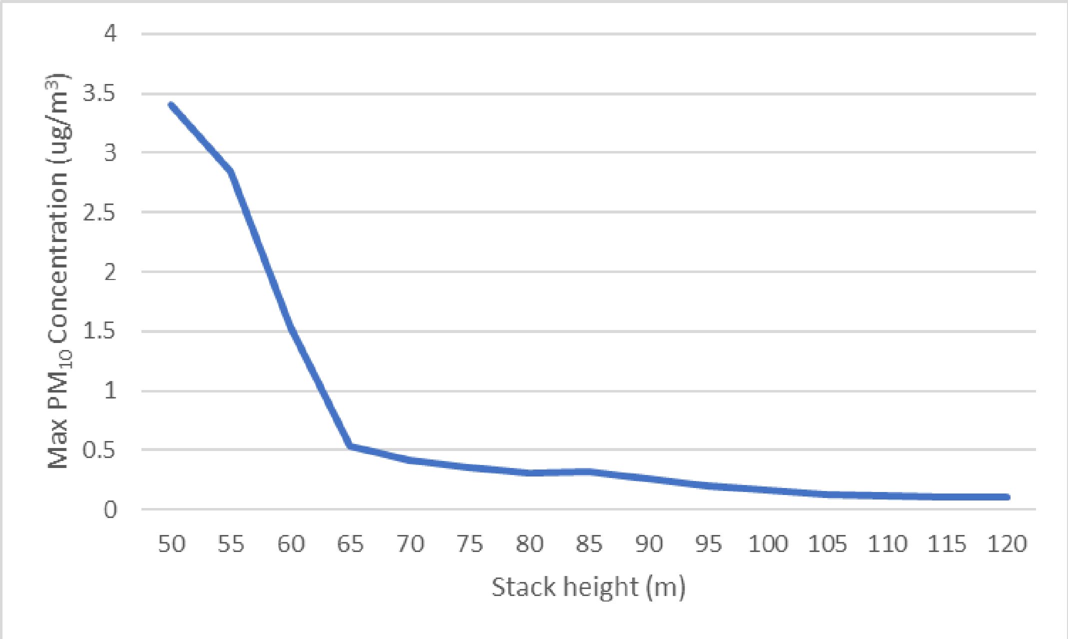
[1] Knee plot shows a point where the curve visibly bends, this represents the optimum stack heights for the proposed furnaces.

99.79th percentile hourly mean NOx concentrations (µg/m³)



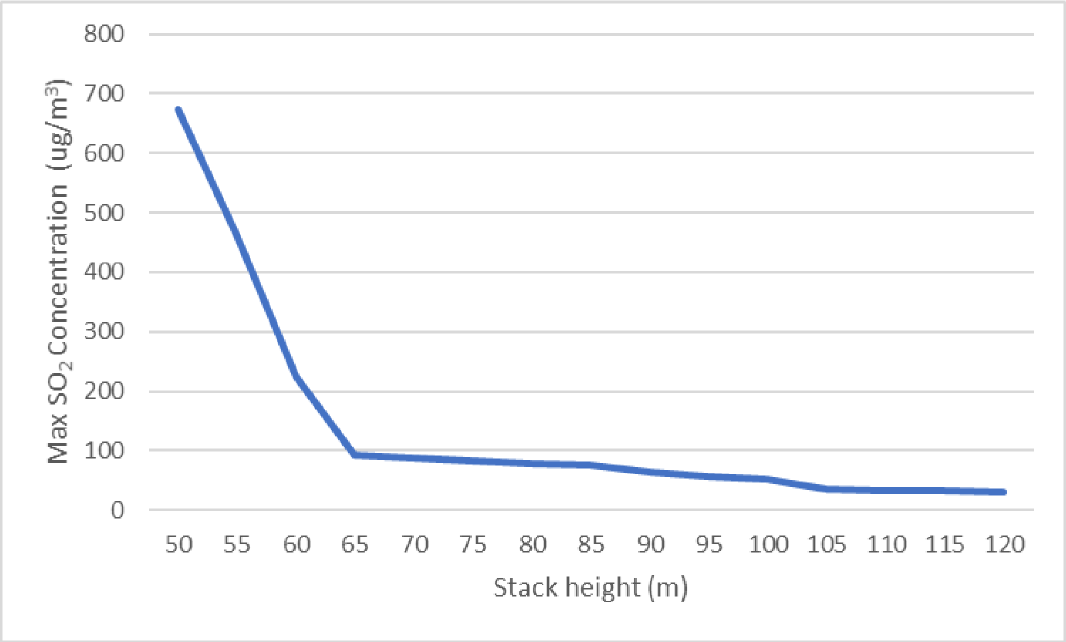
PM10

90.41th percentile 24 hour mean PM_{10} concentrations (µg/m³)



SO_2

99.9th percentile 24 hour mean SO_2 concentrations (μg/m^3)

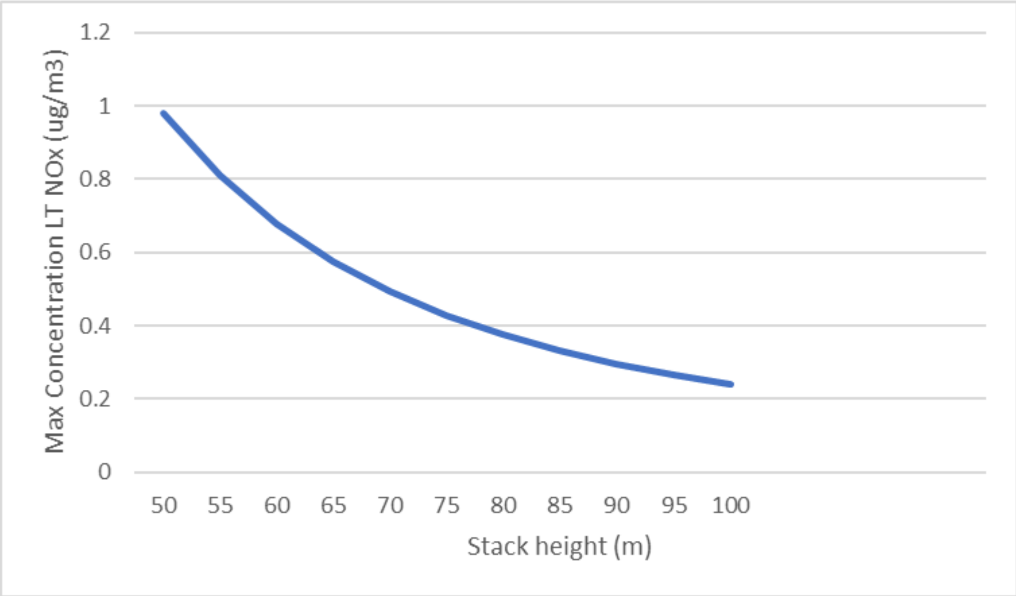


Final design

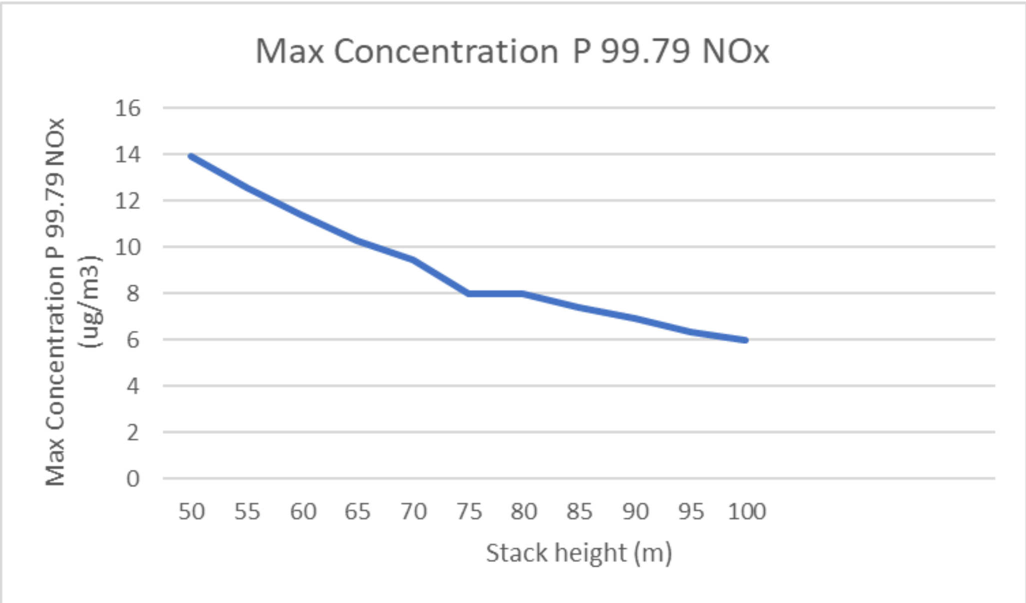
The results of the stack height assessment are presented in knee plots for the pollutants assessed, where the maximum ground level concentrations are plotted against the modelled stack heights (from 50m to 100m, with a 5m interval). It should be noted the model for the final design was run with emission rates at 1g/s rather than the predicted emission rates based on proposed ELVs. This does not change the knee plots, but does alter the total concentrations on the Y axis.

NOx

Knee plot for annual mean NOx concentration against modelled stack heights at 50m-100m.

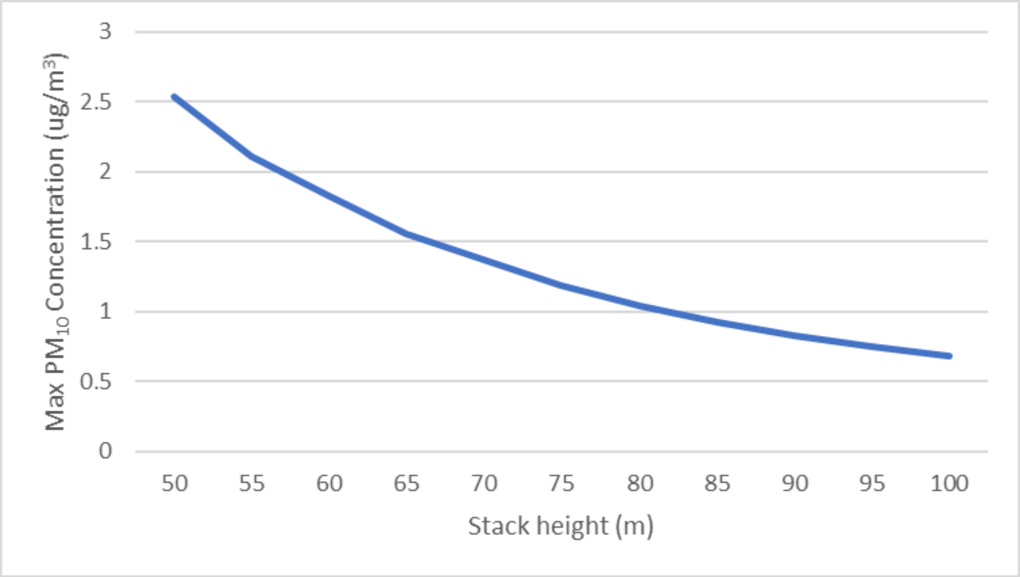


99.79th percentile hourly mean NOx concentrations (µg/m^3)



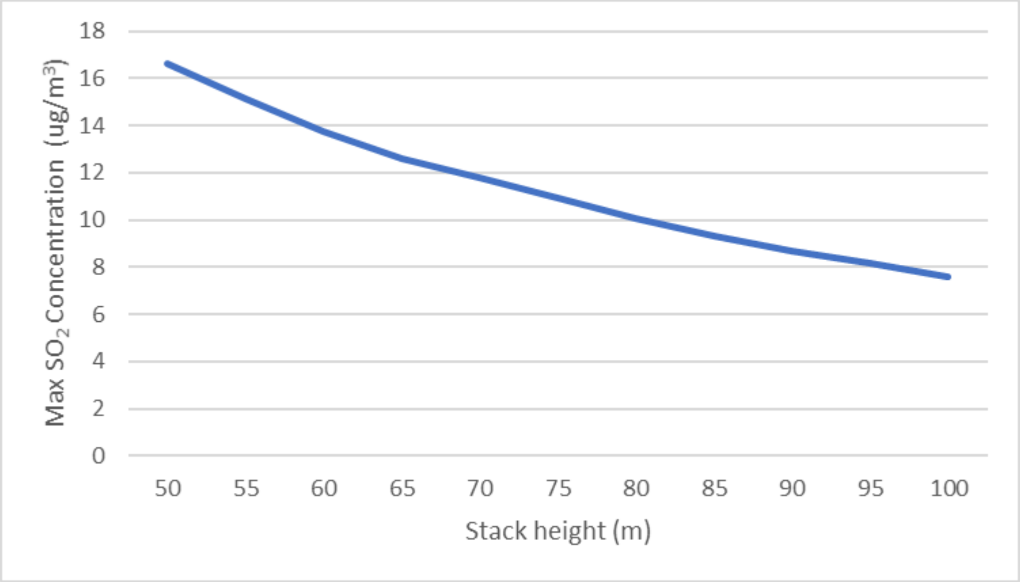
PM_{10}

90.41th percentile 24 hour mean PM_{10} concentrations (μg/m³)



SO_2

99.9th percentile 24 hour mean SO_2 concentrations (μg/m³)



Result summary

For the option 1 design the above knee plots above show predicted maximum concentrations decrease sharply from stack heights 50m to 65m. The predicted concentrations are levelled off at stack heights between 65m and 75m (where the decrease of pollutants are less rapid). As such, the stack height for the proposed facility based on the data available was recommended to be no less than 75m.

When the final design was completed and the exercise to review stack height was repeated it was clear from the results that the proposed height of 75m remained appropriate and it can be seen in the results that whilst the drop off between 50m to 65m is not as marked, beyond 75m there are diminishing returns. In addition with the detailed assessment having been carried out to consider embedded mitigation options the overall conclusion of no significant effects remained valid with the combination of mitigation from stack height plus other mitigation options.

3 Abatement equipment proposed

The furnace supplier TecoGlas has provided details of the abatement plan and equipment process. This is included in Appendix A.

4 Emissions calculations

As set out in the Environmental Statement Volume I (section 5.2, Table 5.10), the emission limit values (ELVs) for the proposed development have been set to meet relevant BAT guidance and Industrial Emissions Director ELVs. In addition, some ELVs have been assessed as being below BAT in order to provide mitigation to potential impacts which were identified.

The emission rates for each pollutant were calculated by converting the proposed emission parameters such as temperature and volumetric flows to g/s emission rates based on the proposed ELVs. The emission rates for Group 1 and 2 metals are calculated in the same way and supplemented with information from the Ciner glass factory in Turkey to define the percentage breakdown for each metal (as detailed in Environmental Statement Volume II, section B2.4.10). In addition, the approach to the assessment of CrVI is detailed in order to assess impacts from this pollutant.

No further information, other than the percentage breakdown for metals, is required for the assessment as all emission rates have been modelled at proposed ELVs. Stack information for actual emission rates from the factory in Turkey would not be relevant to the proposed development as the level of mitigation is significantly different between the sites. It should also be noted the assessment carried out is conservative as emission rates would be expected to be below the proposed ELVs.

5 HGV traffic modelling

Emissions from HGVs accessing the site during the operational phase have been modelled using dispersion modelling software ADMS, details of the model set up are provided in the ES Volume II, Appendix B2. The extent of the modelled area is show in ES Volume III.

The extent of the modelled area was determined by reviewing the changes to traffic flows and modelling roads close to receptors to allow for a cumulative total impact from the operation of the proposed development to be assessed (roads and on-site emissions).

The transport team note that due to the sites location close to the A465, the likely origin/destination of vehicles and the suitability of the route, all HGVs associated with the site would use this strategic network. There is likely to be some impact along the surrounding network from staff car trips but trip generation and distribution assumptions suggest that the majority would also utilise the A465 and therefore impact elsewhere on the highway network would be negligible. The change in traffic along the A465 is forecast to be around 2% of total AADT (annual average daily traffic).

From an air quality perspective, it is important to note that there are no air quality management areas (AQMAs) along the A465 either west to the M4 or east to the A40. As such the extent of the modelled network is considered to be appropriate and proportionate for this assessment.

6 Response to technical review

The following table provides a response to the technical review carried out by Ricardo. The significance or priority level they provided is shown in brackets (the details of the classification are provided on page 2 of the Ricardo review)[2]. Where there are no comments and the method is agreed those have not been added to the below table as no response is required.

Aspect of review	Ricardo Clarifications and Recommendations	Applicant Response
Confirming that all pollution sources, pollutants and their relevant air quality standards, guidelines or Environmental Assessment Levels have been identified and appropriately quantified.	It is recommended that an assessment of operational fugitive emissions is provided by the applicant including any mitigation measures that will be applied to ensure that these are minimised (AQ1) (Medium).	Fugitive emissions from any on-site material handing processes would be managed via best practice material handling procedures. The cullet (broken glass) supply is back tipped into pens and transferred via front loading shovels to the cullet building where deposition takes place into a hopper inside the curtilage of the building. The silica sand is delivered to a bunker and then bucket lifted into the silos, all of which is contained inside the silo buildings. The bunkers have a roof over at high level but are open to atmosphere although the bucket transfer to silos is contained within the building. The IAQM Guidance on the assessment of dust from demolition and construction v1.1 contains best practice mitigation measures which are considered

[2] Ricardo, CINER Glass – Air quality methodology review, Report for Blaenau Gwent County Borough Council (15/12/21)

		suitable for the management of any potential impacts. Appropriate mitigation will be included as part of the Environmental Management System of the plant and therefore be conditioned into the operation of the plant, under the Environmental Permitting (England and Wales) Regulations 2016. In addition to the above management procedures, the distance to the nearest receptors is over 150m, therefore allowing for dispersion of any minimal fugitive emissions to take place. In conclusion, with suitable management procedures in place the risk of significant impacts from fugitive emissions is considered to be not significant.
	It is recommended that the cumulative assessment be updated to take account of emissions associated with the two nearby NRW sites (AQ2) (Medium).	The data for the emissions from the two nearby sites regulated by Natural Resources Wales (NRW), Rassau Recycling Facility Enviro Wales Ltd and GD Yuasa Battery Manufacturing UK Ltd were requested from Blaenau Gwent County Borough Council (BGCBC) and NRW. The data for the emissions from these facilities was not available to be provided for this work, as such as it had to be assumed that the emissions from these facilities were included in the background emissions. This assumption is considered to be suitable as the facilities are regulated and therefore emissions are controlled to minimise environmental or health risks. It is acknowledged there could be a small variation in the local concentrations of pollutants emitted from the two

		facilities, however with the predicted concentrations for the additional pollutants all being well below the relevant air quality standards there is a negligible risk of an exceedance or new significant effect arising as a result of the proposed development.
Checking that the emissions parameter and reference conditions are as specified in the relevant Environment Agency or BREF guidance.	The applicant should provide a justification of how the lower emissions will be achieved within a BAT report. If a suitable justification cannot be provided the applicant should update the modelling predictions using the worst case ELVs (AQ3) (High).	The technology to provide the emissions stated within ES Volume I Table 5.10 are detailed in this document (section 3). This technology will reduce emissions to the proposed ELVs.
	The applicant should clarify if abnormal emissions provided are the unabated emissions of the pollutants mentioned and if not update the modelling using the unabated emissions data (AQ4) (Medium).	The abnormal emissions provided in ES Volume II Table B2.12 are the unabated emissions which would occur in the event of a systems failure or during a power outage (which would affect the furnace and would be managed with the backup supply thus limiting any effect to a very short time). The values modelled are conservative as the catalytic candle filter (CCF) unit, unlike a regulator electrostatic precipitator, never needs to come offline as all maintenance can be carried out with the system in operation. In the event of any failure the raw emissions of NOx could be limited by primary means (ie; close attention to combustion conditions/batch mix). HF and HCl would remain within BAT limits.

<table>
<tr>
<td></td>
<td>The applicant should provide the unabated emissions for the missing pollutants (HCl, HF, SO_2) and undertake detailed modelling of their impacts for the relevant short term and long-term objectives so as to assess the potential impact of abnormal operations (AQ5) (Medium).</td>
<td>Due to the very low risk of unabated emissions occurring, as set out above, it is not proposed to undertake detailed modelling for SO_2 and as noted HF and HCl would remain within the BAT limits.

Due to the technology options proposed the risk is considered to be not significant.</td>
</tr>
<tr>
<td></td>
<td>The applicant should clarify the actual and normalised flow rates and their corresponding reference conditions used to estimate the mass emissions (AQ6) (Low).</td>
<td>Normalised flowrate: 11.5 Nm^3/s

Actual flowrate: 18.2 m^3/s

Normalised conditions are presented below:
<table>
<tr><th>Parameter</th><th>Normalised condition</th></tr>
<tr><td>CO2</td><td>10%</td></tr>
<tr><td>H2O</td><td>12%</td></tr>
<tr><td>N</td><td>20%</td></tr>
<tr><td>O2</td><td>8%</td></tr>
<tr><td>Temperature</td><td>0ºC</td></tr>
</table>

For actual conditions, Tecoglas advised normalised flowrate can be corrected to actual numbers by using the exit temperature at 160ºC. It has also been advised the normalised conditions of O_2 and H_2O won't be differed excessively to the actual conditions, so normalised conditions for H_2O and O_2 are used in actual conditions.</td>
</tr>
</table>

	The applicant should clarify if the stacks have been modelled separately or combined. The emission parameters used for each stack (or the combined stack) should be provided. (AQ7) (Low).	The stacks have been modelled separately, the emission parameters for each modelled stack are shown in ES Volume II Table B2.11.

Appendix A

TecoGlas equipment information

A1 Description of Proposed Abatement Plant and Process

The unit proposed is a catalytic candle filter (CCF).

The cleaning of the flue gases is essentially a four-step process:

1. Flue gas cooling;
2. Reduction of acidic gases by alkali injection;
3. Removal of dust and reaction products; and
4. Reduction of nitrogen oxides by ammonia water injection.

The flue gases coming from the furnace must be cooled before entering the CCF. The cooling to an CCF inlet temperature of 370 °C is achieved by water evaporation. A dilution air damper is foreseen for a malfunction of the water-cooling system.

For acid gas neutralisation the reagent calcium hydroxide is injected by air into the hot flue gas in the raw gas duct upstream of the CCF. A cake of dust and lime forms on the candles surface through which the raw gases are pressed. That leads to a high hit rate between the relevant impurities and the lime which enables the equipment to achieve a SOx reduction of up to 85%.

The solid dust particles i.e., the dust from the furnace and the reaction products present in the waste gases are subsequently removed in the CCF.

The cleaned flue gas is conveyed via a duct by a frequency-controlled fan and released into the atmosphere through the stack.

The dust on the candles surface is removed by cleaning them at regular intervals and collected in the bottom. A screw conveyor system discharges the dust via a pneumatic conveyor to a dust silo.

For the reduction of the nitrogen oxides the reagent ammonia water is injected by a two-component nozzle with air into the hot flue gas in the raw gas duct upstream of the CCF. The reaction is affected by the catalytic candles. The NOx reduction achieved will be up to 90%.

A1.1.1 Flue Gas Cooling

The flue gas of the furnace is cooled down in the cooler by injection of water to the permitted temperature. Via back flow nozzles the water is injected into the cooler, atomized via the nozzles and there it evaporates. The water quantity is controlled in dependency to the temperature at the cooler outlet.

An air-cooling damper is placed in front of the cooler in case there is a malfunction of the water cooling.

A1.1.2 Dry Absorption

The neutralisation of the gaseous acidic components SO2, SO3, HCl and HF into solid particulates is achieved by reaction with dry Ca(OH)2 powder blown into the flue gas duct from a dosing system.

The lime is stored in a pneumatically filled silo. This storage silo is equipped with all the necessary systems for filling and discharging. A suitable sized filter on the top of the silo cleans the discharged air during the filling operation. The silo is sized to take a full truck load, even when there is still plenty of powder left.

A speed-controlled screw conveyor and a weighing device permit an alkali flow. The alkali is conveyed by a centrifugal fan through a flexible rubber hose.

To protect it from the weather the dosing system is located underneath the silo.

The alkali reacts with the flue gas components SO2/SO3, HCl and HF according to the following equations and forms dry reaction products:

SO2	+	Ca(OH)2	→	CaSO3 +	H2O
SO3	+	Ca(OH)2	→	CaSO4 +	H2O
2 HCl	+	Ca(OH)2	→	CaCl2 +	2 H2O
2 HF	+	Ca(OH)2	→	CaF2 +	2 H2O

These reactions start immediately after the powder comes into contact with the hot flue gases. A cake of dust and lime forms on the candles surface through which the raw gases are pressed. That leads to a high hit rate between the relevant impurities and the lime.

For the calculation of the alkali consumption it is assumed that the trademark “Sorbacal A” is used as dry hydrated lime.

A1.1.3 Dust Collection

The particulates contained in the flue gases are collected in the CCF.

Dust collection using a CCF involves three process steps:

- the particle entering the filter will lie down on the candles surface;
- removal of the dust from the candles surface with an air blast cleaning; and
- removal of the dust from the dust collecting hoppers via screw conveyors.

The CCF generally consists of several isolated units, the so-called modules, through which the flue gases pass vertical from the bottom to the top. The CCF consists of four modules through which the exhaust gas flows in parallel. Each module has an inlet and outlet damper and can be separated. A limiting quantity of filters per module house allows for the possibility of taking a single module off-line for inspection/maintenance while continuing to operate with the other modules on-line and maintain compliance with air emission limits. This opens the possibility to year-round operation with zero downtime.

Each module has an optimized flow distribution which is essentially at a CCF. The raw gases enter the upper hopper section of the module assembly and encounters a set of ladder vane baffles, these baffles remove the large particulate and distribute the flue gas evenly across the filters. This reduces wear on the filters and extends the filter lifetime. The filters are arranged in a way to reduce the “can velocity” and to prevent the possibility of material bridging and filter breakage. That ultimately reduces the wear on the filters and extending the filter lifetime.

As the flue gas flows from the outside into the inside of the candle, particulate is collected on the outside surface of the candle.

The cleaned flue gas flows out the top of the candle through an opening in the tube sheet. Upon exiting the candle, the cleaned flue gas enters a clean air plenum and passes from the module through an outlet damper.

Each module has a removable top lid to provide easy access to change/inspect the filters. Instead of an entry through a clean air plenum with confined space the entry is from the top, in a well-lit and ventilated area (penthouse enclosure), this will reduce maintenance time and system down time and avoids working in confined space.

The pulse pipes for the cleaning system are fixed to the top lid assembly not to the framework, this eliminates the possibility of misalignment of the pulse pipes which could damage the filters and is easy to maintain.

The dust, removed by the pulse air system from the candles surface, falls into hoppers, installed at the bottom of the filter and is removed from there with appropriate equipment.

The filter itself is mounted on a steel structure. Stairs and walkways provide easy access for service and maintenance.

The CCF is thermally insulated on all sides and clad in sheet metal.

A1.1.4 Reduction of nitrogen oxides

The reduction of the nitrogen oxides is affected with the SCR-process (selective catalytic reduction). A 90% reduction will be achieved from the process.

For this purpose, the hot waste gases passing the catalytic candles. Ammonia water solution is added which splits into ammonia and water in the hot waste gas. The nitrogen oxides change to nitrogen and steam in the catalyst candles and are reduced according to the following totals formula:

$$4\ NO + 4\ NH_3 \rightarrow O_2 + 4\ N_2 + 6\ H_2O$$

$$2\ NO_2 + 4\ NH_3 \rightarrow O_2 + 3\ N_2 + 6\ H_2O$$

As NH3-base a < 25 % ammonia water solution is used. It is injected and distributed into the waste gas flow via a single flow nozzle. This provides a homogeneous mixture with the waste gas.