FICHTNER
Consulting Engineers Limited

Chirk Particleboard Facility

Kronospan Limited

Schedule 5 Response #4

ENGINEERING + CONSULTING

Document approval

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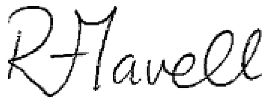
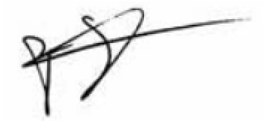
Prepared by:	Rosalind Flavell		Senior Consultant	09/04/2020
Checked by:	James Sturman		Lead Consultant	09/04/2020

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Contents

1 Emission point to air “K1” – Kronoplus

The emission limit value (ELV) for oxides of nitrogen (NO and NO_2 expressed as NO_2) (NOx) from K1 boiler is set at 90 mg/Nm^3, as proposed in the last variation application (EPR/BW9999IG/V007). This emission limit has been used as part of the model input data for K1 in the Air Dispersion Modelling assessment for the site which forms Appendix C of the current variation application (EPR/BW9999IG/V008).

However, on 31 January 2019, Kronospan notified NRW of an abnormal release from K1 boiler, in which the 90 mg/Nm^3 was exceeded (Kronospan notification of abnormal emissions form KC/PARTAB/NRW/06). Kronospan explained that the original proposed limit of 90 mg/Nm^3 was unrealistic because the proposed value was actually 90 parts per million (ppm) and had inadvertently not been converted to mg/Nm^3 as part of the variation application (EPR/BW9999IG/V007).

K1 boiler has a thermal rated input of 2.25 MWth and is classed as a medium combustion plant (MCP), under the Medium Combustion Plant Directive which came into force through the Environmental Permitting Regulations (England and Wales) 2016 on 29 January 2018. As such, K1 will be required meet a NOx emission limit of 250 mg/Nm^3 from 1 January 2030. However, as this is the minimum standard applied, a tighter ELV will be applied where the evidence suggests that this can be met.

The evidence supplied in Kronospan notification of abnormal emissions form KC/PARTAB/NRW/06 proposes that a NOx ELV of 200 mg/Nm^3 would be appropriate, which is supported by monitoring data also supplied as part of the same notification.

On this basis, please amend the air quality dispersion modelling assessment for the overall site, so that it reflects a modelled value of 200 mg/Nm^3 NOx for K1. More specifically, the process contribution associated with the proposed value of 200 mg/Nm^3 shall be added to predicted releases of annual and short-term NOx from all other sources on site and the site’s overall impact on human health and habitats (critical levels and loads) shall be reassessed. The re-assessment shall consider both current site operations and proposed operation scenarios.

The dispersion modelling assessment has been updated to reflect the assumed operation of the K1 boiler with a NOx ELV of 200 mg/Nm^3 (3% reference oxygen content), which equates to a release rate of 0.208 g/s.

Table AC.1 in the dispersion modelling assessment sets out a summary of the results. A table in the same format has been produced which includes the changes to the impacts for oxides of nitrogen, hydrogen chloride and hydrogen fluoride (question 2), presented in Appendix B.

As shown the increase in emissions from the K1 boiler will result in an increase the peak impact. However, the annual mean peak PEC would remain below 70% of the AQAL, and the short-term peak would remain below 20% of the headroom for the likely emissions scenario.

Updated figures have been produced, refer to Appendix A, which account for the revised emissions from the K1 boiler:

- Updated Figure 7: Annual Mean Nitrogen Dioxide PC – Normal Operations – Emissions
- Updated Figure 8: Annual Mean Nitrogen Dioxide PC – Normal Operations – Worst-Case Emissions
- Updated Figure 9: 99.79%ile of 1-hour Nitrogen Dioxide PC – Normal Operations –Likely Emissions

- Updated Figure 10: 99.79%ile of 1-hour Nitrogen Dioxide PC – Normal Operations – Worst-Case Emissions
- Updated Figure 27: Annual Mean NOx Process Contribution - Normal Operations - Proposed Operations - Likely Emissions
- Updated Figure 31: Max Daily Mean NOx Process Contribution - Normal Operations - Proposed Operations - Likely Emissions

As shown the inclusion of the K1 boiler is predicted to have a slight impact on the distribution of emissions of oxides of nitrogen. However, the conclusions of the assessment submitted with the EP application do not change.

2 MDF 2 Cyclones / K7 Solid Fuel Boiler

The Wrexham County Borough Council (WCBC) permit WCBC/IPPC/03/KR(V3) sets ELVs in table 6.8.1 "Emission limits to air – MDF 2 Cyclones" for hydrogen chloride (HCl) and hydrogen fluoride (HF). It is our understanding that the exhaust gas from K7 Solid Fuel Boiler is also released through the MDF2 Cyclones.

These parameters have not been modelled as releases from K7 Solid Fuel Boiler / MDF2 Cyclones, despite being regulated by emission limits in the WCBC permit. It is our understanding that HCl and HF are likely to originate from the combustion of biomass in K7 Solid Fuel Boiler, rather than the MDF manufacturing process. (This assumption is based on a comparison of BAT-AELS set for biomass combustion plants in the Large Combustion Plant (LCP) Bat Conclusions (BATC), against the BAT-AELs for channelled releases to air in the production of wood panels BATC.

Please confirm the source of these pollutants and update the air quality modelling assessment to include the predicted emissions of HCl and HF from the appropriate source(s) being released at the WCBC permit ELVs. The process contribution associated with the HCl and HF releases shall be added to predicted releases from all other sources of the same pollutants (i.e. K8 Biomass Plant) to ensure that the updated assessment considers the site's overall impact on human health and habitats. The updated assessment shall consider both current site operations and proposed operation scenarios.

In addition, Kronospan has submitted the results of formaldehyde monitoring from K7 Solid Fuel Boiler (via email dated 22/11/19). These results show that formaldehyde can be emitted in low concentrations from K7. In view of this, please update the air quality modelling assessment to include the predicted emission of formaldehyde from K7. The process contribution associated with formaldehyde releases from K7 shall be added to predicted releases from all other sources of the same pollutant (i.e. MDF 1 Cyclones, MDF 2 Cyclones, New and Existing WESP, Units A1, A5 and A6) to ensure that the updated assessment considers the site's overall impact on human health. The updated assessment shall consider both site operations and proposed operation scenarios.

When submitting the updated modelling assessments, please ensure that the terminology for emission points and scenarios used in the modelling files and reports match to aid interpretation.

Emissions of hydrogen chloride, hydrogen fluoride and formaldehyde were not included from K7 solid fuel boiler as it was not proposed to apply for ELVs for these sources. The WCBC permit sets ELVs on emissions from the MDF 2 cyclone rather than the K7 solid fuel boiler. It is proposed that the limit should actually be on the K7 solid fuel boiler as this would be the potential source of these pollutants from the MDF 2 cyclone. The release rate is calculated as the concentration multiplied by the volumetric flow rate. As the volume release from the MDF 2 cyclone is significantly larger than that going into the MDF 2 cyclone from the K7 solid fuel boiler, the release rate would be significantly over estimated. Therefore, the emissions of hydrogen chloride and hydrogen fluoride have been calculated based on operation of the K7 solid fuel boiler at the emission limits with the flue gas from the K7 solid fuel boiler being released via the MDF 2 cyclones. This is the same approach that has been taken on the emissions of these pollutants from the MDF 1 cyclone.

For modelling purposes, it has been assumed that the K7 boiler will release hydrogen chloride and hydrogen fluoride at the upper end of the rage of the BAT-AEL's stated in the Large Combustion Plant BAT Conclusions for existing plant. This equates to the following release rates:

- hydrogen chloride (BAT-AEL) 35 mg/Nm^3 - 0.893 g/s; and
- hydrogen fluoride (BAT-AEL) 1.5 mg/Nm^3 - 0.038 g/s.

The monitoring from K7 solid fuel boiler has shown that small amounts of formaldehyde would be emitted from the boiler. However, as explained in the Section 3 of the Dispersion Modelling Assessment submitted with the EP application the K7 solid fuel boiler would normally emit to atmosphere via the MDF 2 cyclone, which itself has an ELV for formaldehyde. In the event that the MDF 2 cyclone is offline this would emit to atmosphere via MDF 1 cyclone which also has an ELV for formaldehyde. It is only in the event that MDF 1 and MDF 2 are offline that the K7 solid fuel boiler would need to vent to atmosphere via its own dedicated stack. However, this would not occur for any prolonged periods as it would not be beneficial for Kronospan to operate the plant when the steam is not needed for the manufacturing process. In addition, in this scenario the MDF cyclones would be offline which is the main source of formaldehyde and as such the impact would be less than normal operations. Therefore, we have not re-produced impacts (or re-modelled) for formaldehyde emissions from the K7 solid fuel boiler.

Table AC.1 in the dispersion modelling assessment set out a summary of the results. A table in the same format has been produced which includes the changes to the impacts for hydrogen chloride, hydrogen fluoride, and oxides of nitrogen (question 1), This is contained in Appendix B.

As shown the inclusion of emissions from the K7 solid fuel boiler is expected to increase the peak impact. However, the annual mean peak PEC would remain below 70% of the AQAL, and the short-term peak would remain below 10% of the AQAL. Furthermore, the conclusions of the assessment submitted with the EP application do not change.

3 K8 Biomass Plant

(a) Air Quality Modelling of Half Hourly Averages

The WCBC permit WCBC/IPPC/03/KR(V3) sets half-hourly and daily average ELVs in table 6.5.1 for the K8 Biomass plant. Kronospan have previously confirmed via email (dated 29 October 2019) that they wish to retain half-hourly averages for the plant under an NRW permit.

Whilst the daily average ELVs have been modelled as part of the Appendix C Air Quality Assessments in variation application EPR/BW9999IG/V008, the half-hourly average ELVS set for K8 pollutant parameters have not been modelled. This information is required if the half-hourly averages and abnormal operation allowance for K8 are to be retained in an NRW permit, as emissions at the half-hourly average ELVs contribute towards the likely worst-case emissions.

Therefore, please amend the air quality dispersion modelling assessment for the overall site, so that it reflects not only the daily average ELVs for K8, but the half-hourly average ELVs compared against the hourly environmental quality standards as well. For clarity, half-hourly average ELVs are set for the following K8 pollutant parameters: particulate matter (PM), Total Organic Carbon (TOC), HCl, carbon monoxide (CO), sulphur dioxide (SO2) and NOx.

The modelling has been updated to reflect the operation of the K8 biomass plant at the half hourly ELVs as currently set out in the WCBC permit, which reflect the half-hourly emission limits for an incineration plant within the IED. Under standard conditions emissions from the K8 biomass plant vent to atmosphere via the MDF 1 cyclone. Therefore, whilst the have half-hourly ELVs could be applied to the K8 biomass plant, the emissions from the MDF 1 cyclone would still need to be complied with, namely NOx, PM and TVOC. Therefore, this analysis has only focussed on HCL, CO, SO2.

Table 2 in Appendix B contains a summary table assuming operation of the K8 biomass plant at the half-hourly ELVs. Results are presented for standard operations (i.e. K8 venting to atmosphere via the MDF 1 cyclone, and when the MDF 1 cyclone is offline). The PC includes the contribution from the K7 solid fuel boiler (as modified in response to Question 2).

As shown, under standard operations the impact can be screened out as insignificant for all pollutants except for the sulphur dioxide impact for the 15-minute mean. The maximum impact is predicted to be 12.6% of the AQAL. Whilst this cannot be screened out as insignificant this is less than 20% of the headroom. Therefore, it can be descried as not significant. This analysis is extremely worst-case as it assumes that the worst-case meteorological conditions for dispersion coincide with the operation at the half-hourly ELVs.

(b) Abnormal Operations Impact Assessment

Kronospan have previously confirmed via email (dated 29 October 2019) that they wish to continue with the abnormal operation allowance for K8 under an NRW permit. However, an abnormal emissions impact assessment has not been provided.

Please submit a written abnormal emissions impact assessment for K8 and supply the electronic modelling files supporting this. In making the assessment of abnormal operations, please consider the range of different abnormal operating conditions that could lead to abnormal emission levels of pollutants being released and use plausible abnormal emission levels. The following pollutant parameters shall be considered with regard to the impact of emissions from abnormal operation on human health short term environmental quality standards (EQS):

Dioxin and Furan, Mercury, NOx, PM, metal emissions other than mercury, SO_2, HCl, dioxin-like PCBs, CO and TOC.

This requirement is important because abnormal operation of K8 contributes towards worst-case emissions from the site. As such, the assessment of the impact of abnormal operations is required to verify that the Chapter IV Industrial Emissions Directive (IED) periods for abnormal operation of no more than a period of 4 hours continuous operation and no more than 60-hour aggregated operation in any calendar year are appropriate.

The abnormal emissions impact assessment and associated modelling files should consider abnormal emissions in the context of K8 and IED requirements, as well as adding predicted abnormal emissions to releases of the same pollutants from the rest of the site, to demonstrate the predicted impact on human health and ecological receptors when K8 is running in abnormal operation at the same time as operations across the rest of the site. The updated air quality assessment shall consider both site operations and proposed operations scenarios.

Please note that item 3a) above (Air Quality Modelling of Half-hourly averages) will not be required if the plausible abnormal emission levels used in the Abnormal Operations Impact Assessment are more conservative than the half-hourly ELVs set for K8.

An updated Abnormal Emissions Assessment is provided in Appendix C.

(c) <u>Human Health Risk Assessment (HHRA)</u>

The HHRA does not consider the consumption of locally caught fish as a potential pathway of concern. The Chirk Fishery (fly fishery and hatchery) is approximately 1.4 km to the south west of the facility and fish originating from here may be for human consumption. The fish pathway (via ingestion of locally caught fish) is an important pathway for bioaccumulation of some pollutants such as some dioxins and furans and dioxin-like PCBs and some metals (mercury and thallium). Please consider the risk of exposure from the consumption of fish originating from the Fishery in the HHRA for dioxins, dioxin-like PCBs, mercury and thallium intake.

In view of the above, please re-run the IRAP-h model and resubmit the HHRA. Please also supply electronic copies of the revised modelling files, which should include the .IRP file.

An HHRA addendum note is provided in Appendix D.

(d) <u>Auxiliary Fuel for K8</u>

Page 25 of the Fichtner "Human Health Risk Assessment" which forms part of Appendix C of the variation application states:

"Start-up of the K8 Biomass Plant from cold will be conducted with clean support fuel (low sulphur light fuel oil)".

This will also be used as a supplementary fuel when required to maintain the temperature of the combustion chamber at the required 850°C for 2 seconds.

Please provide a copy of the Material Safety Data Sheet for the light fuel oil, so that the sulphur content can be verified.

It can be confirmed that there is an error in the Human Health Risk Assessment. The K8 biomass plant is equipped with a low NOx natural gas fired auxillray burner to support with the start-up, shut down and low temperature conditions. Low sulphur light fuel oil is not used for start-up and shutdown purposes.

4 Background Noise Monitoring

We have assessed Kronospan's 2016 "Baseline noise survey at nearest receptors", submitted on 5 June 2019, and consider that the 2016 survey data may not be representative of the background noise at the nearest sensitive receptors.

The reference time intervals for noise measurement in BS4142:2014 are: 1 hour during the day from 07:00 hrs to 23:00 hrs and 15 minutes at night from 23:00 hrs to 07:00 hrs. However, Kronospan's 2016 Baseline noise survey contains only 3 x 5-minute sequential measurements being taken at each receptor during the day and night. Also, the noise measurements were conducted during a single 24-hour period, specifically Thursday 8 to Friday 9 September 2016. As such the measurement time may be too short to be representative of typical background noise levels at sensitive receptors and to pick up variations in noise levels. Furthermore, the survey report did not provide any further information whether the measurements were representative of the noise level during the daytime and night-time.

In order to increase confidence in the representativeness of background noise measurements at the 9 sensitive receptors identified in the 2016 report (expressed as $L_{A90,T}$), please repeat the monitoring of $L_{A90,T}$ using the reference time intervals from BS4142:2014+A1:2019. Measurements can be contiguous or disaggregated but shall capture the range of background sound levels for the period being assessed, taking care to consider diurnal variation and variation during weekday and weekend periods.

The results of this measurement exercise shall be submitted in the form of a written monitoring report, including as a minimum the information detailed in Section 12 of BS4142:2014+A1:2019 pertaining to the background survey. This shall include the weather conditions at the time of monitoring, (e.g. wind speed and direction). The report shall also include the $L_{A90\ (t\ min)}$ measurements used to determine the final background values for day and night time periods (including background values determined for different daytime / night time periods where significant diurnal or weekday / weekend variation has been identified). Please also provide the single octave bands associated with the background measurement as this can provide information regarding the "character" of the sound and helps to inform whether the specific sound is likely to be incongruous.

Measurements in the absence of train deliveries during night time periods shall be included in the final determination of the $LA_{90(15\ min)}$.

Please also submit the electronic file of time series noise recording data for verification of the L_{A90} with the monitoring report. The report shall also include a statistical analysis histogram graph showing the range of background sound levels recorded and demonstrating which is the most representative background level and why (i.e. the background sound level occurring for most of the time as per section 8 of BS4142: 2014 + A1:2019).

Response to follow.

Appendices

A Updated figures

Figure 1: Updated Figure 7 – Annual Mean Nitrogen Dioxide PC – Normal Operations – Likely Emissions

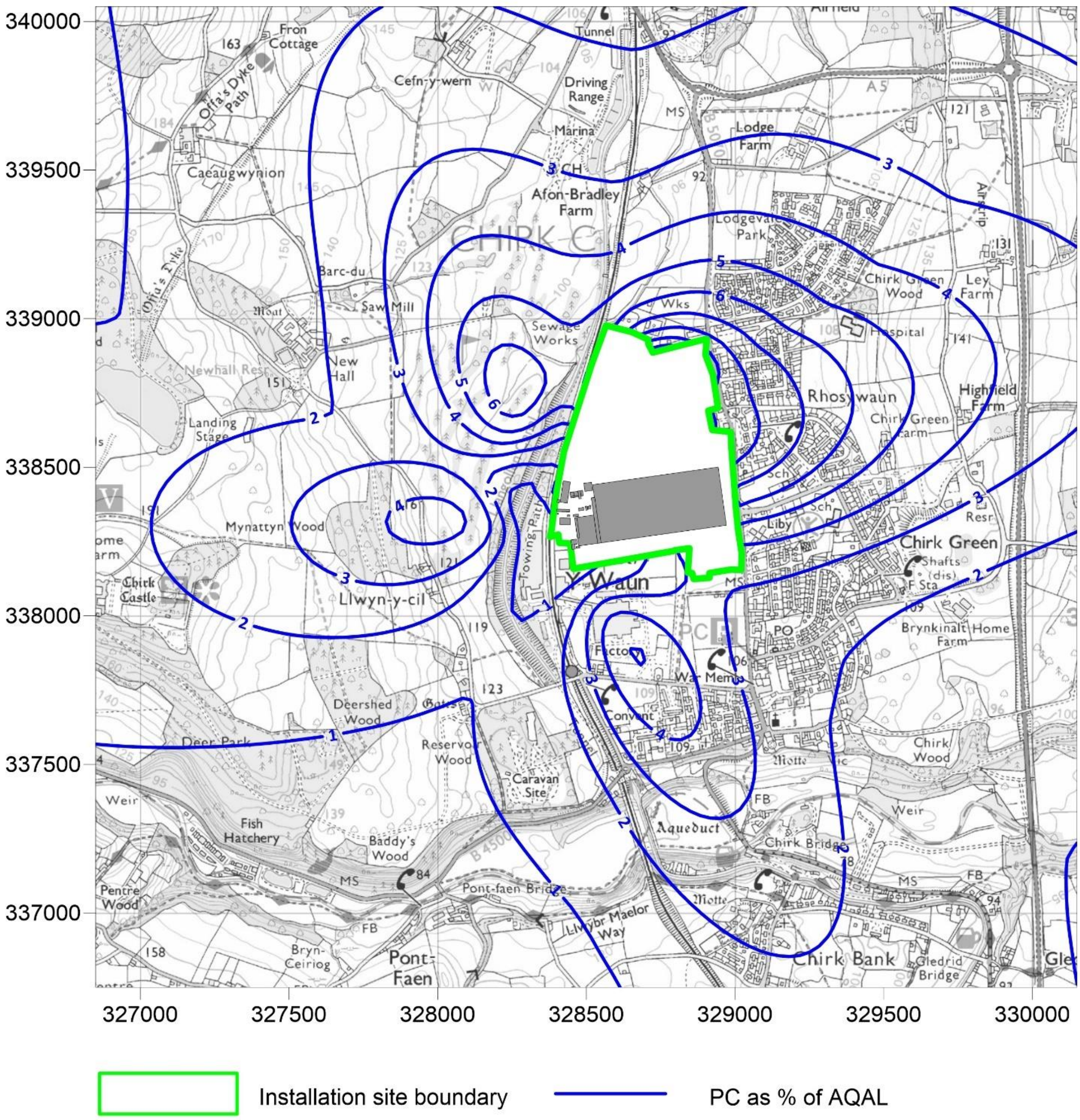


Figure 2: Updated Figure 8 – Annual Mean Nitrogen Dioxide PC – Normal Operations – Worst-Case Emissions

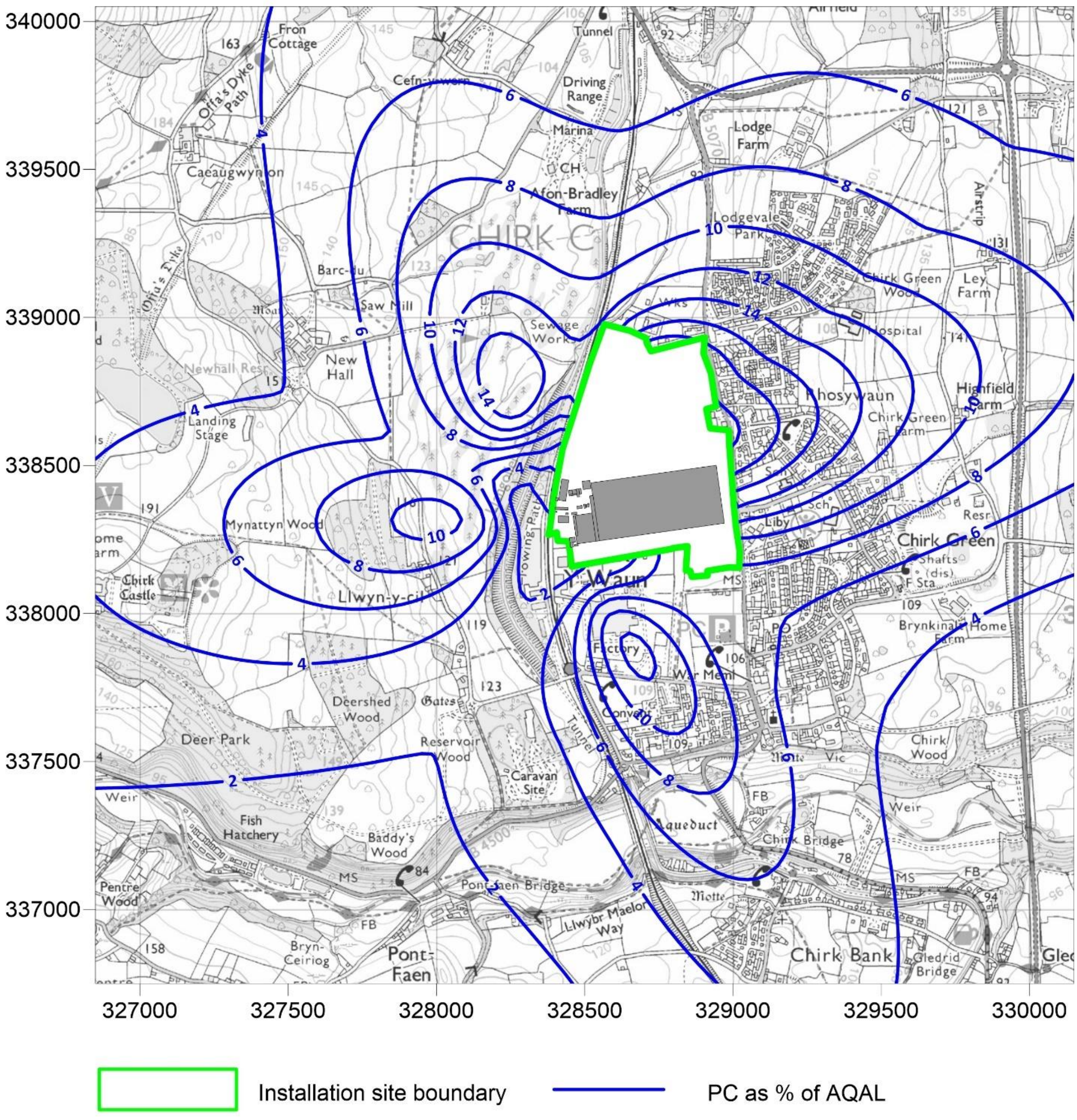


Figure 3: Updated Figure 9 – 99.79%ile of 1-hour Mean Nitrogen Dioxide PC – Normal Operations – Likely Emissions

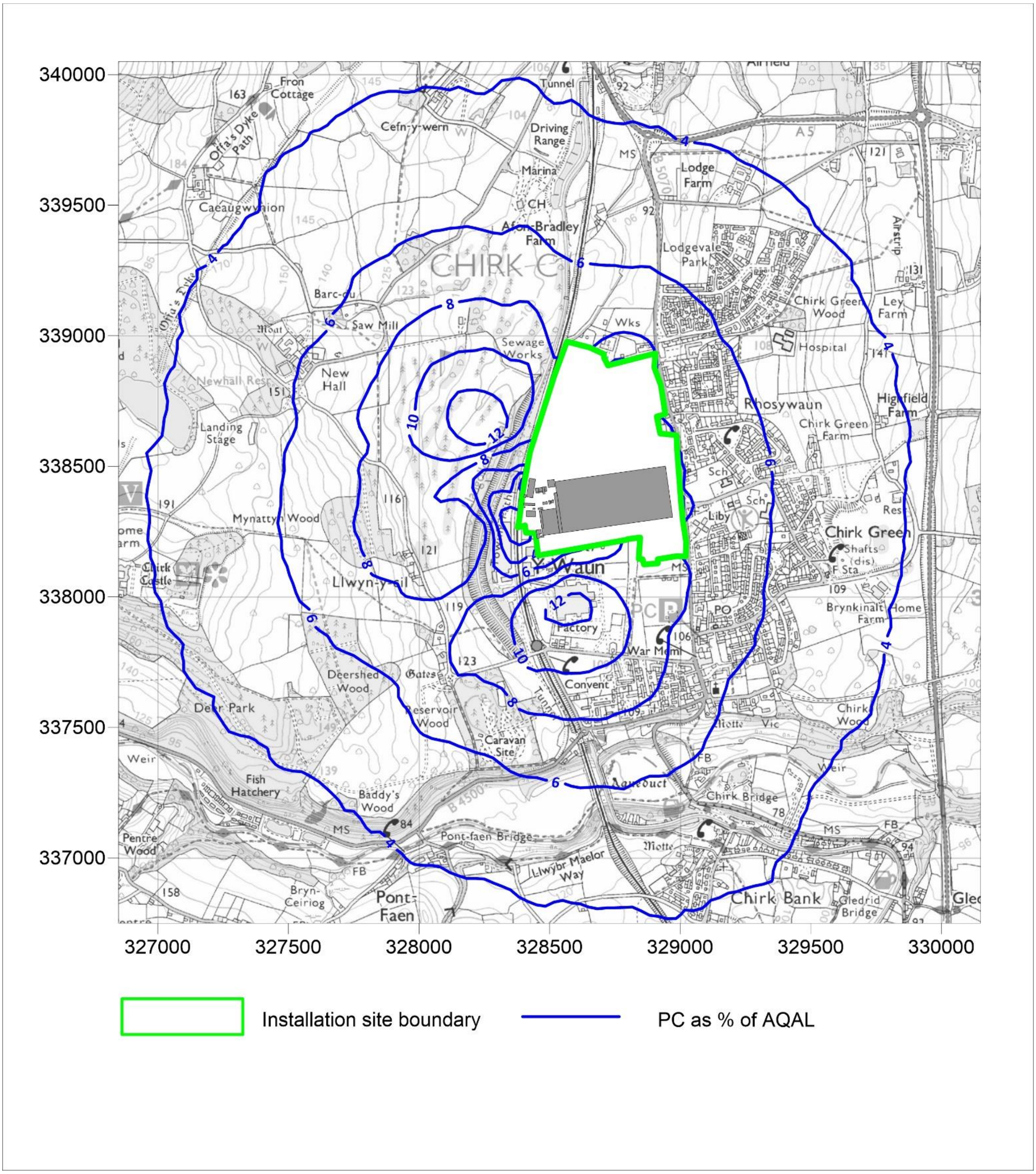


Figure 4: Updated Figure 10 – 99.795ile of 1-hour Mean Nitrogen Dioxide PC – Normal Operations – Worst-case Emissions

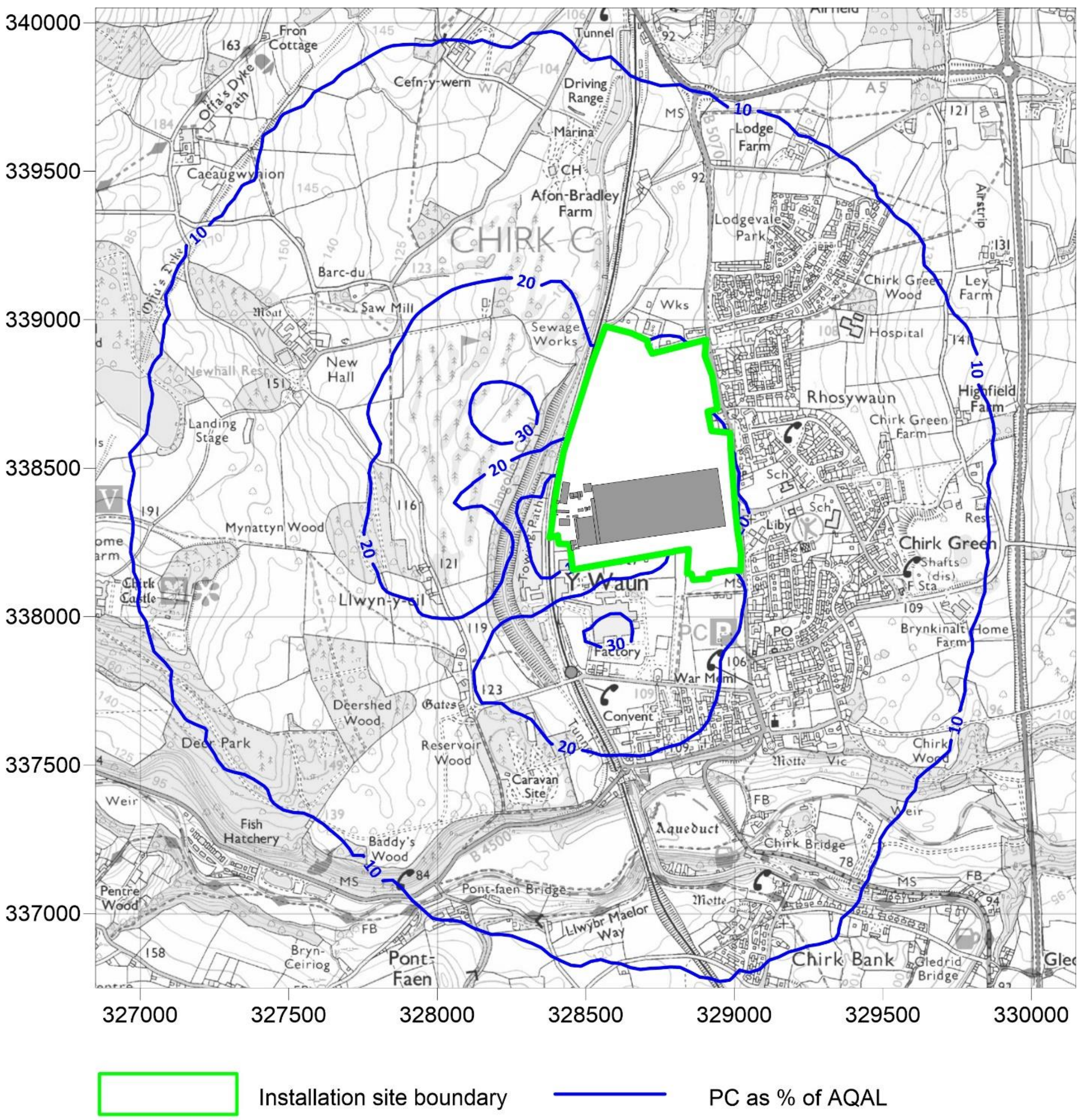


Figure 5: Updated Figure 27 – Annual Mean NOx PC – Normal Operations – Likely Emissions

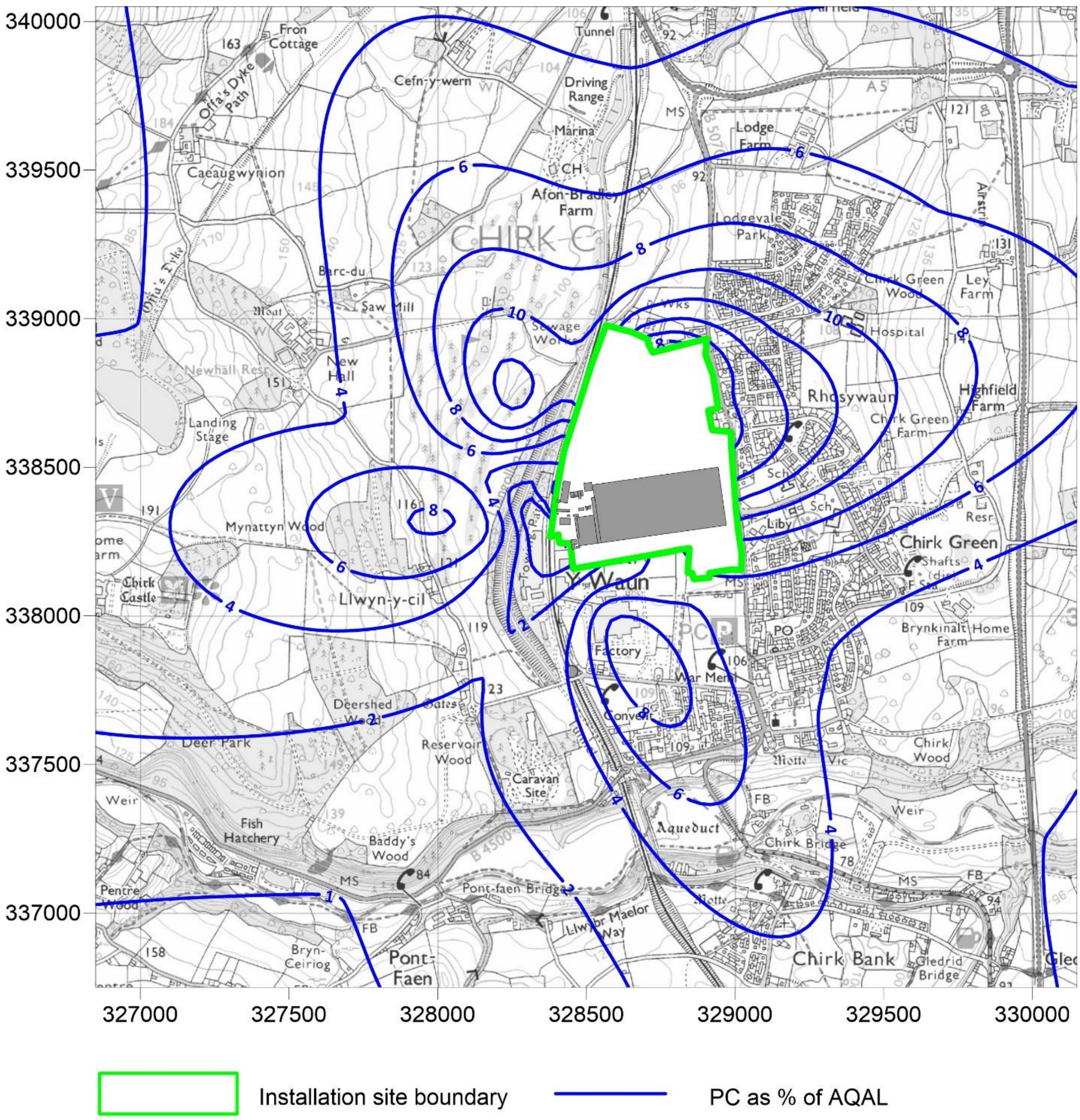
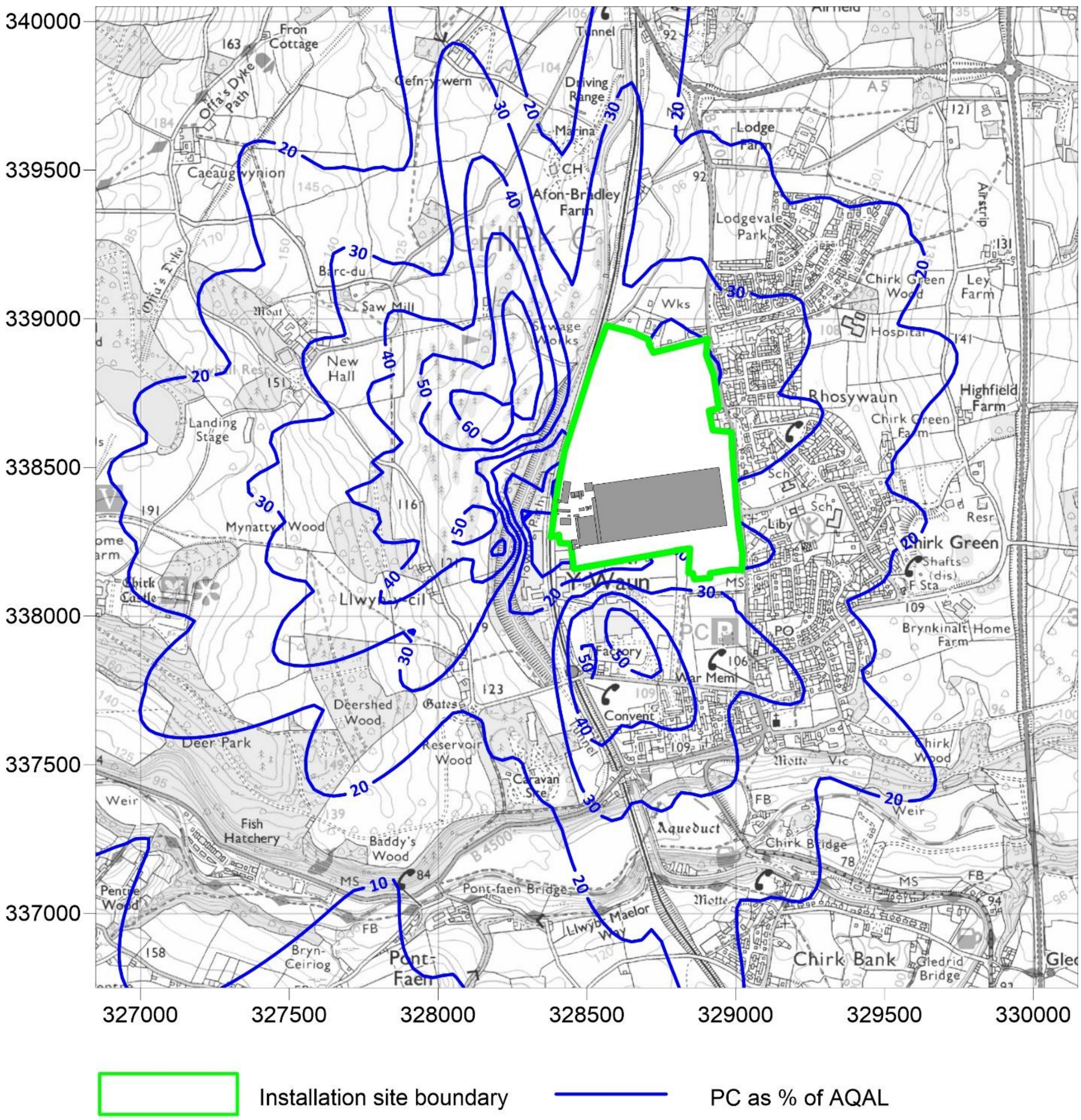


Figure 6: Updated Figure 31 – Max Daily Mean NOx PC – Normal Operations – Likely Emissions



B Detailed results table

Table 1: Summary of results – standard operations

Pollutant	Quantity	AQAL	Bg	Point of Maximum Impact				Maximum Impact outside Installation Boundary			
				PC		PEC		PC		PEC	
		µg/m³	µg/m³	µg/m³	% of AQAL	µg/m³	% of AQAL	µg/m³	% of AQAL	µg/m³	% of AQAL
Nitrogen dioxide – Likely Case	Annual mean	40	11.10	5.76	14.4%	16.86	42.2%	4.12	10.3%	15.22	38.0%
	99.79th %ile of hourly means	200	22.20	27.82	13.9%	50.02	25.0%	27.82	13.9%	50.02	25.0%
Nitrogen dioxide – Worst Case	Annual mean	40	11.10	9.98	25.0%	21.08	52.7%	8.45	21.1%	19.55	48.9%
	99.79th %ile of hourly means	200	22.20	69.45	34.7%	91.65	45.8%	69.45	34.7%	91.65	45.8%
Hydrogen chloride	Hourly mean	750	1.42	7.65	1.0%	9.07	1.2%	4.62	0.6%	6.04	0.8%
Hydrogen fluoride	Annual mean	16	2.35	0.010	0.06%	2.36	14.7%	0.010	0.06%	2.36	14.7%
	Hourly mean	160	4.70	0.602	0.38%	5.30	3.3%	0.366	0.23%	5.07	3.2%

Table 2: Summary of results – Operation of K8 biomass plant at half-hourly ELVs – Standard Operations

Pollutant	Quantity	AQAL	Bg	Point of Maximum Impact				Maximum Impact outside Installation Boundary			
				PC		PEC		PC		PEC	
		µg/m³	µg/m³	µg/m³	% of AQAL	µg/m³	% of AQAL	µg/m³	% of AQAL	µg/m³	% of AQAL
Carbon monoxide	Maximum 8-hour rolling mean	10000	446.0	52.03	0.52%	498.03	5.0%	52.03	0.52%	498.03	5.0%
Sulphur dioxide	99.73%ile 1-hour mean	350	6.80	28.15	8.04%	34.95	9.98%	28.15	8.04%	34.95	9.98%
	99.9%ile 15-minute mean	266	6.80	33.42	12.56%	40.22	15.1%	33.42	12.56%	40.22	15.1%
Hydrogen chloride	Hourly mean	750	1.42	28.15	3.75%	29.57	3.94%	28.15	3.75%	29.57	3.94%

Table 3: Summary of results – Operation of K8 biomass plant at half-hourly ELVs – K8 Venting via dedicated stack

Pollutant	Quantity	AQAL	Bg	Point of Maximum Impact				Maximum Impact outside Installation Boundary			
				PC		PEC		PC		PEC	
		µg/m³	µg/m³	µg/m³	% of AQAL	µg/m³	% of AQAL	µg/m³	% of AQAL	µg/m³	% of AQAL
Carbon monoxide	Maximum 8-hour rolling mean	10000	446.0	5.52	0.06%	-	-	5.52	0.06%	-	-
Sulphur dioxide	99.73%ile 1-hour mean	350	6.80	8.54	2.44%	-	-	8.54	2.44%	-	-
	99.9%ile 15-minute mean	266	6.80	12.54	4.71%	-	-	12.54	4.71%	-	-
Hydrogen chloride	Hourly mean	750	1.42	5.13	0.68%	-	-	5.13	0.68%	-	-

C Abnormal Emissions Assessment

FICHTNER

Consulting Engineers Limited

Chirk Particleboard Facility

Kronospan

Abnormal Emissions Assessment

ENGINEERING CONSULTING

Document approval

	Name	Signature	Position	Date
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Checked by:	James Sturman		Lead Consultant	08/04/2020

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0	24/03/2020	First draft for Client review	RSF	JRS
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Contents

1 Introduction

This Abnormal Emissions Assessment has been produced to support the Schedule 5 response for additional information to assist with Natural Resources Wales's (NRWs) determination of the Environmental Permit (EP) application for the Particleboard Facility (the Facility) in Chirk. The Facility includes the K8 Biomass Plant which is regulated under the Industrial Emissions Directive (IED).

Article 46(6) of the Industrial Emissions Directive (IED) states that:

"… the waste incineration plant … shall under no circumstances continue to incinerate waste for a period of more than 4 hours uninterrupted where emission limit values are exceeded.

The cumulative duration or operation in such conditions over 1 year shall not exceed 60 hours."

Article 47 continues with:

"In the case of a breakdown, the operator shall reduce or close down operations as soon as practicable until normal operations can be restored."

The conditions detailed in Article 46(6) are considered to be "abnormal operating conditions" for the purpose of this assessment applies to the K8 Biomass Plant.

As detailed in the Dispersion Modelling Assessment undertaken to support the EP application, under standard operating conditions, the emissions from the K8 Biomass Plant are used in the MDF 1 drier and released to atmosphere via the MDF 1 cyclone. However, in the event that the MDF 1 drier is offline these emissions would be used in the MDF 2 drier and released to atmosphere via the MDF 2 cyclone. In the event that both MDF driers are offline the emissions from the K8 Biomass Plant would be released to atmosphere via the dedicated stack on the K8 Biomass Plant. Therefore, this assessment has considered the abnormal operations as defined by the IED for following the operating scenarios:

1. Standard operations – K8 Biomass Plant releasing to atmosphere via the MDF 1 cyclone together with two gas engines;
2. MDF 1 offline - K8 Biomass Plant releasing to atmosphere via the MDF 2 cyclone together with the K7 Solid Fuel Boiler and four gas engines;
3. MDF 2 offline – K8 Biomass Plant releasing to atmosphere via the MDF 1 cyclone together with the K7 Solid Fuel Boiler and two gas engines; and
4. MDF 1 and 2 offline - K8 Biomass Plant releasing to atmosphere via its dedicated stack.

Following confirmation from NRW this analysis has only focussed on the impact of abnormal operations on the short- term impact of emissions noting that the effect of any short term increase would not have a significant effect on the long term air quality impacts associated with the Facility.

When considering the impact of emissions from the K8 Biomass Plant venting to atmosphere via either the MDF 1 or MDF 2 cyclone only those pollutant which would not be limited at the exit from the cyclones has been considered as the MDF cyclones would still need to demonstrate compliance with the limits even during these abnormal events.

2 Identification of Abnormal Operating Conditions

The following are considered to be examples of abnormal operating conditions which may lead to 'abnormal emission levels' of pollutants from the K8 Biomass Plant:

1. Reduced efficiency of lime injection system such as through blockages or failure of fans leading to elevated acid gas emissions;
2. Complete failure of the lime injection system leading to unabated emissions of hydrogen chloride. (Note: this would require the plant to have complete failure of the bag filter system. As a plant of modern design the plant would have shut down before reaching these operating conditions);
3. Reduced efficiency of particulate filtration system due to bag failure and inadequate isolation, leading to elevated particulate emissions and metals in the particulate phase;
4. Reduced efficiency of the Selective Non-Catalytic Reduction (SNCR) system as a result of blockages or failure of ammonia injection system, leading to elevated oxides of nitrogen emissions; and
5. Loss of temperature control leading to high levels of dioxin reformation and their unabated release.

The identification of plausible abnormal emission levels has been based primarily on the data obtained from modern plants. Where actual data is not available, worst case conservative assumptions have been made.

2.1 Plant start-up and shutdown

The K8 Biomass Plant is equipped with a low NOx natural gas fired auxiliary burner to support the start-up and shut-down process and during low temperature conditions. Waste wood is not introduced onto the grate unless the temperature is above the minimum requirement (850ºC) and other operating parameters (for example, air flow and oxygen levels) are within the range stipulated in the permit. During the warming up period the gas cleaning plant is operational as is the control systems and monitoring equipment.

The same is true during plant shutdown. The waste wood remaining on the grate is allowed to burn out, the temperature not being permitted to drop below 850ºC by the use of the low NOx natural gas fired auxiliary burner. After complete burnout of the waste wood, the burners are turned off and the plant is allowed to cool. During this period the gas cleaning equipment is fully operational, as is the control systems and monitoring equipment.

It should also be noted that start-up and shutdown are infrequent events; the K8 Biomass Plant is designed to operate continuously, and ideally only shut down for its scheduled maintenance programme.

In relation to the magnitude of dioxin emissions during plant start-up and shutdown, research has been undertaken by AEA Technology on behalf of the Environment Agency. Whilst elevated emissions of dioxins (within one order of magnitude) were found during shutdown and start-up phases where the fuel was not fully established on the grate, the report concluded that:

"The mass of dioxin emitted during start-up and shutdown for a 4-5 day planned outage was similar to the emission which would have occurred during normal operation in the same period. The emission during the shutdown and restart is equivalent to less than 1 % of the estimated annual emission (if operating normally all year)."

There is therefore no reason why such start-up and shutdown operations will affect the long term impact of the K8 Biomass Plant.

3 Plausible Abnormal Emission Levels

The following plausible abnormal emission levels for the K8 Biomass Plant have been identified based on the performance of similar plants in the UK. The plausible abnormal emissions concentrations are presented in Table 1, where available, these have been based on measured data from a comparable facility.

Table 1: Plausible Abnormal Emissions

Pollutant	Permitted Emission Limit, (mg/Nm^3)(1)		Plausible Abnormal Emission, (mg/Nm^3)	% Above Max Permitted Emission
	Daily Average	½ hourly max		
Oxides of nitrogen	300	600	750(2)	25
Particulate matter (PM_{10})	15	45	225(3)	400
Sulphur dioxide	75	300	675(4)	125
Hydrogen chloride	15	90	1,350(4)	1,400
Hydrogen fluoride	1.5	6	30(4)	400
Dioxins and dioxin-like PCBs	0.01 ng/Nm^3		10 ng/Nm^3	9,900(5)
PCBs	0.0075 mg/Nm^3(6)		0.75 mg/Nm^3	9,900(7)

Notes:

(1) All emissions expressed as Nm^3 based (dry, 0°C, 6% reference oxygen content).

(2) Taken as the upper end of the range of monitored raw flue gas after the boiler from the Waste Incineration BREF (Table 3.6) converted to 6% reference oxygen content.

(3) Taken from the IED maximum permitted level converted to 6% reference oxygen content.

(4) Based on information presented in the Devonport Decision Document (Reference: EPR/WP3833FT) converted to 6% reference oxygen content.

(5) Assumes a 99% removal efficiency in lieu of any other information as set out in the Devonport Decision Document.

(6) The Waste Incineration BREF provides a range of values for PCB emissions to air from European municipal waste incineration plants. This states that the annual average total PCBs is less than 0.005 mg/Nm^3 (dry, 11% oxygen, 273K). In lieu of other available data, this has been assumed to be the emission concentration for the Facility converted to 6% reference oxygen content.

(7) In lieu of any publicly available information, the plausible emissions multiplier for PCBs is assumed to be the same as for dioxins.

A number of assumptions have been made with regard to the emissions of individual metals.

1. Emission concentration of mercury has been assumed to be 100% of the ELV concentration of 0.05 mg/m^3.
2. Emission concentration of cadmium has been taken as half the ELV concentration for cadmium and thallium and compounds of 0.05 mg/m^3.
3. Emission concentration of heavy metals that have a short or long term EAL have been considered (antimony, arsenic, chromium, copper, lead, manganese, nickel, vanadium) and have been taken from the Environment Agency guidance document “Guidance on assessing group 3 metal stack emissions from incinerators” (version 4). This guidance summarises the

existing emissions from 18 Municipal Waste Incinerators (MWIs) and Waste Wood Co-incinerators in the UK over a period between 2007 and 2015.

4. The Predicted Abnormal Emission are calculated based on 15 times the emission concentration, as it is assumed that metals are in the particulate phase with the exception of mercury where it has been assumed there is a 99% removal efficiency.

The plausible abnormal emissions concentrations for metals are presented in Table 2.

Table 2: Plausible Abnormal Metal Emissions

Pollutant	Emission Concentrations (µg/Nm³)	Predicted Abnormal Emission (µg/Nm³)	% Above Max Permitted Emission
Antimony	11.5	172.5	1,400
Arsenic	25	375	1,400
Cadmium	25	375	1,400
Chromium	92	1380	1,400
Chromium (VI)	0.13	1.95	1,400
Copper	29	435	1,400
Lead	50.3	754.5	1,400
Manganese	60	900	9,900
Mercury	50	5,000	1,400
Nickel	220	3300	1,400
Vanadium	6	90	1,400

The definition of 'abnormal operating conditions' also encompasses periods where the continuous emission monitoring equipment is not operating correctly and data relating to the actual emission concentrations are not available. This assessment has only used data where the concentration of continuously monitored pollutants has been quantified. Furthermore, no data on flow characteristics (flow rate, temperature etc.) during these abnormal operating conditions is available, so for the purposes of this assessment the design flow characteristics have been applied to the plausible emission levels to derive an emission rate and assess impact.

In defining abnormal operating conditions Annex VI, Part 2 (2) notes that under no circumstances shall the total dust concentration exceed 150 mg/Nm³ expressed as a half hourly average. As such total dust has been included in this analysis. However, this section continues to state that the limits prescribed for TOC (VOCs) set must not be exceeded. As such there is no potential for the impact of emissions of TOC (VOCs) to be greater than that outlined in the Dispersion Modelling Assessment, and TOC (VOCs) has not been considered further in this assessment.

4 Impact Resulting from Plausible Abnormal Emissions

4.1 Predicted short term impacts – standard operations

In order to assess the effect on short term ground level concentrations associated with the K8 Biomass Plant operating at the identified abnormal emission concentration under standard operations, the calculated ground level concentration has been modelled with the operation of the K8 Biomass Plant as per the plausible abnormal emission levels. The PEC has also been calculated which includes the contribution from the other sources on site.

Emissions of oxides of nitrogen and particulate matter are limited at the exit from the MDF 2 cyclone even during abnormal operations. Therefore, the impact would be no greater than that set out in the Dispersion Modelling Assessment for these pollutants.

Table 3: Short-term Impacts Resulting from Plausible Abnormal Emissions – Standard Operations

Pollutant	AQAL (µg/m³)	Predicted Impact – Standard Operation		Predicted Impact – Abnormal Emissions		PEC – Abnormal Emissions	
		Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL
Nitrogen dioxide	200	Limited at MDF 2 cyclone so no greater than as set out in Dispersion Modelling Assessment					
Particulate matter (PM_{10})	50	Limited at MDF 2 cyclone so no greater than as set out in Dispersion Modelling Assessment					
Sulphur dioxide (24-hour)	125	2.31	1.8%	15.42	12.3%	22.22	17.8%
Sulphur dioxide (1-hour)	350	5.20	1.5%	38.15	10.9%	44.95	12.8%
Sulphur dioxide (15-min)	266	6.08	2.3%	45.88	17.2%	52.68	19.8%
Hydrogen chloride	750	7.65	1.0%	166.89	22.3%	168.31	22.4%
Hydrogen fluoride	160	0.60	0.4%	3.83	2.4%	8.53	5.3%
Pollutant	**AQAL (ng/m³)**	**Predicted Impact – Standard Operation**		**Predicted Impact – Abnormal Emissions**		**PEC – Abnormal Emissions**	
		Conc. ng/m³	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**
Antimony	150,000	1.37	0.001%	20.62	0.01%	22.18	0.01%
Chromium	150,000	11.00	0.007%	165.00	0.11%	172.54	0.12%
Copper	200,000	3.47	0.002%	52.01	0.03%	55.85	0.03%
Manganese	1,500,000	7.17	0.000%	107.61	0.01%	111.27	0.01%
Mercury	7,500	5.98	0.080%	597.82	7.97%	600.36	8.00%
Vanadium	1,000	0.72	0.072%	10.76	1.08%	12.46	1.25%

Pollutant	AQAL (µg/m³)	Predicted Impact – Standard Operation		Predicted Impact – Abnormal Emissions		PEC – Abnormal Emissions	
		Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL
PCBs	6,000	0.90	0.015%	89.63	1.49%	89.87	1.50%
NOTES: Predicted impact is from all sources at the Facility. The PEC is calculated as the contribution from all sources at the Facility and the background concentration as set out in the Dispersion Modelling Assessment.							

This is considered to be a conservative assessment as it assumes that the plausible abnormal emissions coincide with worst case meteorological conditions. Even with this conservative factor, the process contribution is not predicted to exceed any of the short term AQALs. The maximum predicted process contribution (as a % of the applied AQAL) is less than 25% for hydrogen chloride with all other pollutants lower.

4.2 Predicted short term impacts – MDF 1 offline

In order to assess the effect on short term ground level concentrations associated with the K8 Biomass Plant operating at the identified abnormal emission concentration when the MDF 1 drier is offline, the calculated ground level concentration has been modelled with the operation of the K8 Biomass Plant as per the plausible abnormal emission levels. In this instance the emissions from the K8 Biomass Plant are emitted to atmosphere via the MDF 2 drier. The PEC has also been calculated which includes the contribution from the other sources on site.

Emissions of oxides of nitrogen and particulate matter are limited at the exit from the MDF 2 cyclone even during abnormal operations. Therefore, the impact would be no greater than that set out in the Dispersion Modelling Assessment for these pollutants.

Table 4: Short-term Impacts Resulting from Plausible Abnormal Emissions – MDF 1 Offline

Pollutant	AQAL (µg/m³)	Predicted Impact – Standard Operation		Predicted Impact – Abnormal Emissions		PEC – Abnormal Emissions	
		Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL
Nitrogen dioxide	200	Limited at MDF 2 cyclone so no greater than as set out in Dispersion Modelling Assessment					
Particulate matter (PM_{10})	50	Limited at MDF 2 cyclone so no greater than as set out in Dispersion Modelling Assessment					
Sulphur dioxide (24-hour)	125	7.69	6.2%	14.97	12.0%	21.77	17.4%
Sulphur dioxide (1-hour)	350	17.14	4.9%	33.36	9.5%	40.16	11.5%
Sulphur dioxide (15-min)	266	19.10	7.2%	37.17	14.0%	43.97	16.5%
Hydrogen chloride	750	6.76	0.9%	86.73	11.6%	88.15	11.8%

Pollutant	AQAL (µg/m³)	Predicted Impact – Standard Operation		Predicted Impact – Abnormal Emissions		PEC – Abnormal Emissions	
		Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL
Hydrogen fluoride	160	0.43	0.3%	2.05	1.3%	6.75	4.2%
Pollutant	**AQAL (ng/m³)**	**Predicted Impact – Standard Operation**		**Predicted Impact – Abnormal Emissions**		**PEC – Abnormal Emissions**	
		Conc. ng/m³	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**
Antimony	150,000	0.69	0.000%	10.33	0.01%	11.89	0.01%
Chromium	150,000	5.51	0.004%	82.66	0.06%	90.20	0.06%
Copper	200,000	1.74	0.001%	26.06	0.01%	29.90	0.01%
Manganese	1,500,000	3.59	0.000%	53.91	0.00%	57.57	0.00%
Mercury	7,500	2.99	0.040%	299.49	3.99%	302.03	4.03%
Vanadium	1,000	0.36	0.036%	5.39	0.54%	7.09	0.71%
PCBs	6,000	0.45	0.007%	44.90	0.75%	45.14	0.75%

NOTES:
Predicted impact is from all sources at the Facility. The PEC is calculated as the contribution from all sources at the Facility and the background concentration as set out in the Dispersion Modelling Assessment.

The impact of all pollutants considered would be lower than abnormal operations for the standard operating regime as emissions from K8 would be emitted to atmosphere via the MDF 2 drier and cyclone which has a taller stack than the MDF 1 cyclone (which emissions from K8 would normally be emitted to atmosphere).

4.3 Predicted short term impacts – MDF 2 offline

In order to assess the effect on short term ground level concentrations associated with the K8 Biomass Plant operating at the identified abnormal emission concentration when the MDF 2 drier is offline, the calculated ground level concentration has been modelled with the operation of the K8 Biomass Plant as per the plausible abnormal emission levels. In this instance the emissions from the K8 Biomass Plant are emitted to atmosphere via the MDF 1 drier. The PEC has also been calculated which includes the contribution from the other sources on site.

Emissions of oxides of nitrogen and particulate matter are limited at the exit from the MDF 1 cyclone even during abnormal operations. Therefore, the impact would be no greater than that set out in the Dispersion Modelling Assessment for these pollutants.

Table 5: Short-term Impacts Resulting from Plausible Abnormal Emissions – MDF 2 Offline

Pollutant	AQAL (µg/m³)	Predicted Impact – Standard Operation		Predicted Impact – Abnormal Emissions		PEC – Abnormal Emissions	
		Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL
Nitrogen dioxide	200	Limited at MDF 1 cyclone so no greater than as set out in Dispersion Modelling Assessment					
Particulate matter (PM_{10})	50	Limited at MDF 1 cyclone so no greater than as set out in Dispersion Modelling Assessment					
Sulphur dioxide (24-hour)	125	14.21	11.4%	27.64	22.1%	34.44	27.6%
Sulphur dioxide (1-hour)	350	34.98	10.0%	68.06	19.4%	74.86	21.4%
Sulphur dioxide (15-min)	266	42.35	15.9%	82.41	31.0%	89.21	33.5%
Hydrogen chloride	750	13.50	1.8%	173.12	23.1%	174.54	23.3%
Hydrogen fluoride	160	0.86	0.5%	4.09	2.6%	8.79	5.5%
Pollutant	**AQAL (ng/m³)**	**Predicted Impact – Standard Operation**		**Predicted Impact – Abnormal Emissions**		**PEC – Abnormal Emissions**	
		Conc. ng/m³	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**
Antimony	150,000	1.37	0.001%	20.62	0.01%	22.18	0.01%
Chromium	150,000	11.00	0.007%	165.00	0.11%	172.54	0.12%
Copper	200,000	3.47	0.002%	52.01	0.03%	55.85	0.03%
Manganese	1,500,000	7.17	0.000%	107.61	0.01%	111.27	0.01%
Mercury	7,500	5.98	0.080%	597.82	7.97%	600.36	8.00%
Vanadium	1,000	0.72	0.072%	10.76	1.08%	12.46	1.25%
PCBs	6,000	0.90	0.015%	89.63	1.49%	89.87	1.50%

NOTES:
Predicted impact is from all sources at the Facility. The PEC is calculated as the contribution from all sources at the Facility and the background concentration as set out in the Dispersion Modelling Assessment.

The K8 Biomass Plant is the only source of metals from the Facility. It can be seen that when the MDF 2 cyclone is offline, the impact is the same as standard operations. This is because the emissions from K8 would vent to atmosphere via the MDF 1 cyclone in the same was as standard operations. However, the acid gases (sulphur dioxide, hydrogen chloride and hydrogen fluoride) impacts would be greater as the MDF 1 cyclone would also contain the emissions from the K7 Solid Fuel Boiler and abnormal operation of the K8 Biomass Plant. In any case the during abnormal operations the process contribution is not predicted to exceed any of the short term AQALs.

4.4 Predicted short term impacts – MDF 1 and 2 offline

In order to assess the effect on short term ground level concentrations associated with the K8 Biomass Plant operating at the identified abnormal emission concentration when the MDF 1 and MDF 2 driers are offline, the calculated ground level concentration has been modelled with the operation of the K8 Biomass Plant as per the plausible abnormal emission levels. The PEC has also been calculated which includes the contribution from the other sources on site.

When both the MDF 1 and MDF 2 driers are offline the emissions from the K8 Biomass Plant would emit to atmosphere via its dedicated stack. In this instance the limit set for oxides of nitrogen on the MDF cyclones would not apply. Therefore, the impact of abnormal operations of oxides of nitrogen and particulate matter has also been considered.

Table 6: Short-term Impacts Resulting from Plausible Abnormal Emissions – MDF 1 and MDF 2 Offline

Pollutant	**AQAL (µg/m³)**	**Predicted Impact – Standard Operation**		**Predicted Impact – Abnormal Emissions**		**PEC – Abnormal Emissions**	
		Conc. µg/m³	**% of AQAL**	**Conc. µg/m³**	**% of AQAL**	**Conc. µg/m³**	**% of AQAL**
Nitrogen dioxide (Likely case)	200	90.49	45.2%	90.49	45.2%	112.69	56.3%
Nitrogen dioxide (Worse case)	200	90.49	45.2%	90.49	45.2%	112.69	56.3%
Particulate matter (PM_{10})	50	8.74	17.5%	11.37	22.7%	40.37	80.7%
Sulphur dioxide (24-hour)	125	36.00	28.8%	36.12	28.9%	42.92	34.3%
Sulphur dioxide (1-hour)	350	76.39	21.8%	76.39	21.8%	83.19	23.8%
Sulphur dioxide (15-min)	266	82.30	30.9%	82.30	30.9%	89.10	33.5%
Hydrogen chloride	750	14.14	1.9%	79.63	10.6%	81.05	10.8%
Hydrogen fluoride	160	0.60	0.4%	1.82	1.1%	6.52	4.1%
Pollutant	**AQAL (ng/m³)**	**Predicted Impact – Standard Operation**		**Predicted Impact – Abnormal Emissions**		**PEC – Abnormal Emissions**	
		Conc. ng/m³	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**	**Conc. ng/m³**	**% of AQAL**
Antimony	150,000	0.66	0.000%	9.84	0.01%	11.40	0.01%
Chromium	150,000	5.25	0.003%	78.71	0.05%	86.25	0.06%
Copper	200,000	1.65	0.001%	24.81	0.01%	28.65	0.01%
Manganese	1,500,000	3.42	0.000%	51.33	0.00%	54.99	0.00%
Mercury	7,500	2.85	0.038%	285.18	3.80%	287.72	3.84%
Vanadium	1,000	0.34	0.034%	5.13	0.51%	6.83	0.68%
PCBs	6,000	0.43	0.007%	42.76	0.71%	43.00	0.72%

Pollutant	AQAL (µg/m³)	Predicted Impact – Standard Operation		Predicted Impact – Abnormal Emissions		PEC – Abnormal Emissions	
		Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL	Conc. µg/m³	% of AQAL

NOTES:

Predicted impact is from all sources at the Facility. The PEC is calculated as the contribution from all sources at the Facility and the background concentration as set out in the Dispersion Modelling Assessment.

As shown when the MDF 1 and MDF 2 driers are offline the impact of metals is lower than standard operations. This is because the emissions from K8 would vent to atmosphere via its dedicated stack which is significantly taller than the either of the MDF cyclones. However, the impact of acid gases would be higher than standard operations. The cumulative process contribution presented is from all sources on site. The higher acid gas concentrations is driven by the emissions from the K7 Solid Fuel Boiler which would vent to atmosphere via its dedicated stack. The stack for K7 is significant shorter than either of the MDF cyclones therefore concentrations from the K7 boiler are greater than if the emissions were to vent to atmosphere via either of the MDF cyclones. The chance of this occurring is minimal. In any case the during abnormal operations the process contribution is not predicted to exceed any of the short term AQALs.

5 Summary

An assessment of the impact on air quality associated with abnormal operating conditions from the K8 Biomass Plant has identified plausible abnormal emissions based on a review of monitoring data from operational facilities of a similar type in the UK. Notwithstanding the low frequency of occurrence of such abnormal operating conditions identified by the review, the potential impact on air quality has been assessed.

The predicted impact on air quality associated with the identified plausible abnormal emissions has been calculated by remodelling with the plausible abnormal emissions from the K8 Biomass Plant via the MDF 1 cyclone as per standard operations. In addition, the range of non-standard operating scenarios have been considered where the emissions from the K8 Biomass Plant vent to atmosphere either via the MDF 2 cyclone or its dedicated stack. The assessment is considered to be conservative as it assumes that the plausible abnormal emissions coincide with the worst-case meteorological conditions.

Even with this highly conservative factor, there are no predicted exceedences of any of the short-term air quality limits associated with abnormal operations for any operating scenario. The maximum predicted short term process contribution (as % of the applied AQAL) is less than 55% and therefore abnormal emissions from the K8 Biomass Plant will not cause any exceedences of any AQAL.

It is concluded that during four hour periods of abnormal operation of the K8 Biomass Plant as permissible under the IED (Article 46) is not predicted to give rise to an unacceptable impact on air quality or the environment.

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D Human Health Risk Assessment Addendum

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Kronospan

Chirk Particleboard Facility

Human Health Risk Assessment Addendum

1 Introduction

This addendum note has been prepared to support the Schedule 5 response for additional information to assist with Natural Resources Wales's (NRWs) determination of the Environmental Permit (EP) application for the Particleboard Facility (the Facility) in Chirk.

A Human Health Risk Assessment (HHRA) was submitted with the EP Application. This qualitatively considered the impact of additional exposure from the consumption of fish originating from Chirk Fishery. The HHRA explained that it was considered highly unlikely that fish caught at this location would make up a significant proportion of the diet of a single individual, and therefore this pathway was excluded from the assessment. However, NRW has requested that the risk of exposure from the consumption of fish originating from the Chirk Fishery is quantified, and that this should consider dioxins, dioxins-like PCBs, mercury and thallium.

The HHRA methodology compares the intake from each contaminant to the specific Tolerable Daily Intake (TDI). No TDI has been prescribed for thallium. Therefore, this addendum only considers the risk of exposure of dioxins, dioxin-like PCBs and mercury.

This addendum note follows the same approach as used for the HHRA submitted with the EP application. This includes the assumptions relating to the Mean Daily Intake (MDI) and Tolerable Daily Intake (TDI).

2 Updates to the modelling

The following updates have been made to the IRAP model to allow for the calculation of the risk of exposure from the consumption of fish originating from the Chirk Fishery:

1. including a "Fisher" receptor at the location of the Chirk Fishery;
2. including a watershed; and
3. including of a waterbody.

The "Fisher" receptor has been included in IRAP which assumes a person lives at the location of the Chirk Fishery, and consumes fish caught from the Chirk Fishery and home-grown produce. The typical "Fisher" type receptor in IRAP has been modified to exclude the ingestion of drinking water (post modelling) as it has been assumed that drinking water would be from mains supply and not affected by emissions from the Facility.

A watershed has been included which covers the Ceiriog confluence Dee to Teirw estimated from the Natural Resource Wales Water Watch Wales online mapping tool[1]. The USLE cover management factor has been set to be 0.1 and the USLE rainfall factor 600. These values have been estimated as the average across the watershed from EU European Commission, Institute of Environment and Sustainability, Land Resource Management Unit mapping.

A waterbody has been included which covers the Fishery area. Based on a description of the Fishery conditions the following estimates have been used:

- the depth of water column - 3.5 m;
- the total suspended solids content - 300 mg/L; and
- the average volumetric flow rate through the water body - 100,000 m^3/year.

3 Results and conclusions

The following table outline the impact of emissions from the Facility compared to the TDI at the Chirk Fishery for the "Fisher" type receptor.

Table 1: Impact Analysis – Chirk Fishery

Substance	MDI (% of TDI)		Process Contribution (% of TDI)		Overall (% of TDI)	
	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion
Adult						
Methyl mercury	-	3.11%	-	8.02%	-	11.13%
Mercuric chloride	-	0.71%	-	<0.001%	-	0.71%
Mercury	1.19%	-	<0.001%	-	1.19%	-
Dioxins and dioxin-like PCBs	35.00%		0.15%		35.15%	
Child						
Methyl mercury	-	8.04%	-	5.65%	-	13.69%
Mercuric chloride	-	1.85%	-	<0.001%	-	1.85%
Mercury	3.08%	-	<0.001%	-	3.08%	-
Dioxins and dioxin-like PCBs	90.65%		0.10%		90.75%	

As shown, the overall impact (including the contribution from existing dietary intakes) is less than the TDI for methyl mercury, mercuric chloride, mercury and dioxins. Therefore, there would not be an appreciable health risk based on the emission of these pollutants and the conclusion of the HHRA submitted with the EP application does not change.

[1] https://waterwatchwales.naturalresourceswales.gov.uk/en/

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