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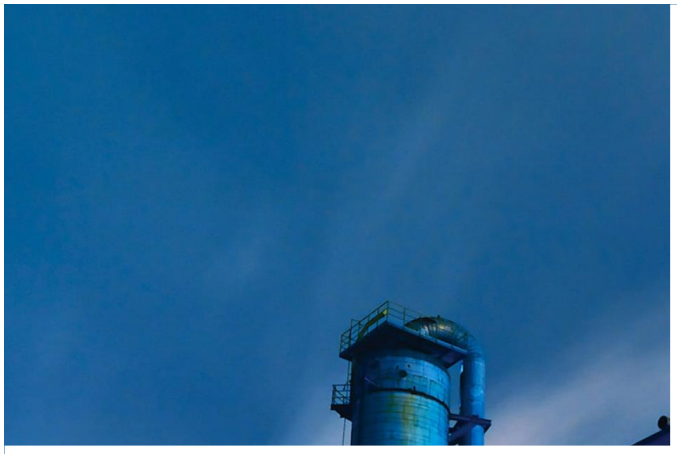

Chirk Particleboard Facility

Kronospan Limited

Schedule 5 Response #4

ENGINEERING CONSULTING

Document approval

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0	12/03/2020	Draft for Client review	RSF	JRS
1	16/03/2020	Final for issue to NRW	RSF	JRS

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 to follow.

(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 update HHRA to follow.

(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

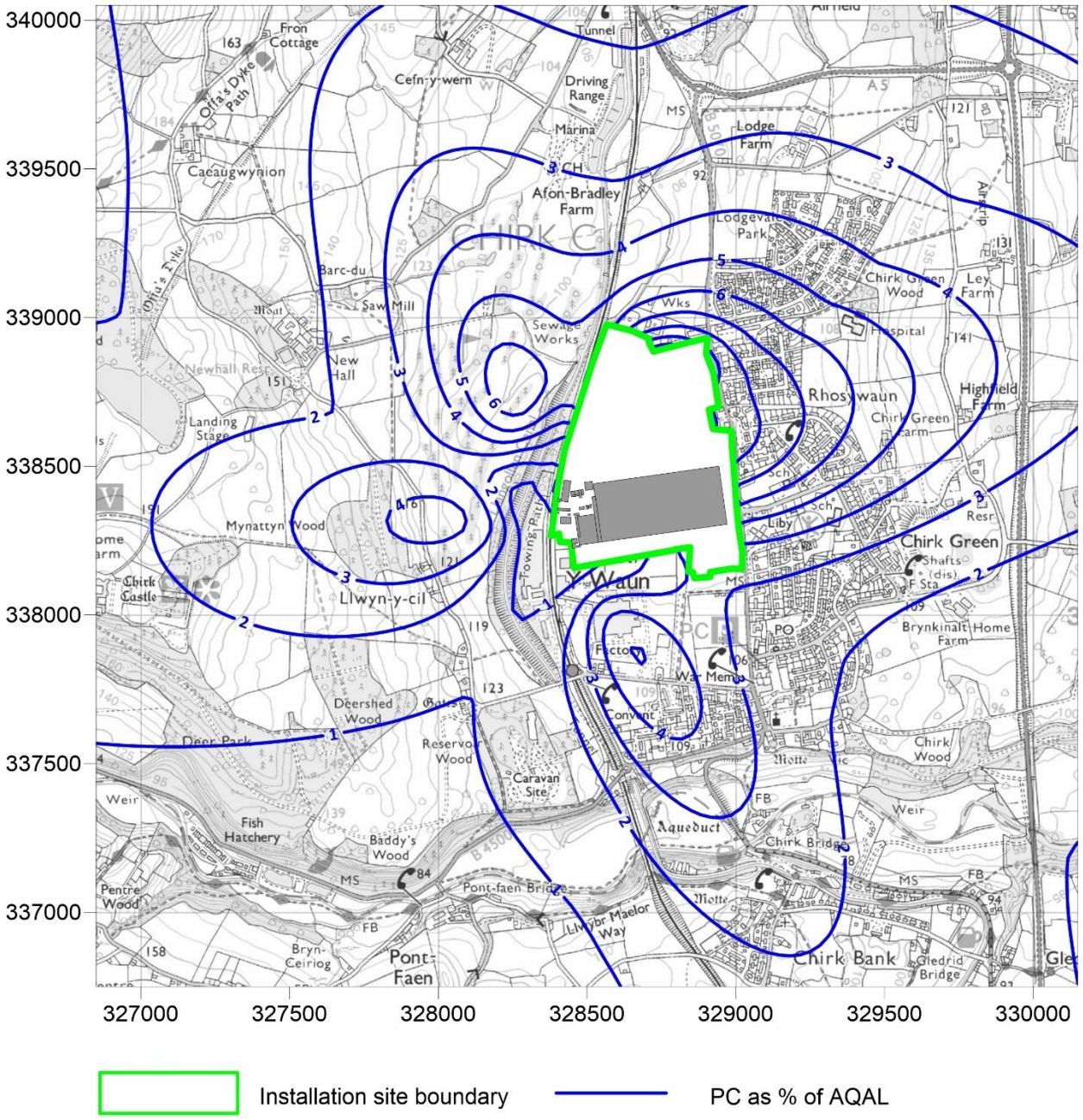


Figure 2: Updated Figure 8 – Annual Mean Nitrogen Dioxide PC – Normal Operations – Worst-Case Emissions

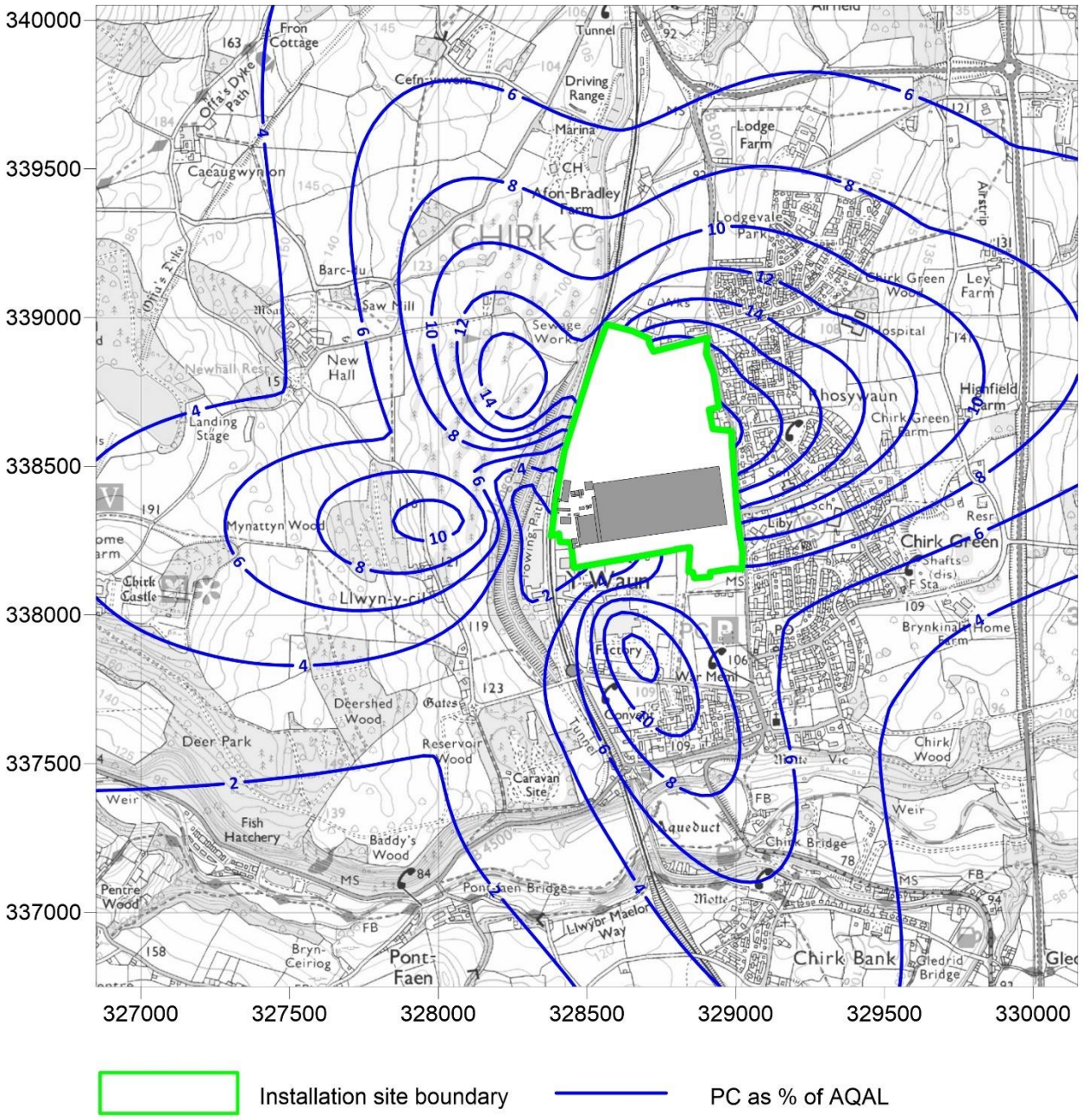


Figure 3: Updated Figure 9 – 99.79%ile of 1-hour Mean Nitrogen Dioxide PC – Normal Operations – Likely Emissions

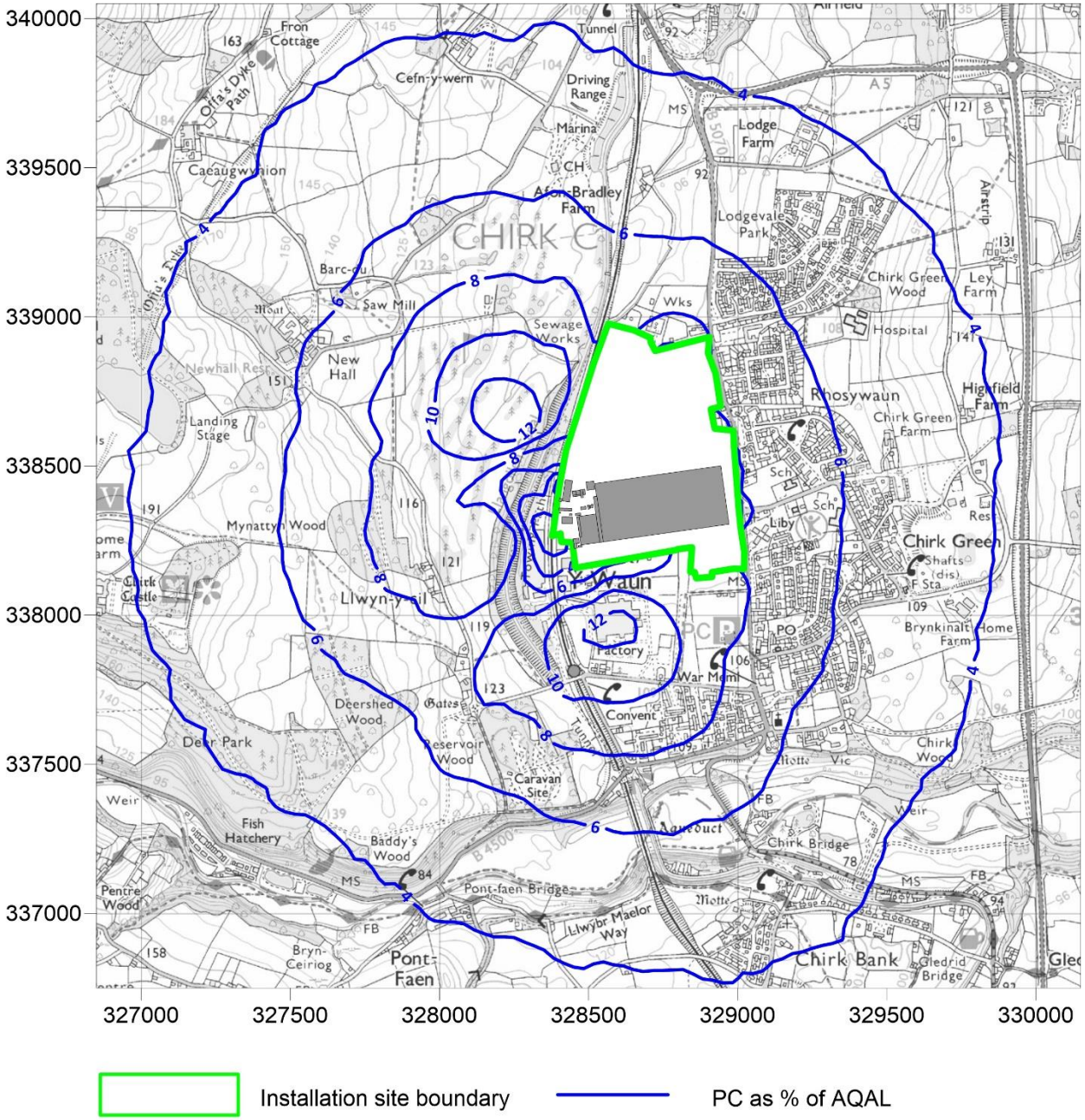


Figure 4: Updated Figure 10 – 99.795ile of 1-hour Mean Nitrogen Dioxide PC – Normal Operations – Worst-case Emissions

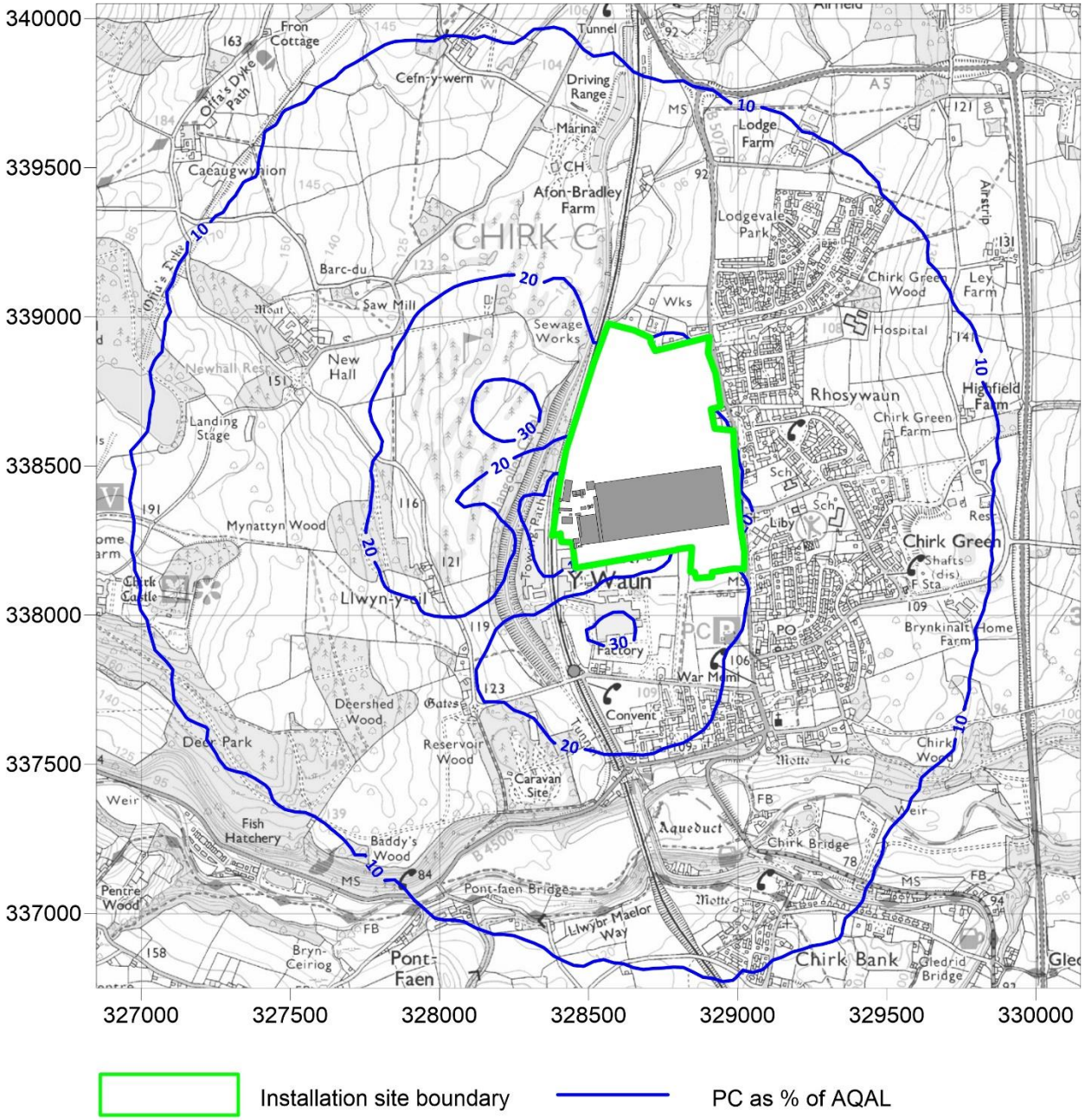


Figure 5: Updated Figure 27 – Annual Mean NOx PC – Normal Operations – Likely Emissions

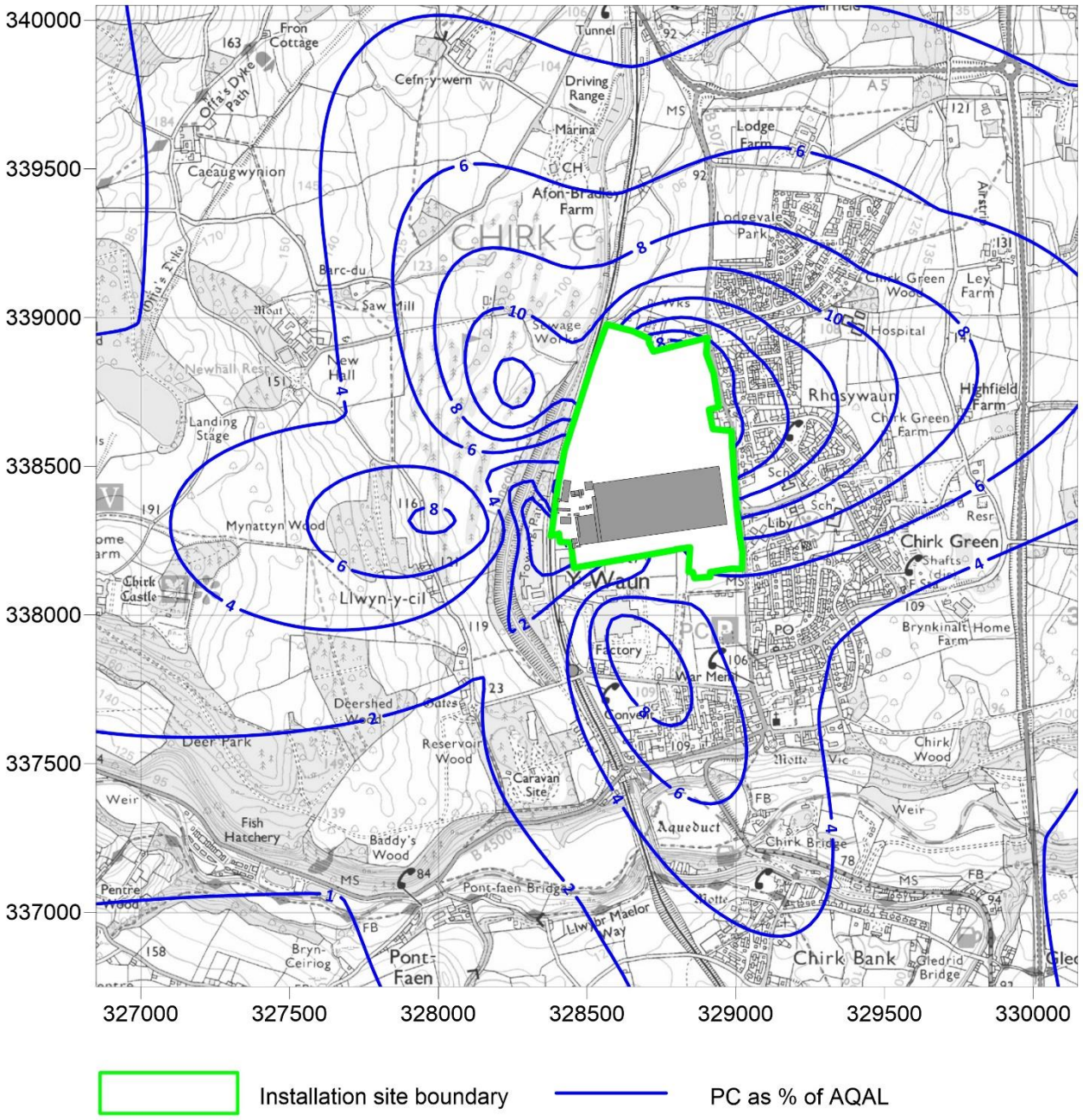
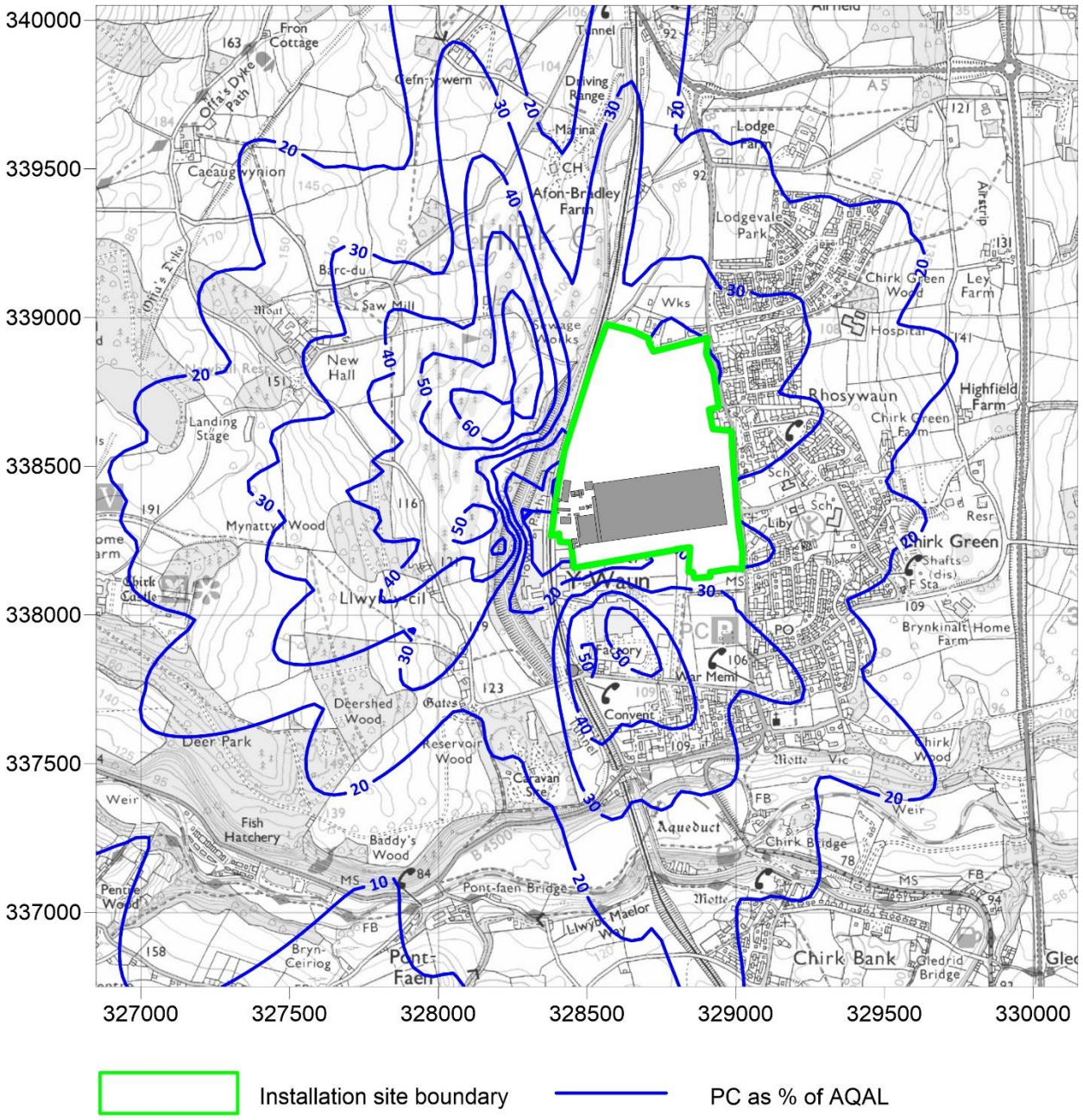


Figure 6: Updated Figure 31 – Max Daily Mean NOx PC – Normal Operations – Likely Emissions



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%	-	-

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