

**AQMAU Reference:** AQMAU\_C1775\_RP01

**Project Title:** Endless Energy Facility

**Work Title:** Audit of Air Quality, Habitats and Human Health Risk Assessments

**Date Requested:** 6<sup>th</sup> November 2018

**AQMAU Response Date:** 12<sup>th</sup> April 2019

AQMAU recommendation	Conditions/Noted
<ul style="list-style-type: none"> <li>The consultant's air quality predictions for human health can be used for permit determination.</li> </ul>	<ul style="list-style-type: none"> <li>We agree with the consultant's conclusions that emissions from the site will not contribute towards exceedences of the ES (Environmental Standards) with regards to the impacts at human receptors during both normal and abnormal operations.</li> </ul>
<ul style="list-style-type: none"> <li>The consultant's conclusions with regards to critical levels and nutrient nitrogen deposition critical loads can be used for permit determination.</li> <li>We recommend consultation with Natural England with regards to acid deposition exceedences at the South Pennine Moors (SAC / SPA/ SSSI) habitat site.</li> <li>At all Local Wildlife Sites (LWS) the consultant's conclusions with regards to acid deposition critical loads can be used for permit determination.</li> </ul>	<ul style="list-style-type: none"> <li>We predict no exceedences of the relevant critical levels or nutrient nitrogen deposition critical loads at all receptor locations.</li> <li>If any bog habitat features are located north east of the site at the South Pennine Moors then there is likely an exceedence of up to 1.5% of the acid deposition critical load.</li> <li>We predict no exceedences of the relevant acid deposition critical loads at any LWS receptor.</li> </ul>
<ul style="list-style-type: none"> <li>The consultant's predictions with respect to the intake of dioxins, furans and dioxin-like PCBs can be used for permit determination.</li> </ul>	<ul style="list-style-type: none"> <li>Sensitivity checks to normal and abnormal emissions of dioxins furans and dioxin-like PCBs are likely to be less than 10% of the COT-TDI. The consultant's abnormal predictions can be used as an extreme worst case.</li> </ul>

**Detailed response and evidence starts on Page 2.**

## 1. Summary of work request

- 1.1 The National Permitting Service (NPS) asked the Air Quality Modelling and Assessment Unit (AQMAU) to audit an air quality impact assessment. The requested scope of the audit was to consider the consultant's assessment of air emissions for human health and ecological impacts.
- 1.2 The assessment comprises of 6 reports: for human health and habitats<sup>1</sup>, human health risk assessment<sup>2</sup>, air quality assessment addendum<sup>3</sup>, follow up habitats assessment<sup>4</sup> and two schedule 5 responses<sup>5,6</sup>. The human health and habitats and the human health risk assessment were drafted by Ricardo Energy and Environment (the consultant) and the follow up habitats assessment and schedule responses were drafted by Wardell Armstrong (the consultant) on behalf of Endless Energy Ltd (the applicant) for their proposed Aire Valley Clean Energy Facility. The facility will treat approximately 148,000 tonnes of commercial and industrial waste per annum, based on the estimated throughput at design point, generating both heat and electricity.

## 2. Conclusions that lead to AQMAU recommendations

### 2.1 The consultant concludes that:

- There will not be any exceedences of the Environmental Standard (ES) as a PEC (Predicted Environmental Concentration) at any human health receptor location when considering both normal and abnormal emissions.
- The proposed installation "will not pose unacceptable health risks to residents or allotment-holders in the vicinity of the proposed facility"
- There will not be any exceedences of the critical levels or loads at any SAC (Special Area of Conservation), SPA (Special Area of Protection), SSSI (Site of Specific Scientific Interest) or LWS (Local Wildlife Site).

### 2.2 We have audited the consultant's submission and have made observations relating to the methodology used and assumptions made. We note:

- The consultant has not considered inter-model variation in their assessment which could lead to different conclusions at receptors. We have tested sensitivity to this.
- The consultant has not considered potential variations in meteorological data between Bingley and the site which could occur due to the local valley. We have tested sensitivity to this.

### 2.3 We conclude that for air quality impacts at human receptors, whilst we do not agree with the consultant's absolute numerical predictions, the consultant's conclusions

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<sup>1</sup> Ricardo - Proposed Aire Valley Clean Energy Facility Environmental Permit Application – Air Quality Impact Assessment - Report for Endless Energy Ltd – 20/07/2017

<sup>2</sup> Ricardo - Proposed Aire Valley Clean Energy Facility Environmental Permit Application – Human Health Risk Assessment - Report for Endless Energy Ltd – 20/07/2017

<sup>3</sup> Ricardo - Proposed Aire Valley Clean Energy Facility Environmental Permit Application – Air Quality Impact Assessment ADDENDUM - Report for Endless Energy Ltd – 22/10/2018

<sup>4</sup> Habitats ENDLESS ENERGY LIMITED ENDLESS ENERGY FACILITY HABITATS RISK ASSESSMENT - SEPTEMBER 2018 – Wardell Armstrong

<sup>5</sup> Schedule 5 response - Response to a Schedule 5 Notice EPR/ZP3537AT/A001 – 18/02/2019 – Wardell Armstrong

<sup>6</sup> Schedule 5 response – Air Quality – Wardell Armstrong

can be used for the basis of permit determination. We do not predict any exceedences of the ES under normal or abnormal conditions.

- 2.4 We agree with the consultant that there is unlikely to be an exceedence of 10% of the COT-TDI under both normal and abnormal conditions.
- 2.5 We agree with the consultant that there is unlikely to be an exceedence of the relevant critical levels and nutrient nitrogen deposition critical loads at all habitat sites.
- 2.6 For all LWS we do not predict any exceedences of the acid deposition critical loads.
- 2.7 At the South Pennine Moors Special Area of Conservation (SAC), Special Protected Area (SPA) and Site of Special Scientific Interest there is an exceedence with the background exceeding the critical load and the PC of up to 1.5% of the acid deposition critical load relevant for bogs in the area north east of the site.

### **3. Evidence for recommendations**

#### **Consultant's Air Quality Assessment**

- 3.1. The consultant has used meteorological data observed at Bingley between 2012 and 2016. This meteorological site is located 6km from the consultant's site and is likely to be reasonably representative. However, due to the potential for localised temperature inversions it is possible alternative meteorological data could be more representative and we would expect the consultant to have considered this.
- 3.2. The consultant used ADMS 5 version 5.2 air dispersion modelling software, but they have not fully justified that it is appropriate. The ADMS user guide<sup>7</sup> states that gradients of up to 1:3 can be modelled. Some receptors are associated with steeper terrain gradients. In very rugged hilly or mountainous terrain, and along coastlines, the characterization of the winds is a balance of various forces, such that the assumptions of steady-state straight-line transport both in time and space (as used in ADMS) can be inappropriate (US EPA<sup>8</sup>). Under these circumstances, US EPA recommends CALPUFF be used on a case-by-case basis. We have used Lakes Environmental CALPUFF View version 8.6 as alternative modelling software. CALPUFF is a non-steady state model able to predict through a 3D meteorological wind field.
- 3.3. The stack parameters used in the consultant's modelling are listed in table 4 of their report. The consultant has derived their emission rates from concentrations in Annex VI part 4 of the Industrial Emissions Directive (IED)<sup>9</sup>, with the exception of:
  - NO<sub>x</sub> emissions (long-term): 150 mg/Nm<sup>3</sup> (below IED limit of 200 mg/Nm<sup>3</sup>)
  - Sulphur dioxide emissions (long-term): 18 mg/Nm<sup>3</sup> (below IED limit of 50 mg/Nm<sup>3</sup>)
  - Ammonia emissions: 5 mg/Nm<sup>3</sup> (below benchmark in BREF note<sup>10</sup> of 10 mg/Nm<sup>3</sup>)

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<sup>7</sup> ADMS 5 Atmospheric Dispersion Modelling System User Guide Version 5.2. Cambridge Environmental Research Consultants Limited, November 2016.

<sup>8</sup> Revisions to the Guideline on Air Quality Models. Environmental Protection Agency, January 2017.

<sup>9</sup> Directive 2010/75/EU of the European Parliament and of the council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) 17/12/2010.

<sup>10</sup> COMMISSION IMPLEMENTING DECISION (EU) 2017/1442 of 31 July 2017 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants

- 3.4. The effects of building downwash from the four buildings on site have been considered within the consultant's modelling. These buildings are listed in table 6 and shown in figure 1 of their report.
- 3.5. The local terrain features have been considered within the consultant's model by incorporating a terrain file.
- 3.6. The consultant has selected 31 human receptors in the vicinity of the plant, which we consider to be reasonably representative of sensitive receptors. This includes allotment receptors which were included by the applicant in their schedule 5 response. The consultant's predictions were based on the maximum on the grid impact and therefore will likely be higher than at any individual receptor.
- 3.7. The consultant has identified multiple ecological receptors within the appropriate screening distances<sup>11</sup>. We agree with their selection when taking into account the additional ecological receptors in their schedule 5 response.

### **Consultant Predictions at Human Receptors**

- 3.8. The consultant has derived background values from both mapped and monitored sources. They have used the most conservative values, which are from the monitored data. The values used by the consultant are higher than those available using Defra background maps<sup>12</sup>. The value selected by the consultant is based on a conservative estimate of the background at receptor locations. Roadside measurements will likely be higher, however, they are not necessarily representative of the impacts at receptor locations due to the drop off in concentrations with distance between the kerbside and the receptor location. Therefore we consider the applicant's selected background value appropriate. There is an air quality management area (AQMA) located approximately 10km from the site in Bradford, at this location impacts are insignificant.
- 3.9. The consultant has taken a screening approach and reported predicted PCs for all pollutants as a max on the grid rather than at receptors. The only pollutants they claim require further consideration and are greater than the insignificance criteria (PC<1% of the Environmental Quality Standards (EQS) for long term and PC<10% of the EQS for short term) are:
  - Volatile organic compounds (VOCs – assessed against the air quality standard for benzene): annual mean
  - Hydrogen chloride: maximum hourly mean
  - Sulphur dioxide: 99.9th percentile of 15 minute means
  - Sulphur dioxide: 99.7th percentile of 1 hour means
  - Nitrogen dioxide: annual mean
  - Nitrogen dioxide: 99.79th percentile of 1 hour means
  - Cadmium: annual mean
  - Arsenic: annual mean
  - Nickel: annual mean

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<sup>11</sup> Environment Agency and Department for Environment, Food & Rural Affairs: Environmental management-guidance: Air emissions risk assessment for your environmental permit. 1 March 2016. [www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit](http://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit)

<sup>12</sup> <https://uk-air.defra.gov.uk/data/laqm-background-home>

- Chromium VI: annual mean and
  - Polycyclic Aromatic Hydrocarbons (PAHs): annual mean
- 3.10. The consultant's predicted maximum process contributions (PC) are shown in table 12 of their air quality impact assessment. They predict that for all pollutants there will not be an exceedence of the ES as a PEC.
- 3.11. The consultant has followed the Metals Guidance for Municipal Waste Incinerators (MWI)<sup>13</sup> when considering impacts from metals. Their PC predictions are in Tables 13 and 14 of their air quality impact assessment. For the group three metals, all were screened out as insignificant when following the guidance with the exception of arsenic and chromium VI. Both showed no likely exceedence of the long term EQS as a PEC following stage 2 of the metals guidance.
- 3.12. The consultant's predicted PECs from their abnormal emissions assessment are shown in their report and schedule 5 response. They do not predict any exceedences of the PEC at any receptor location for all relevant pollutants.
- 3.13. The consultant's HHRA report<sup>2</sup> shows predictions at residential receptors will not exceed 10% of the COT TDI and therefore would not cause harm to human health at any relevant receptor location.

#### **Consultant's Ecological Assessment**

- 3.14. The consultant has screened out the PCs against the long and short term critical levels and loads as less than the insignificance criteria for all habitat sites. This is shown in tables 17 and 21 of their report.
- 3.15. Critical levels and loads for all habitat sites were taken from APIS<sup>14</sup> which is appropriate.

#### **AQMAU Check Modelling**

- 3.16. In order to check the validity of the consultant's predictions, we have undertaken our own detailed check modelling based on the consultant's modelling files using ADMS 5 Version 5.2, Breeze Aermot within ADMS and Calpuff version 8.6. We carried out calculations and sensitivity analysis to:
- Our own meteorological data observed at Bingley (2003 to 2007), on site NWP (Numerical Weather Prediction) data (2012) and MM5 data for the south of the UK (2001).
  - Considering background values from Defra background maps, alongside local data.
  - Using high resolution terrain data to take into account the local topography including local valleys.
  - Testing sensitivity to surface roughness values used in the assessment based on the surrounding land use.
  - Using multiple dispersion models to take into account likely temperature inversions based on the localised conditions. The Calpuff model allows us to consider the impact of the terrain on local meteorological conditions.
- 3.17. As a result of our checks, we are satisfied that the consultant's predictions at human receptors can be used for determination as a reasonable worst-case. We agree that

<sup>13</sup> AQMAU, Environment Agency, Guidance to Consultants on impact Assessment for group 3 Metals Stack Released from municipal waste Incinerators – V.3 September 2012.

<sup>14</sup> www.apis.ac.uk

where the PC cannot be screened as insignificant the PEC is less than 100% of the ES.

- 3.18. Our sensitivity checks of the Human Health Risk Assessment agree with the consultant that the intake of dioxins', furans and dioxin-like PCBs are less than 10% of the COT-TDI. Therefore the risk associated with the proposed installation is unlikely to have an adverse impact to human health from normal or abnormal operations.
- 3.19. We agree with the consultant that there are unlikely to be any exceedences of the relevant critical levels or nutrient nitrogen deposition critical loads at all sites. We also agree there are not likely to be any exceedences of the acid deposition critical loads at all local sites.
- 3.20. We do not agree that there will not likely be an exceedence of the acid deposition critical load at the South Pennine Moors SAC / SPA / SSSI site. Based on the critical load appropriate for bogs (0.569 keq/ha/yr) we predict there are possible exceedences, with the PC being up to 1.5% of the acid deposition critical load in the area to the north east of the proposed facility and the background already exceeding the critical load. We recommend consultation with Natural England with regards to this exceedence.