FICHTNER
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Powerfuel Portland Limited

Air Quality Analysis for EP Application

Portland Energy Recovery Facility

1 Introduction

Powerfuel Portland Limited (Powerfuel) is proposing to build the Portland Energy Recovery Facility (the Facility) at a site within Portland Port on the Isle of Portland, Dorset. The Facility will incinerate refuse derived fuel (RDF) produced from domestic (municipal solid waste) and commercial & industrial (C&I) non-hazardous waste.

A detailed description of the activities to be undertaken at the Facility is included within the Supporting Information within the Environmental Permit (EP) application pack.

To support the planning application an Environmental Statement was produced which included an Air Quality Environmental Impact Assessment (EIA). This was supported by a number of documents as technical appendices which have also been submitted with this EP application:

- Appendix D1: Baseline Analysis (Ref: S2953-0030-0003RSF);
- Appendix D2: Process Emissions Modelling (S2953-0030-0005RSF); and
- Human Health Risk Assessment

Appendix D2 sets out the dispersion modelling methodology and results. All modelling was carried out in line with the Environment Agency's (EA's) requirements. The results are presented as concentrations and then drawn upon in the ES chapter. This note draws upon the results presented in Appendix D2 and screens the impacts in line with the EA's requirements.

When considering the impact on ecology the results of the dispersion modelling were drawn upon in the Ecology ES chapter. This has also been provided for reference.

2 Screening criteria for permitting

A screening approach has been used in accordance with the EA's Air Emissions Guidance methodology. To screen out 'insignificant' process contributions:

- the long-term PC must be less than 1% of the long-term environmental standard; and
- the short-term PC must be less than 10% of the short-term environmental standard.

As part of this assessment, predicted process contributions have been compared to the AQALs.

If the above criteria are achieved, it can be concluded that "it is not likely that emissions would lead to significant environmental impacts" and the process contributions can be screened out.

The long-term 1% process contribution threshold is based on the judgement that:

- it is unlikely that an emission at this level will make a significant contribution to air quality; and
- the threshold provides a substantial safety margin to protect health and the environment.

The short-term 10% process contribution threshold is based on the judgement that:

- spatial and temporal conditions mean that short-term process contributions are transient and limited in comparison with long-term process contributions; and
- the threshold provides a substantial safety margin to protect health and the environment.

For the purpose of this assessment, if the process contribution can be screened out as insignificant at the point of maximum impact, further assessment is not required. However, if the process contributions cannot be screened out, assessment has been undertaken for the following:

- the Predicted Environmental Concentration (PEC) (defined as the process contribution plus the baseline concentration) at the point of maximum impact; and
- the process contribution and PEC at areas of public exposure.

In these cases, using the EA's Air Emissions Guidance, if the long-term PEC is below 70% of the AQAL, or the short-term process contribution is less than 20% of the headroom[1] it can be concluded that 'there is little risk of the PEC exceeding the AQAL', and the impact can be considered to be 'not significant'.

3 Analysis – impact on human health

Table 12 of Appendix D2 Process Emissions Modelling, sets out the impact of the Facility at the point of maximum impact assuming operation at the daily ELVs, whilst Table 13 sets out the impact assuming operation at the half-hourly ELVs. As shown the impact is less than 1% of the long term and less than 10% of the short term AQAL and can be screened out as 'insignificant' with the exception of the following:

- Annual mean nitrogen dioxide impacts;
- Annual mean VOCs impacts;
- Annual mean cadmium impact;
- 99.79th percentile of 1-hour nitrogen dioxide impacts assuming operation at the half-hourly ELV;
- 99.73rd percentile of 1-hour mean sulphur dioxide assuming operation at the half-hourly ELV; and
- 99.9th percentile of 15-minute mean sulphur dioxide assuming operation at the half-hourly ELV.

3.1 Further analysis – annual mean nitrogen dioxide

The above analysis does not account for any difference in the spatial distribution of impacts. Therefore, additional consideration has been made to the spatial distribution of the annual mean nitrogen dioxide impacts.

The following table provides a breakdown of the maximum impact on any grid point identified as land, and within an area of residential properties. This is calculated as the maximum over the 5 years of weather data.

Table 1: Annual mean nitrogen dioxide further analysis – table 14 of Appendix D.2

Area	Maximum PC		PEC (PC +Bg)	
	µg/m^3	as % of AQAL	µg/m^3	as % of AQAL
Max any point	0.77	1.93%	22.79	56.98%

[1] Calculated as the AQAL minus twice the long-term background concentration

Area	Maximum PC		PEC (PC +Bg)	
	µg/m³	as % of AQAL	µg/m³	as % of AQAL
Land	0.76	1.91%	22.78	56.96%
Residential	0.39	0.97%	22.41	56.02%

As shown, the point of maximum impact does not occur at any point of relevant exposure. The maximum impact at a residential property is less than 1% of the AQAL.

The contour plot is provided in Figure 6.4 of Appendix D2 Process Emissions Modelling. This shows that the area where impacts are not screened out as 'insignificant' is restricted to an area of the harbour and not at any areas of relevant exposure in relation to the annual mean AQAL.

3.2 Further analysis – annual mean VOCs

There are two VOCs for which an AQAL has been set: benzene and 1,3-butadiene. For the purpose of this analysis it has been assumed that the entire VOC emissions consist of only benzene or 1,3-butadiene. This is a highly conservative assumption as it does not take into account the speciation of VOCs in the emissions and the modelling does not take into account the volatile nature of the compounds.

The maximum PC from the Facility is predicted to be 1.84% of the AQAL for benzene and 4.08% of the AQAL for 1,3-butadiene at the point of maximum impact. The following table provides a breakdown of the maximum impact on any grid point identified as land, and within an area of residential properties. This is calculated as the maximum over the 5 years of weather data.

Table 2: Annual mean VOC further analysis – table 15 of Appendix D.2

Area	Maximum PC		PEC (PC +Bg)	
	µg/m³	as % of AQAL	µg/m³	as % of AQAL
Benzene				
Max any point	0.092	1.84%	0.36	7.24%
Land	0.091	1.82%	0.36	7.22%
Residential	0.05	0.92%	0.32	6.32%
1,3-butadiene				
Max any point	0.092	4.08%	0.18	8.08%
Land	0.091	4.04%	0.18	8.04%
Residential	0.05	2.05%	0.14	6.05%

As shown the point of maximum impact does not occur at any point of relevant exposure.

The contour plot of annual mean benzene and 1,3-butadiene is provided in Figure 6 and Figure 7 respectively of Appendix D2 Process Emission Modelling. This shows that the area where annual mean benzene impacts are not screened out as 'insignificant' is restricted to an area of the harbour and not at any areas of relevant exposure in relation to the annual mean AQAL. There is a small area where annual mean 1,3-butadiene impacts cannot be screened out as 'insignificant'. However,

as shown in Table 2, the PEC is well below 70% of the AQAL. This is not considered to be a significant impact.

3.3 Further analysis – annual mean cadmium

The annual mean cadmium PC from the Facility is predicted to be 3.67% of the AQAL. However, this assumes that the entire cadmium and thallium emissions consist of only cadmium. The Waste Incineration BREF shows that the average concentration recorded from UK plants equipped with bag filters was 1.6 µg/Nm^3 (or 8% of the ELV of 0.02 mg/Nm^3), the highest recorded concentration of cadmium and thallium was 14 µg/Nm^3 (or 70% of the ELV of 0.02 mg/Nm^3) and only three lines recorded concentrations higher than 10 µg/Nm^3 (or 50% of the ELV of 0.02mg/Nm^3).

Table 3 shows the annual mean cadmium PC at the point of maximum impact, and the maximum in an area of residential properties, for cadmium emitted at 100%, 50% and 8% of the ELV, referred to as the 'screening', 'worst case' and 'typical' scenarios. Figure 8 of Appendix D2 Process Emissions Modelling shows the spatial distribution of emissions assuming cadmium is emitted at 100%, 50% and 8% of the combined cadmium and thallium emission limit.

Table 3: Annual mean cadmium further analysis – table 16 of Appendix D.2 (corrected)

Area	Maximum PC		PEC (PC +Bg)	
	ng/m^3	as % of AQAL	ng/m^3	as % of AQAL
Screening – 100% of the ELV				
Max any point	0.184	3.67%	0.754	15.07%
Land	0.182	3.64%	0.752	15.04%
Residential	0.092	1.84%	0.662	13.24%
Worst-case – 50% of the ELV				
Max any point	0.092	1.84%	0.662	13.24%
Land	0.091	1.82%	0.661	13.22%
Residential	0.046	0.92%	0.616	12.32%
Typical – 8% of the ELV				
Max any point	0.015	0.29%	0.585	11.69%
Land	0.015	0.29%	0.585	11.69%
Residential	0.007	0.15%	0.577	11.55%

As shown the point of maximum impact does not occur at any point of relevant exposure. Even if it is assumed that 50% of the cadmium and thallium emissions consist of only cadmium the impact at all residential areas is less than 1% of the AQAL and can be screened out as 'insignificant'.

3.4 Further analysis – short term impact

If it assumed that the Facility operates at the half hourly ELVs set in the IED, the 1-hour nitrogen dioxide, and 1-hour and 15-minute sulphur dioxide impacts, exceed 10% of the relevant AQALs at the point of maximum impact. However, this assumes that the Facility operates at the half-hourly ELVs during the worst-case weather conditions for dispersion. This is a highly conservative

assumption. The half-hourly ELV is that from the IED. The BREF introduces a lower daily limit for oxides of nitrogen and sulphur dioxide. The IED half-hourly limit for oxides of nitrogen is 2 times the daily limit, whilst the half-hourly limit for sulphur dioxide is 4 times the daily limit. With the reduced ELVs the half-hourly limit is 3.3 times the daily ELV for oxides of nitrogen, and 6.7 times the daily ELV for sulphur dioxide. Therefore, it is unlikely that peaks in short term emissions would be this high given that a lower daily ELV needs to be achieved.

The half-hourly ELV in the IED is 2 times the daily ELV for oxides of nitrogen and 4 times the daily ELV for sulphur dioxide. The following table applies the same ratio to the emissions from the Facility.

Table 4: Short term impacts further analysis – table 17 of Appendix D.2 (corrected)

Area	Maximum PC – assuming at IED half-hourly ELV		Maximum PC – assuming at same ratio of half-hourly to daily ELV is applied to the BAT AEL	
	µg/m^3	as % of AQAL	µg/m^3	as % of AQAL
99.79th percentile of 1-hour nitrogen dioxide				
Max any point	27.94	13.97%	16.77	8.38%
Land	27.94	13.97%	16.77	8.38%
Residential	27.92	13.96%	16.75	8.38%
99.73rd percentile of 1-hour sulphur dioxide				
Max any point	39.53	11.29%	23.72	6.78%
Land	39.53	11.29%	23.72	6.78%
Residential	39.53	11.29%	23.72	6.78%
99.9th percentile of 15-min sulphur dioxide				
Max any point	49.16	18.48%	29.50	11.09%
Land	49.16	18.48%	29.50	11.09%
Residential	46.94	17.65%	28.16	10.59%

As shown, if this same ratio is applied to the emissions from the Facility and it is assumed that the Facility operates at this level during the worst-case meteorological conditions for dispersion the maximum 1-hour impact of nitrogen dioxide and sulphur dioxide is less than 10% of the AQAL and can be screened out as 'insignificant'. The maximum impact of 15-minute sulphur dioxide emissions remains slightly above 10% of the AQAL. However, in all instances the short term impact is less than 20% of the headroom and the impact can be screened out as not significant.

3.5 Heavy metals – at the point of maximum impact

Detailed results tables showing the process contribution and PEC are provided in Table 18 and Table 19 of Appendix D.2. These tables present the result assuming that each metal is released at the combined long and short-term metal ELVs respectively. If the PC is greater than 1% of the AQAL when it is assumed that each metal is emitted at the total metal ELV, further analysis has been undertaken assuming the release is no greater than the maximum monitored at an existing waste facility. The EA's metals guidance details the maximum monitored concentrations of group 3 metals emitted by Municipal Waste Incinerators and Waste Wood Co-Incinerators as a percentage of the

group ELV. The maximum monitored emission presented in the EA's analysis has been used as a conservative assumption.

As shown, if it is assumed that the entire emissions of metals consist of only one metal, the impact of the Facility is generally less than 1% of the long term and less than 10% of the short term AQAL, with the exception of annual mean impacts of arsenic, chromium (VI), lead, manganese and nickel. The PEC is only predicted to exceed the long term AQAL for arsenic and chromium (VI) using this worst-case screening assumption. If it is assumed that the Facility would perform no worse than a currently operating facility, the PC is below 1% of the long term and 10% of the short term AQAL for all pollutants with the exception of annual mean arsenic and nickel. However, in both instances the PEC is well below the AQAL.

4 Analysis – impact on ecology

Section 8 of Appendix D2 Process Emission Modelling sets out the assessment of the impact of emissions at ecological receptors. The impact at most sites can be screened out as the process contribution does not exceed 1% of the long term of 10% of the short term Critical Level or Load. Where the process contribution exceeds 1% of the long term of 10% of the short term Critical Level or Load the PEC is less than 70%. Further discussion of these impacts are provided in the Environmental Risk Assessment, refer to Appendix I of the EP application.