



Real Alloy UK Ltd

# UPDATED H1 ASSESSMENT

Waunarlwydd Works, Swansea

## 1 Introduction

Real Alloy UK Ltd is proposing to increase the waste input materials from 65,000 tonnes per annum to 80,250 tonnes per annum. To support the variation to the environmental permit a previous H1 assessment was used (AES report dated January 2009). However, Natural Resources Wales (NRW) has requested some additional information as follows.

*I have review the H1 assessment that you submitted as part of the first schedule 5 response. While the assessment did carry out the worst case scenario for most of the emissions, there are several things that we may need re-assessment and/or more justification as there are assessment criteria for habitats and human health have since tightened or not require in the 2009 report but are required as per guidance [Air emissions risk assessment for your environmental permit - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit).*

*This mostly regards on hydrogen fluoride - The currently guidance has limits for monthly EAL for human health and weekly mean screening for protected conservation areas – Can you provide additional assessment and/or justification this as both furnaces would run all week as opposed to only one running all week and the other having running 5 days a week as previously stated.*

Therefore, this assessment provides a revised air quality assessment utilising dispersion modelling to predict the impact of the proposed furnace operation on human health and habitat receptors. The assessment has considered all pollutants regulated by the permit except for dioxins and furan for which there is no air quality standard with which to compare predicted impacts. The emission characteristics for the furnace have been obtained from the last five extractive monitoring reports, emission concentrations are based on the current emission limit values and are representative of the worst-case. The location of the proposed site is presented in Figure 1.

## 2 Methodology

### *Dispersion Modelling*

The predicted impact of the installation emissions on local air quality has been undertaken using the UK ADMS dispersion model (Version 5.2). Dispersion modelling has been undertaken using five years (2015 to 2019) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from the meteorological station at Mumbles Head (approximately 10 km south-southeast of the site) has been used for the assessment. Results are presented for the worst-case meteorological year.

The dispersion modelling has taken into account building downwash affects and the influence of terrain on the dispersion of emissions from the stack.

### *Emission Parameters*

The emission parameters for the furnace are presented in Table 1. The emission temperature and flow rates are representative of the average for the last five extractive monitoring reports (May 2021 to September 2022). The emission concentrations are the emission limit values from 30<sup>th</sup> June 2020 as specified in the permit for the



installation. Monitoring was carried out with both furnaces operating and are representative of the proposed future operation.



Figure 1: Site Location

Table 1: Summary of the Stack Emissions Data for Dispersion Modelling		
Parameter	Furnace	
Stack height (m)	23	
Temperature of emission (°C)	95.2	
Actual flow rate (m <sup>3</sup> /s)	60.8	
Emission velocity at stack exit (m/s)	27.4	
Normalised flow rate (Nm <sup>3</sup> /s) (a)	45.4	
Stack diameter (m)	1.68	
Pollutant	Emission Limit Value (mg/Nm <sup>3</sup> ) (a)	Emission Limit Concentration (g/s)
NO <sub>x</sub>	60	2.72
Particles	5	0.227
SO <sub>2</sub>	50	2.27
HF	1	0.0454
HCl	10	0.454
Volatile organic compounds (VOCs)	30	1.36

(a) Reference conditions of 273K, 1 atmosphere, without the correction for water vapour



## Sensitive Receptors

### Human Health

The locations of the discrete sensitive receptors selected for the assessment are presented in Table 2 and Figure 2. Pollutant concentrations have been predicted at both discrete receptor locations and the maximum predicted concentration over a 4 km by 4 km Cartesian grid of 40 m grid resolution.

ID	Receptor	Type	Easting	Northing
H1	Oak Drive	Residential	259898	195881
H2	Tir Y Farchnad	Residential	259466	196205
H3	Liiw Valley Close	Residential	259174	196528
H4	Alder Way	Residential	259255	196736
H5	Dobes Acres	Residential	260872	196069
H6	Roseland Road	Residential	260773	195684
H7	Keeper's Lodge Farm	Residential	261196	196256
H8	Glasfryn Terrace	Residential	260808	197042
H9	Pen y Fodau Fawr	Residential	260060	197011
H10	Cae'r Bont	Residential	261455	196758
H11	Heol Will George	Residential	260327	195158
H12	Sardis Close	Residential	260319	195125
H13	Sardis Close	Residential	260349	195134
H14	Heol Will George	Residential	260300	195201

### Habitat Sites

The assessment has considered the impact of emissions on European sites within 10 km and nationally and locally designated sites within 2 km. There are extensive areas designated as Local Wildlife Sites (LWS) within 2 km of the installation. The nearest is immediately adjacent to the site to the northeast and as well as being close to the site, it is immediately downwind of the predominant wind direction. Therefore, the impact of emission on LWS has been assessed based on the maximum predicted concentration anywhere within the model domain. For the European sites, five locations have been included in the model and these are presented in Table 3.

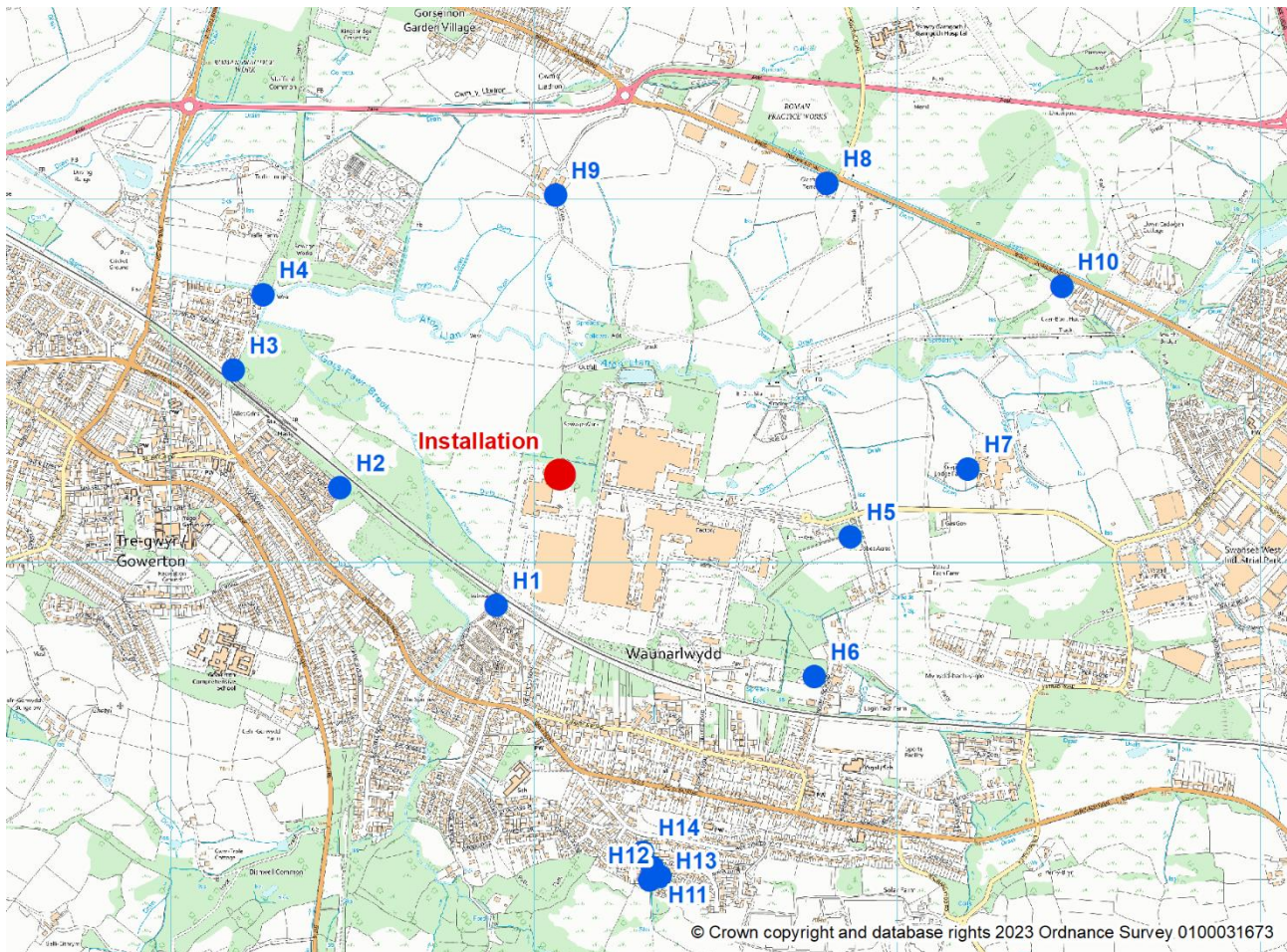


Figure 2: Sensitive Receptors

Table 3: Sensitive European Habitat Receptors

Receptor	Designation	Approx. Location (Relative to the Site)
E1. Limestone Coast of South West Wales	Special Area of Conservation (SAC)	9.8 km south-southwest
E2. Gower Commons/Barry Inlet	Gower Commons SAC and Barry Inlet Special Protection Area (SPA) and Ramsar site	3.6 km southwest
E3. Gower Ash Woods	SAC	7.4 km south-southwest
E4. Crymlyn Bog	SAC and Ramsar site	8.7 km east-southeast
E5. Carmarthen Bay & Estuaries	SAC	2.3 km west-northwest

### 3 Assumed Background Concentrations

#### Nitrogen Dioxide

Annual mean NO<sub>2</sub> background concentrations for 2022 have been obtained from the Defra UK Background Air Pollution Maps. The latest background maps were issued in August 2020 and are based on 2018 monitoring data. The 2022 mapped annual mean NO<sub>2</sub> background concentration for the installation site and surrounding area is 7.3 µg/m<sup>3</sup>, 18% of the air quality objective. This is the maximum for the twelve 1 km<sup>2</sup> grid squares surrounding the installation. This is considered a reasonable baseline NO<sub>2</sub> concentration for the assessment.



### Particles (PM<sub>10</sub> and PM<sub>2.5</sub>)

The maximum Defra background mapped concentrations for 2022 are 11.0 µg/m<sup>3</sup> for PM<sub>10</sub> and 6.9 µg/m<sup>3</sup> for PM<sub>2.5</sub> for the twelve 1 km<sup>2</sup> grids located around the site. These are assumed to be representative of air quality at the installation site.

### Sulphur Dioxide (SO<sub>2</sub>)

The maximum mapped SO<sub>2</sub> concentration for the area surrounding the installation site is 2.9 µg/m<sup>3</sup>. The SO<sub>2</sub> mapping is based on 2001 monitoring data and the 2022 SO<sub>2</sub> concentrations are assumed to be 100% of the published 2001 estimates and represent a worst-case.

### Hydrogen Chloride (HCl) and Hydrogen Fluoride (HF)

Ambient monitoring of hydrogen chloride has been carried out as part of the Defra Acid Gases & Aerosol Network at a number of locations around the UK. The closest monitoring site is at Narberth (rural background site), which is 50 km northwest of the site. This is some distance from the development site but in a similarly rural location and will likely be characteristic of measured concentrations at the site.

There is no data beyond 2015 but monthly measured concentrations in 2015 varied between 0.07 and 0.37 µg/m<sup>3</sup>. Therefore, the highest monthly concentration (0.37 µg/m<sup>3</sup>) is assumed to be representative of air quality at the installation site.

Monitoring of ambient levels of hydrogen fluoride is not currently carried out in the UK. However, the Expert Panel on Air Quality Standards (EPAQS) report on halogen and hydrogen halides in ambient air<sup>1</sup> cites a modelling study which suggests that the typical natural background HF concentration is 0.5 µg/m<sup>3</sup>, with an elevated background of 3 µg/m<sup>3</sup> where there are local anthropogenic emission sources.

There is no indication that a further significant source of HF is present at the site and a background HF concentration of 0.5 µg/m<sup>3</sup> is assumed to be applicable at sensitive human health and habitat receptors in the vicinity of the installation site.

### VOCs (as Benzene)

It is assumed as an absolute worst-case that all of the VOCs emitted from the process comprise benzene. Concentrations of benzene have been obtained from the Defra UK Background Air Pollution Maps. The mapped benzene concentrations are based on 2001 monitoring data, projected to 2010. This is the most recent projection available and is assumed to be representative of concentrations in future years.

The maximum estimated 2010 annual mean background benzene concentration for the area surrounding the installation site is 0.27 µg/m<sup>3</sup>.

### Summary of Background Concentrations

A summary of the annual mean and short-term background concentrations assumed for the assessment is presented in Table 4.

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<sup>1</sup> EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects



Table 4: Summary of Background Concentrations		
Pollutant	Annual Mean	Short-Term
Nitrogen Dioxide (NO <sub>2</sub> )	7.3 µg/m <sup>3</sup>	14.6 µg/m <sup>3</sup> (a)
Particles (PM <sub>10</sub> )	11.0 µg/m <sup>3</sup>	13.0 µg/m <sup>3</sup> (a)(b)
Particles (PM <sub>2.5</sub> )	6.9 µg/m <sup>3</sup>	n/a
Sulphur Dioxide (SO <sub>2</sub> )	2.9 µg/m <sup>3</sup>	24- hour 3.4 µg/ m <sup>3</sup> (a)(b) 1-hour 5.8 µg/m <sup>3</sup> (a) 15- minute 7.8 µg/m <sup>3</sup> (a)(d)
Hydrogen Fluoride (HF)	0.5 µg/m <sup>3</sup>	1.0 µg/m <sup>3</sup> (a)
Hydrogen Chloride (HCl)	0.37 µg/m <sup>3</sup>	0.74 µg/m <sup>3</sup> (a)
Benzene	0.27 µg/m <sup>3</sup>	0.32 µg/m <sup>3</sup> (a)(b)

- (a) 1-hour mean background concentration estimated by multiplying the annual mean by a factor of 2 in accordance with the EA Guidance.
- (b) 24-hour mean background concentration estimated by multiplying the 1-hour mean by a factor of 0.59 in accordance with the EA Guidance.
- (c) 8-hour mean background concentration estimated by multiplying the 1-hour mean by a factor of 0.70 in accordance with the EA Guidance.
- (d) 15-minute mean background concentration estimated by multiplying the 1-hour mean by a factor of 1.34 in accordance with the EA Guidance.

#### 4 Assessment of Significance

##### *Impact on Human Health*

The following has been carried out on the basis that Natural Resources Wales rely on the Environment Agency risk assessment Guidance.

The Environment Agency has developed criteria for assessing the significance of an impact compared with relevant air quality standards and background air quality<sup>2</sup> for the purposes of environmental permitting. These are different to the IAQM planning guidance. A process contribution (PC) is considered not significant if:

- The long-term PC < 1% of the long-term air quality standard;
- The short-term PC < 10% of the short-term air quality standard.

At 1% of the long-term air quality standard, the impact of a development is unlikely to be significant compared with background air quality. Both the short and long-term criteria are also designed to ensure that there is a substantial safety margin to protect public health and the environment.

If the screening criteria are not met, the process contribution should be considered in combination with relevant ambient background pollutant concentrations. The air quality standards are likely to be met if:

- The long-term PC + background concentration < 70% of the air quality standard;
- The short-term PC < 20% (air quality standard – short-term background concentration), where the short-term background concentration is assumed to be twice the long-term background concentration.

<sup>2</sup> Environment Agency Risk Assessment Guidance (<https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit>)



### *Impact on Habitat Sites*

The Environment Agency has developed criteria for assessing the significance of air quality impacts at SPAs, SACs, Ramsar sites and SSSIs, compared with the relevant critical level/load and background air quality/deposition. The criteria are designed to ensure that there is a substantial safety margin to protect the environment.

#### Stage 1

A process contribution (PC) is considered not significant if:

- The long term PC < 1% of the long-term critical load/level
- The short term PC < 10% of the short-term critical load/level

#### Stage 2

If the Stage 1 screening criteria are not met, the PC should be considered in combination with relevant ambient background pollutant concentrations or deposition rates. The air quality standards are likely to be met if:

- The long term PC + background contribution is < 70% of the critical level/load
- The short term PC < 20% of the (critical level/load – short term background contribution)

For local nature sites (SINCs, SLINCs, NNRs, LNRs and ancient woodland), a process contribution (PC) is considered not significant if:

- The long term PC < 100% of the long-term critical level/load
- The short term PC < 100% of the short-term critical level/load

## **5 Predicted Impact – Human Health**

### *Maximum Predicted Concentrations*

The predicted maximum impact of the furnace emissions anywhere within the model domain is provided in Table 5. This provides the predicted contribution of the facility (PC) and the predicted environmental concentration (PEC) which is the PC plus the background concentration. Results are compared to the relevant air quality assessment levels (AQAL) also provided in Table 5. As a worst-case it is assumed that all of the particle emissions comprise PM<sub>10</sub> and PM<sub>2.5</sub>. For VOCs, it is assumed all of the VOC emissions comprise benzene.

It should be noted that the results presented in Table 5 represent the very worst-case. Predicted concentrations are the maximum anywhere within the model domain, for the worst-case meteorological year and for the furnace to operate continuously at the emission limit values.

Predicted annual mean concentrations of PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>2</sub> can be screened out as the PECs are less than 70% of the respective AQALs. Similarly, short-term concentrations of PM<sub>10</sub>, NO<sub>2</sub>, HF and HCl can be screened out as the PCs are less than 10% of the AQAL. Short-term concentrations of SO<sub>2</sub> (hourly and 15-minute) can also be screened out as the PC is less than 20% of the difference between the AQAL and the background concentration. Therefore, a more detailed analysis is required for SO<sub>2</sub> (24-hour mean) and VOCs (annual mean and 24-hour mean).



Pollutant	Averaging Period	PC ( $\mu\text{g}/\text{m}^3$ )	PC %age of AQAL	PEC %age of AQAL	AQAL ( $\mu\text{g m}^{-3}$ )
PM <sub>10</sub>	Annual	0.60	1.5%	29.0%	40
PM <sub>10</sub>	24 hour (90.4 <sup>th</sup> percentile)	1.7	3.5%	29.5%	50
PM <sub>2.5</sub>	Annual	0.60	3.0%	37.0%	20
NO <sub>2</sub>	Annual	5.0	12.5%	30.8%	40
NO <sub>2</sub>	1 hour (99.8 <sup>th</sup> percentile)	17.3	8.7%	16.0%	200
SO <sub>2</sub>	24 hour (99.2 <sup>nd</sup> percentile)	34.1	27.3%	30.0%	125
SO <sub>2</sub>	1 hour (99.7 <sup>th</sup> percentile)	41.2	11.8%	13.4%	350
SO <sub>2</sub>	15 minute (99.9 <sup>th</sup> percentile)	42.8	16.1%	19.0%	266
HF	Monthly (weekly)	0.36	2.2%	5.4%	16
HF	1 hour	0.85	0.5%	1.2%	160
HCl	1 hour	8.5	1.1%	1.2%	750
VOCs as benzene	Annual	3.6	71.5%	76.9%	5
VOCs as benzene	24 hour	20.8	69.2%	70.2%	30

#### Detailed Results for SO<sub>2</sub> (24-hour Mean)

Predicted 24-hour mean SO<sub>2</sub> concentrations (as the 99.2<sup>nd</sup> percentile) for the discrete sensitive receptors are presented in Table 6.

Receptor	99.2 <sup>nd</sup> Percentile of 24-Hour Means	
	PC ( $\mu\text{g}/\text{m}^3$ )	PC (%age AQAL)
H1 Oak Drive	6.8	5.4%
H2 Tir Y Farchnad	6.4	5.1%
H3 Liiw Valley Close	2.8	2.2%
H4 Alder Way	2.1	1.7%
H5 Dobes Acres	3.6	2.9%
H6 Roseland Road	2.9	2.3%
H7 Keeper's Lodge Farm	2.9	2.3%
H8 Glasfryn Terrace	1.8	1.4%
H9 Pen y Fodau Fawr	3.3	2.6%
H10 Cae'r Bont	2.0	1.6%
H11 Heol Will George	1.6	1.3%
H12 Sardis Close	1.5	1.2%
H13 Sardis Close	1.6	1.2%
H14 Heol Will George	1.7	1.4%
AQAL ( $\mu\text{g}/\text{m}^3$ )	125	
Background ( $\mu\text{g}/\text{m}^3$ )	3.4	
Maximum PC as %age of AQAL	5.4%	
Maximum PEC as %age of AQAL	8.2%	



Predicted concentrations of SO<sub>2</sub> at all receptor locations are less than 10% of the AQAL of 125 µg/m<sup>3</sup> and would be assessed as not significant.

#### *Detailed Results for VOCs (as Benzene)*

Predicted annual mean and maximum 24-hour mean benzene concentrations for the discrete sensitive receptors are presented in Table 7.

Receptor	Annual Mean		Maximum 24-Hour Mean	
	PC (µg/m <sup>3</sup> )	PC (% of AQAL)	PC (µg/m <sup>3</sup> )	PC (% of AQAL)
H1 Oak Drive	0.35	7.0%	4.7	15.6%
H2 Tir Y Farchnad	0.34	6.8%	4.0	13.5%
H3 Liiw Valley Close	0.19	3.8%	2.2	7.3%
H4 Alder Way	0.14	2.7%	1.4	4.6%
H5 Dobes Acres	0.27	5.4%	2.8	9.5%
H6 Roseland Road	0.15	3.0%	1.9	6.4%
H7 Keeper's Lodge Farm	0.33	6.6%	2.1	7.0%
H8 Glasfryn Terrace	0.20	4.0%	1.4	4.7%
H9 Pen y Fodau Fawr	0.19	3.8%	2.3	7.5%
H10 Cae'r Bont	0.26	5.2%	1.4	4.8%
H11 Heol Will George	0.09	1.7%	1.1	3.8%
H12 Sardis Close	0.08	1.7%	1.1	3.8%
H13Sardis Close	0.09	1.7%	1.1	3.7%
H14 Heol Will George	0.09	1.8%	1.2	4.2%
AQAL (µg/m <sup>3</sup> )	5		30	
Background (µg/m <sup>3</sup> )	0.27		0.32	
Maximum PC as %age of AQAL	7.0%		0%	
Maximum PEC as %age of AQAL	12.4%		1%	

Predicted concentrations at the annual mean are potentially significant as the PC at most of the receptors is greater than 1% of the AQAL of 5 µg/m<sup>3</sup>. However, the PEC is well below 70% of the AQAL and it is unlikely that the AQAL would be exceeded. For the 24-hour mean, the PC is greater than 10% of the 24-hour mean AQAL at two receptors. However, the PC at both receptors is less than 20% of the difference between the AQAL and the background concentration (5.9 µg/m<sup>3</sup>). Therefore, it is unlikely that the short-term AQAL would be exceeded.

Therefore, it is concluded that emissions from the furnace, even under the worst-case assumptions adopted for the assessment, would not have a significant impact on human health.

## 6 Predicted Impact – Habitat Sites

The impact of airborne emissions of NO<sub>x</sub>, SO<sub>2</sub> and HF on the identified LWS and European sites has been assessed. For the LWS, the maximum impact at any LWS is presented and represents a worst-case. Predicted concentrations are compared to relevant critical levels.



### Oxides of Nitrogen (NO<sub>x</sub>)

Predicted annual mean and maximum 24-hour mean concentrations of NO<sub>x</sub> at the identified habitat sites are presented in Table 8.

Habitat Site	Annual Mean		24-Hour Mean	
	PC (µg/m <sup>3</sup> )	PC (% of CL)	PC (µg/m <sup>3</sup> )	PC (% of CL)
Maximum LWS	7.2	23.8%	41.5	55.3%
E1. Limestone Coast of South West Wales SAC	0.018	0.1%	0.43	0.6%
E2. Gower Commons SAC/Barry Inlet SPA	0.063	0.2%	0.66	0.9%
E3. Gower Ash Woods SAC	0.025	0.1%	0.45	0.6%
E4. Crymlyn Bog SAC/Ramsar	0.030	0.1%	0.38	0.5%
E5. Carmarthen Bay & Estuaries SAC	0.10	0.3%	1.2	1.6%
<b>Critical Level (µg/m<sup>3</sup>)</b>	<b>30</b>		<b>75</b>	

At the LWS, predicted annual mean and 24-hour mean NO<sub>x</sub> concentrations are less than 100% of the critical levels and would be assessed as not significant. At the European sites, predicted annual mean and 24-hour mean concentrations are less than 1% and 10% of the long-term and short-term critical levels and would also be assessed as not significant.

### Sulphur Dioxide (SO<sub>2</sub>)

Predicted annual mean concentrations of SO<sub>2</sub> at the identified habitat sites are presented in Table 9. Results are compared to the most stringent critical level of 10 µg/m<sup>3</sup>.

Habitat Site	Annual Mean	
	PC (µg/m <sup>3</sup> )	PC (% of CL)
Maximum LWS	4.2	41.8%
E1. Limestone Coast of South West Wales SAC	0.011	0.1%
E2. Gower Commons SAC/Barry Inlet SPA	0.037	0.4%
E3. Gower Ash Woods SAC	0.014	0.1%
E4. Crymlyn Bog SAC/Ramsar	0.017	0.2%
E5. Carmarthen Bay & Estuaries SAC	0.060	0.6%
<b>Critical Level (µg/m<sup>3</sup>)</b>	<b>10</b>	

Predicted annual mean SO<sub>2</sub> concentrations at the LWS are less than 100% of the most stringent critical level and less than 1% of the critical level at the European sites. Therefore, the impact of SO<sub>2</sub> emissions on habitat sites would be assessed as not significant.



### Hydrogen Fluoride (HF)

Predicted weekly mean and 24-hour mean HF concentrations at the identified habitat sites are presented in Table 10.

Table 10: Predicted Maximum HF Concentrations ( $\mu\text{g}/\text{m}^3$ )				
Habitat Site	Weekly Mean		24-Hour Mean	
	PC ( $\mu\text{g}/\text{m}^3$ )	PC (% of CL)	PC ( $\mu\text{g}/\text{m}^3$ )	PC (% of CL)
Maximum LWS	0.36	71.8%	0.69	13.9%
E1. Limestone Coast of South West Wales SAC	0.0013	0.3%	0.0072	0.1%
E2. Gower Commons SAC/Barry Inlet SPA	0.0046	0.9%	0.011	0.2%
E3. Gower Ash Woods SAC	0.0020	0.4%	0.0074	0.1%
E4. Crymlyn Bog SAC/Ramsar	0.0020	0.4%	0.0063	0.1%
E5. Carmarthen Bay & Estuaries SAC	0.0086	1.7%	0.020	0.4%
<b>Critical Level (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>0.5</b>		<b>5</b>	

At the LWS, predicted weekly mean and 24-hour mean HF concentrations are less than 100% of the critical levels and would be assessed as not significant. At the European sites, predicted weekly mean and 24-hour mean concentrations are less than 10% of the short-term critical levels and would also be assessed as not significant.

## 7 Conclusion

Even under the worst-case assessment adopted, the impact of the furnace emissions on human and habitat receptors would be assessed as not significant or that an exceedance of the air quality assessment level would not be exceeded.