

Air Quality Assessment: Earlswood Fire Training Facility, Neath Port Talbot

June 2022



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management & assessment



Document Control

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Executive Summary

The air quality and odour impacts associated with the proposed Compartment Fire Behavior Training (CFBT) Facility at Earlswood Fire Training Centre in Neath have been assessed.

The proposed development will not generate any additional traffic on the local road network but will comprise combustion of wood within a building in order to provide a realistic training environment for firefighters, which will lead to emissions of combustion pollutants.

The pollution controls that will be installed within the facility will be effective and, combined with the distance to the nearest locations where members of the public may be exposed, impacts from particulate matter, polycyclic aromatic hydrocarbons (PAHs), carbon monoxide and odour emissions will be sufficiently low that combustion within the facility will have no significant offsite air quality effects.

Overall, the air quality impacts of the proposed development are judged to be 'not significant'.

Contents

1	Introduction	3
2	Process Description	5
3	Policy Context	8
4	Assessment Criteria	13
5	Assessment Approach	15
6	Baseline Conditions.....	17
7	Impact Assessment.....	19
8	Conclusions	25
9	References.....	26
10	Glossary.....	28
11	Appendices	29
A1	EPUK & IAQM Planning for Air Quality Guidance.....	30
A2	Professional Experience.....	36

Tables

Table 1:	Indicative Training Exercises Envisaged by MWWFRS	6
Table 2:	Air Quality Criteria for PM ₁₀ , PM _{2.5} , CO and PAH	14
Table 3:	Summary of Annual Mean NO ₂ Monitoring (2015-2019).....	17
Table 4:	Estimated Annual Mean Background Pollutant Concentrations in 2019 (µg/m ³) 18	
Table 5:	Calculation of Emission Rates of PM, CO and PAHs from the Proposed Facility 19	
Table 6:	Calculation of Emission Rates of CO and PAHs from Domestic Open Fires ^a .20	

Figures

Figure 1:	Proposed Development Setting in the Context of Air Quality	3
Figure 2:	Schematic of Development Set-up	5
Figure 3:	Monitoring Locations	18
Figure 4:	Stack Location.....	22
Figure 5:	Wind Rose for Mumbles Head in 2021	23

1 Introduction

- 1.1 This report describes the potential air quality and odour impacts associated with the proposed Compartment Fire Behaviour Training (CFBT) facility, located within the Earlswood Fire Training Centre, near Neath. The assessment has been carried out by Air Quality Consultants Ltd on behalf of Mid and West Wales Fire and Rescue Service (MWWFRS).
- 1.2 The proposed development will consist of a new CFBT facility located within an existing building. The CFBT will allow 'real fire' conditions to be replicated in an enclosed training environment and this involves real combustion generating smoke. Smoke will be treated using a Smoke Control Unit (SCU), before being released externally. The main air pollutants of concern related to the combustion activities are fine particulate matter (PM₁₀ and PM_{2.5}), carbon monoxide (CO), Polycyclic Aromatic Hydrocarbons (PAHs) and odours.
- 1.3 The CFBT facility will form part of a wider training programme, which is already being provided at the site; therefore, it will not generate additional traffic on the local road network.
- 1.4 The location of the proposed development is shown in Figure 1.



Figure 1: Proposed Development Setting in the Context of Air Quality

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- 1.5 This assessment focuses on the potential for emissions from the CFBT facility to affect air quality for nearby residents and members of the public. This report has been prepared taking into account all relevant local and national guidance and regulations, and follows a methodology agreed with Neath Port Talbot County Borough Council (NPT).

2 Process Description

- 2.1 The proposed development comprises a house ('training building') located within a larger existing building known as the 'giraffe building'. Fires will be started within a purpose-built fire compartment known as an attack/burn box. Burns will also be undertaken within mobile fire cribs located within the dining room or bedroom within the building. Figure 2 shows the layout of the building.

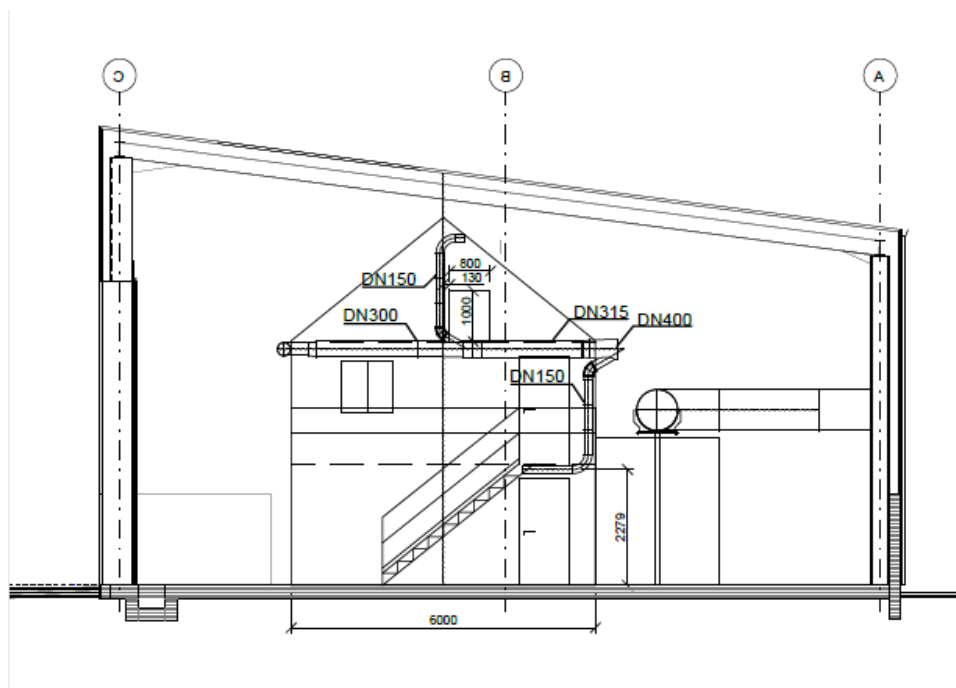


Figure 2: Schematic of Development Set-up

Combustion Activities

- 2.2 MWWFRS and Drager (the equipment supplier) have advised that the combustion material most likely to be used in attack/burn box setups is 4-6 mm hardboard plates, in two layers, totalling 8-12 mm thickness. If these are unavailable, Oriented Strand Board (OSB) may be used in sheets of up to 16 mm in thickness. No second-hand waste wood will be burned within the facility. A maximum of 150 kg of dry wood will be burned per hour of operation of the attach/burn box setup. For use in fire cribs, two Euro pallets comprising approximately 50 kg of dry wood are likely to be used. MWWFRS has provided the indicative information in Table 1 which sets out the frequency of burning activities.

Table 1: Indicative Training Exercises Envisaged by MWWFRS

Exercise	Approx. burn time (hours)	Frequency (per year)	Total burn time (per year)	Quantity of Wood Burned per year (tonnes) ^a
Two-day Breathing Apparatus Refresher	3	50 (100 days)	150	30
Breathing Apparatus Initial	7.5	12 (60 days)	90	18
Evening Exercises	1.5	50 (50 days)	75	12
Tactical Ventilation	3	60 (60 days)	180	36
Total Per year		270	495	96

^a Assuming 200 kg/hr of wood burned (150 kg per attack/burn box and 50 kg per fire crib).

2.3 The principal pollutants of concern from these combustion activities will be:

- carbon monoxide (CO);
- particulate matter – both in terms of visible smoke and in terms of health effects from fine particulate matter (PM₁₀ and PM_{2.5});
- Polycyclic Aromatic Hydrocarbons (PAHs); and
- odours.

Containment and Treatment of Airborne Material

- 2.4 During training exercises, smoke will be captured directly at the doors and windows of the training building using hoods. Any residual smoke will be captured in the giraffe building itself by secondary ducting and extracted into the SCU. Therefore, there are two levels of containment of smoke emissions. Given the extraction of air, which will result in the giraffe building being under negative pressure, there is judged to be limited potential for fugitive emissions from the giraffe building.
- 2.5 The SCU will be provided by Dräger. Extracted air from the training building and giraffe building will be forced through a series of filters which will remove particulate matter from the air including the larger particulates responsible for visible emissions.
- 2.6 The filtration system has been designed by Dräger to meet the Medium Combustion Plant Directive (MCPD) emission limit for dust, for new combustion plants other than engines and gas turbines (20 mg/Nm³). There will be no additional treatment to remove CO, or residual PAH or odour emissions, but removal of particulate matter will, in itself, also remove much of the odour and PAH emissions.

Release Parameters

- 2.7 The filtered air will be discharged from a stack 10-12 m high, of 0.6-0.8m in diameter, which is located to the east of the building. Dräger have advised that the actual exhaust flow rate from the stack will be 18,000 m³/hr at 150°C, which equates to a normalised flow rate of 11,619 m³/hr under standard conditions, as set out in the MCPD (273.15 K, 101.3 kPa, 0% H₂O and 20.67% O₂). The velocity will be approximately 10m/s.

3 Policy Context

- 3.1 All European legislation referred to in this report is written into UK law and remains in place.

Air Quality Strategy

- 3.2 The Air Quality Strategy (Defra, 2007) published by the Department for Environment, Food, and Rural Affairs (Defra) and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Strategy 2019

- 3.3 The Clean Air Strategy (Defra, 2019b) sets out a wide range of actions by which the UK Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

The Clean Air Plan for Wales

- 3.4 In August 2020, the Welsh Government published the Clean Air Plan for Wales (Welsh Government, 2020), which aims to *“improve air quality and reduce the impacts of air pollution on human health, biodiversity, the natural environment and our economy”*. The Plan sets out the following four themes, around which the plan is structured, with actions in order to enable collaborative approaches to reducing air pollution:
- People: Protecting the health and well-being of current and future generations;
 - Environment: Taking action to support our natural environment, ecosystems and biodiversity;
 - Prosperity: Working with industry to reduce emissions, supporting a cleaner and more prosperous Wales; and
 - Place: Creating sustainable places through better planning, infrastructure and transport.

- 3.5 The Plan details intentions to publish a Clean Air Zone Framework, stating an expectation *“to see Clean Air Zones established in towns and cities throughout Wales to reduce the impact of transport emissions on health. Some of these may be supported by a charging element. Clean Air Zones, where appropriate, would enable a range of co-ordinated actions to deliver significant reductions in public and environmental exposure to harmful airborne pollutants from all sources”*.
- 3.6 The Plan also includes plans to *“introduce LAQM policy changes by 2023 to ensure the regime is public health focused and proactively finding and tackling areas of pollution”*. These changes include a focus on the human health impacts of PM_{2.5}, stating *“In the current regime, monitoring of PM_{2.5} is encouraged but not mandatory. In the context of the known health impacts associated with PM_{2.5}, we propose to investigate the extent to which Local Authorities can support monitoring, reporting and action on PM_{2.5} as part of their existing LAQM functions”*.
- 3.7 The Plan states that the Welsh Government will *“publish and consult on a White Paper on a Clean Air Act for Wales before the end of this Senedd Term”*, which will include:
- *“New powers for smoke control linked to tackling air pollution from domestic burning (PM_{2.5})*
 - *A requirement for a Clean Air Plan / Strategy to be published / reviewed every 5 years*
 - *Potential new air quality targets (for example, taking account of WHO guidelines for air quality)*
 - *Clarified and strengthened local air quality management legislation*
 - *Strengthened powers to address road vehicle idling*
 - *Consolidated powers to implement Clean Air Zones / Low Emission Zones*
 - *Focused powers to protect vulnerable groups from the effects of air pollution*
 - *Enhanced air quality monitoring and modelling*
 - *A potential new duty on public bodies to adhere to guidance encouraging different ways of working and actions to reduce air pollution and support decarbonisation.”*

Environment Act 2021

- 3.8 The UK’s new legal framework for protection of the natural environment, the Environment Act (2021) passed into UK law in November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the government to account and ensuring compliance with these targets.
- 3.9 The Act requires the government to set at least one long-term target (spanning a minimum of 15 years), supported by interim targets set in a five year cycle, in each of four identified areas: Air Quality, Biodiversity, Water and Resource Efficiency and Waste Reduction. An additional target for

mean levels of PM_{2.5} is also required. These must be set before November 2022. As the targets have not yet been either finalised or adopted by the Government, they cannot impact on current planning policy.

Planning Policy

National Policies

- 3.10 Land-use planning policy in Wales is established within the policy document Planning Policy Wales (PPW) (Welsh Government, 2021), which provides the strategic policy framework for the effective preparation of local planning authority development plans. With regard to pollution and health effects, it states:

“Planning authorities have a role to play in the prevention of physical and mental illnesses caused, or exacerbated, by pollution, disconnection of people from social activities (which contributes to loneliness) as well as the promotion of travel patterns which facilitate active lifestyles. The planning system must consider the impacts of new development on existing communities and maximise health protection and well-being and safeguard amenity. This will include considering the provision of, and access to, community and health assets, such as community halls, libraries, doctor’s surgeries and hospitals. Health impacts should be minimised in all instances, and particularly where new development could have an adverse impact on health, amenity and well-being. In such circumstances, where health or amenity impacts cannot be overcome satisfactorily, development should be refused”.

“Planning authorities should develop and maintain places that support healthy, active lifestyles across all age and socio-economic groups, recognising that investment in walking and cycling infrastructure can be an effective preventative measure which reduces financial pressures on public services in the longer term. The way a development is laid out and arranged can influence people’s behaviours and decisions and can provide effective mitigation against air and noise pollution. Effective planning can provide calming, tranquil surroundings as well as stimulating and sensory environments, both of these make an important contribution to successful places”

“Green infrastructure can be an effective means of enhancing health and well-being, through linking dwellings, workplaces and community facilities and providing high quality, accessible green spaces. In all development and in public spaces especially, there should be sensitive management of light, and exposure to airborne pollution should be kept as low as reasonably practicable. The compatibility of land uses will be a key factor in addressing air quality and creating appropriate soundscapes which are conducive to, and reflective of, particular social and cultural activities and experiences, particularly in busy central areas of towns and cities. Equally, the provision of quiet, tranquil areas which provide peaceful sanctuaries in otherwise noisy environments can help to reduce general levels of pollution and promote both mental and physical well-being”.

- 3.11 PPW places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. Local development plans should enable consideration of the effects that the proposed development may have on air quality, as well as the effect that air quality may have on the proposed development. To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location.
- 3.12 PPW also places considerable emphasis on the Well-being of Future Generations Act (Welsh Government, 2015) with the intention to improve the social, economic, environmental and cultural well-being of Wales, and outlines how this can be achieved through the concept of 'Placemaking'.
- 3.13 PPW is supported by a series of Technical Advice Notes (TANs) and National Assembly for Wales Circulars. Local planning authorities have to take PPW, TANs and Circulars into account when preparing Development Plans.
- 3.14 The need for compliance with any statutory air quality limit values and objectives is stressed, and the presence of AQMAs must be accounted for in terms of the cumulative impacts on air quality from individual sites in local areas. New developments in AQMAs should be consistent with local air quality action plans.

Local Policies

- 3.15 The Neath Port Talbot County Borough Council Local Development Plan (NPT, 2016) was adopted in January 2016. Policy Sp16 refers specifically to air quality and states that:

"Air, water and ground quality and the environment generally will be protected and where feasible improved through the following measures:

1. Ensuring that proposals have no significant adverse effects on water, ground or air quality and do not significantly increase pollution level....

3. Ensuring that developments do not increase the number of people exposed to significant levels of pollution."

- 3.16 NPT has also published a Supplementary Planning Guidance (SPG) document on 'Pollution', which includes the following policies relevant to air quality in the study area.

- 3.17 Policy EN8 Pollution and Land Stability:

"Proposals which would be likely to have an unacceptable adverse effect on health, biodiversity and/or local amenity or would expose people to unacceptable risk due to the following will not be permitted:

Air Pollution..."

Air Quality Action Plans

National Air Quality Plan

- 3.18 Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK (Defra, 2017); a supplement to the 2017 Plan (Defra, 2018) was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities (or the GLA in the case of London Authorities) to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a CAZ. There is currently no straightforward way to take account of the effects of the 2017 Plan or 2018 Supplement in this assessment; however, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the proposed development. This assessment has principally been carried out in relation to the air quality objectives, rather than the limit values that are the focus of the Air Quality Plan.

Welsh Government Supplemental Air Quality Plan

- 3.19 The Welsh Government has produced a supplemental plan to the 2017 UK plan for tackling roadside nitrogen dioxide concentrations (Welsh Government, 2018). The document sets out the work done to date to identify how the Welsh Government will reduce concentrations of nitrogen dioxide around roads where levels are above legal limits. The plan expands on Section 7.6 (Additional Actions in Wales) of the 2017 UK plan for tackling roadside nitrogen dioxide concentrations, and sets out how the Welsh Government will comply within the shortest possible time with the limit values for nitrogen dioxide.

Local Air Quality Action Plan

- 3.20 The NPT Air Quality Action Plan sets out a series of measures by which the Council will seek to achieve the air quality objectives in its AQMA. None of the policies are especially relevant to this assessment, being focussed on locations outside of the assessment study area.

4 Assessment Criteria

Air Quality Objectives

- 4.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (Wales) Regulations (2000) and the Air Quality (Amendment) (Wales) Regulations (2002).
- 4.2 PAH's are a broad family of pollutants and there is no objective set for total PAH concentrations. An objective has been set for concentrations of benzo(a)pyrene and it is common to consider total PAH effects in the context of the objective set for this pollutant.
- 4.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2021a). The annual mean objectives for PM₁₀ are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour and 8-hour mean objective for PM₁₀ and carbon monoxide are considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels.
- 4.4 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for PM₁₀ and PM_{2.5}, and is implemented in UK law through the Air Quality Standards Regulations (2010)¹. The limit value for PM₁₀ is the same numerical concentration as the UK objective, whilst the limit value for PM_{2.5} is 20 µg/m³. Achievement of the limit values is a national obligation rather than a local one. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).
- 4.5 The relevant air quality criteria for this assessment are provided in Table 2.

¹ As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

Table 2: Air Quality Criteria for PM₁₀, PM_{2.5}, CO and PAH

Pollutant	Time Period	Objective
PM₁₀	24-hour Mean	50 µg/m ³ not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m ³ ^a
PM_{2.5} ^a	Annual Mean	25 µg/m ³
CO	8-hour Mean	10 mg/m ³
PAH (Benzo(a)pyrene)	Annual Mean	0.25 ng/m ³

^a The PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

Odour

4.6 There are currently no statutory standards in the UK covering the release and subsequent impacts of odours. This is due to complexities involved with measuring and assessing odours against compliance criteria, and the inherently subjective nature of odours.

4.7 It is recognised that odours have the potential to pose a nuisance for residents living near to an offensive source of odour. Determination of whether or not an odour constitutes a statutory nuisance in these cases is usually the responsibility of the local planning authority or the Environment Agency. The Environmental Protection Act 1990 (1990) outlines that a local authority can require measures to be taken where any:

“dust, steam, smell or other effluvia arising on an industrial, trade and business premises and being prejudicial to health or a nuisance...” or

“fumes or gases are emitted from premises so as to be prejudicial to health or cause a nuisance..”

4.8 Odour can also be controlled under the Statutory Nuisance provisions of Part III of the Environmental Protection Act.

5 Assessment Approach

Consultation

- 5.1 The assessment follows a methodology agreed with NPT via email correspondence between Calum Lewis (Environmental Health Officer at NPT) and Lucy Hodgins (Air Quality Consultants) in May 2022. Specifically, it was agreed that a semi-quantitative approach to assessing the impacts of emissions from the facility, by estimating emissions rates of particulate matter, CO and PAHs and providing context to these emissions with respect emissions from an open domestic fire, would be appropriate. Additionally, it was agreed that an assessment of the impacts of emissions from road traffic could be screened out, as the development is not expected to result in an increase in road traffic.

Existing Conditions

- 5.2 Existing sources of emissions and baseline air quality conditions within the study area have been defined using a number of approaches:
- industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2022a);
 - local sources have been identified through examination of the Council's Air Quality Review and Assessment reports;
 - information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority;
 - background concentrations have been defined using Defra's 2018-based background maps (Defra, 2022d). These cover the whole of the UK on a 1x1 km grid. Mapped background concentrations of PM₁₀ and PM_{2.5} have not been adjusted.

Risk of Impacts

- 5.3 The potential for emissions from the facility to lead to impacts at the nearest sensitive receptors has been assessed using the Source-Pathway-Receptor approach. This is based on the concept that, in order for an impact to occur, there must be a source, a pathway to carry pollutants to an off-site location, and a receptor (e.g. people) to be affected (i.e. Source-Pathway-Receptor).
- 5.4 This approach considers the proposed activities: the emission rates from the facility and, the duration and frequency of the burns; and the meteorological conditions which provide the pathway between the facility and sensitive properties. The assessment also provides context to the emissions by comparing them to those from domestic homes.

Assessment of Significance

- 5.5 There is no official guidance in the UK in relation to development control on how to assess the significance of air quality impacts. The approach developed jointly by EPUK and the IAQM (Moorcroft and Barrowcliffe et al, 2017) has therefore been used. The overall significance of the air quality impacts is determined using professional judgement; the experience of the consultants preparing the report is set out in Appendix A2. Full details of the EPUK/IAQM approach are provided in Appendix A1.

6 Baseline Conditions

Relevant Features

- 6.1 The proposed development is located approximately 3.5 km to the south west of Neath town centre. It is located within the existing Earlswood Training Centre, which is bounded to the north by the A48, to the west by the A483, and to the south and east by a residential property and gardens. Monkstone Cruising and Sailing Club is also located in proximity to the southeast, and the M4 is approximately 150 m to the south.

Industrial sources

- 6.2 No significant industrial or waste management sources have been identified that are likely to affect the study area, in terms of air quality or odour.

Local Air Quality Monitoring

- 6.3 NPT operates five automatic monitoring stations within its area measuring particulate matter, which are all located in Port Talbot, between five and nine kilometres to the southeast of the development site. One of these sites also measured concentrations of CO. Annual mean results for the years 2015 to 2019 are summarised in Table 3. The monitoring locations are shown in Figure 3. The monitoring data have been taken from NPT's 2020 Progress Report (Neath Port Talbot County Borough Council, 2020).

Table 3: Summary of Annual Mean Particulate Matter and Carbon Monoxide Monitoring (2015-2019)

Site No.	Site Type	Location	2015	2016	2017	2018	2019
Annual Mean PM ₁₀ (µg/m ³)							
DS1	Industrial	Dyffryn School	20	18	21	-	22
LW1	Industrial	Port Talbot Little Warren	24	21	21	21	20
PS2	Industrial	Prince Street	-	23	25	23	20
PT2	Industrial	Port Talbot Fire Station	27	22	23	23	21
TW1	Industrial	Twll-yn-y Wal Park	26	24	21	21	21
Objective			40				
Annual Mean PM _{2.5} (µg/m ³)							
PS2	Industrial	Prince Street	10	10	10	9	9
PT2	Industrial	Port Talbot Fire Station	10	9	10	11	11
Objective			40				
8-hour Mean CO - No. of Exceedances > 10 mg/m ³							
PT2	Industrial	Port Talbot Fire Station	0	0	0	0	0

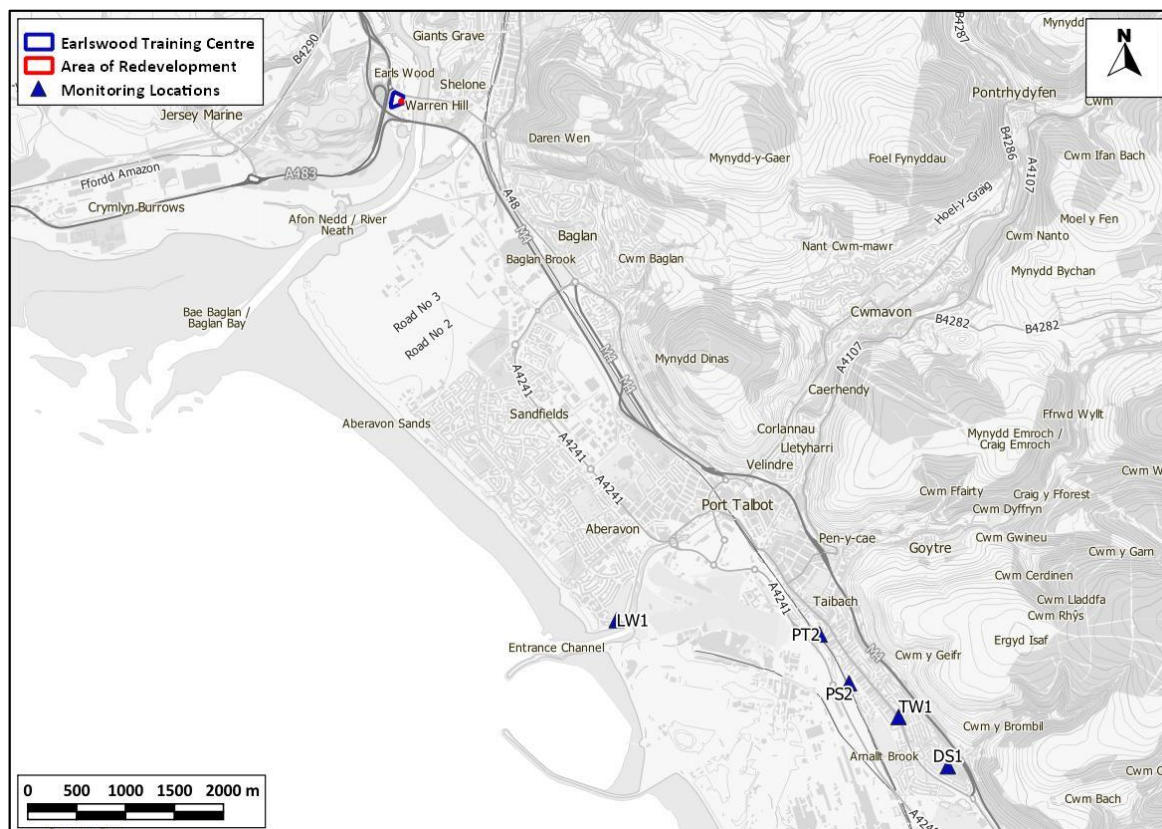


Figure 3: Monitoring Locations

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- 6.4 Annual mean PM₁₀, PM_{2.5} and 8-hour mean CO concentrations remained well below the respective objectives at all monitoring locations between 2015 and 2019. No clear trends in concentrations were observed between 2015 and 2019.

Background Concentrations

- 6.5 Estimated background concentrations at the proposed development are set out in Table 4 and are all well below the objectives. There are no background maps available for PAH (Benzo(a)pyrene)

Table 4: Estimated Annual Mean Background Pollutant Concentrations in 2019 (µg/m³)

Year	PM ₁₀	PM _{2.5}	CO ^b
2019	12.2	7.8	0.00024
Objective	40	25 ^a	10000

^a The 25 µg/m³ PM_{2.5} objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

^b CO annual mean taken from 2001 based background maps while objective for 8-hour rolling mean presented.

7 Impact Assessment

Source of Pollutants

Calculation of Emissions

- 7.1 The impacts of potential pollutant emissions from the combustion of wood within the CFBT, have been assessed semi-quantitatively by providing context to the anticipated emissions by comparing the estimated emission rates for the training room with those from a single residential dwelling with an open fire.

Emissions from the Proposed Facility

- 7.2 Details of the scale of operations, fuel type, frequency of burning and exhaust filtration system were provided by Dräger UK, the equipment supplier, and are set out in Section 2.
- 7.3 The SCU, as discussed in Paragraph 2.6, will include a particulate matter filtration system that will ensure the particulate emission rate does not exceed the MCPD emission limit of 20 mg/Nm³.
- 7.4 Table 5 shows how the emission rates used in this assessment have been calculated. The emission rates in Table 5 for CO and PAH may not ideally represent combustion conditions within the CFBT. Emissions of CO link strongly with available oxygen and efficiency of burn, and emissions from the CFBT may thus be higher than those from a wood-burning furnace. However, the conclusions of the assessment are not sensitive to precision in the CO emissions factor, and so the values in Table 5 are considered sufficient to inform the assessment. The emission rate for PAH relates principally to the burning of raw wood. Hardboard sheets and OSB contain glues and so the initial PAH emissions may be higher. However, while the SCU does not specifically target removing PAH, it will nevertheless provide effective mitigation since PAHs will be removed through particle filtration. Thus, on balance, the values given in Table 5 are most likely to overstate the PAH emissions from the CFBT.

Table 5: Calculation of Emission Rates of PM, CO and PAHs from the Proposed Facility

Pollutant	Emission Rate	Fuel Consumption of CFBT (kg/h)	Emission Rate Used in This Assessment (mg/s)
PM	20 mg/Nm ³ ^a	-	64.6 ^e
CO	2,580 mg/kg ^b	200 ^d	143.3
PAHs	16.2 g/GJ ^c		14.7

^a Based on MCPD Emission Limit Value and Normalised conditions defined as 273.15K, 101.3kPa, dry and 20.67% O₂.

^b AEA Technology Environment emission rate for a small industrial wood-burning furnace (AEA Technology, 2001).

- ^c UK National Atmospheric Emissions Inventory (Defra, 2022) assuming calorific content of wood of 16,300 kJ/kg and based on the 16 species included on the USEPAs Priority Pollutant List
- ^s As advised by MWWFRS (see Paragraph 2.2).
- ^e Based on normalised flow rate for the SCU of 11,619 m³/hr

Emissions from Domestic Combustion

- 7.5 Emission factors for particulate matter, CO and PAH from typical domestic wood combustion have been extracted from the UK National Atmospheric Emissions Inventory (NAEI) (Defra, 2022). These are expressed in g/GJ. It has been assumed that a domestic property might burn 4 kg of wood per hour, with average calorific values of 16,300 kJ/kg for wood (engineeringtoolbox.com, n.d.) (similar to the rate used by Dräger for the facility ranging from 15 to 17 mg/kg of wood or OSB). Table 6 sets out the assumed emission rates for domestic combustion².

Table 6: Calculation of Emission Rates of CO and PAHs from Domestic Open Fires ^a

Pollutant	Emissions from NAEI (g/GJ)	Assumed Emission Rate per Residence (mg/s)
PM ₁₀	480	8.69
Carbon Monoxide	3,076	55.7
PAHs ^b	16.2	0.29

^a Assuming 4kg of wood is burnt per hour, with calorific contents of 16,300 kJ/kg.

^b Based on the 16 species included on the USEPAs Priority Pollutant List

Comparison of CFBT to Domestic Open Fire

Emissions of Particulate Matter

- 7.6 The nature of the combustion process within the training rooms will be such that much of the wood will pyrolyse. Within the SCU, any unburnt particles and soot will be removed using filters. The residual emissions of particulate matter will be less than the MCPD emission limit of 20mg/Nm³.
- 7.7 As presented in Table 5 the calculated emission rate of particulate matter by the CFBT (64.6 mg/s) is equivalent to the emissions from approximately seven domestic wood fires (8.69 mg/s), presented in Table 6.

Emissions of Carbon Monoxide

- 7.8 The calculated emission rate of CO by the CFBT, as presented in Table 5 (143.3 mg/s), is approximately 2.5 times greater than the assumed emission rate of a single domestic wood fire (55.7 mg/s), presented in Table 6. The CFBT will thus emit less CO than three average homes with fires.

² The emission factor for PAHs used for domestic combustion is the same as that assumed for the CFBT. Differences in the calculated emissions between these two source types thus relate solely to the assumed quantities of wood burned.

- 7.9 As noted in Paragraph 7.4, emissions of CO from the CFBT may be higher than calculated, but it is important to recognise that the calculated emission rate of CO is only twice that of particulate matter, while the objective for CO is 1,000 times higher than that of PM₁₀ or PM_{2.5}. As such, since it is ultimately concluded that the CFBT will not give rise to significant impacts with respect to PM, it can also be safely concluded that the CFBT will not give rise to significant impacts with respect to CO, and this conclusion is not at all sensitive to the relatively small uncertainties in the calculated CO emission rate.

Emissions of PAHs

- 7.10 The calculated emission rate of PAHs by the CFBT, as presented in Table 5 of (14.7 mg/s), is higher than that of a single domestic wood fire (0.29 mg/s), presented in Table 6. The emissions of PAHs from the CFBT could be equivalent to approximately 50 average homes with fires.
- 7.11 However as noted in Paragraph 7.4, emissions of PAH from the CFBT are expected to be smaller than predicted here since, although the wood burned will contain glues, PM will be effectively filtered by the SCU and this will also remove much of the PAH.

Emissions of Odours

- 7.12 The SCU will remove the majority of particulate matter, which comprises the majority of odours in smoke. Odours associated with volatile components will not be removed, but are anticipated to comprise a small component of the odours from combustion.

Pathway

- 7.13 The proposed development, as illustrated in Figure 4, is surrounded on three sides by busy roads, which do not represent relevant exposure to emissions; the only sensitive receptors in proximity to the proposed development are two residential properties located approximately 90 m to the east and 40 m to the south east of the site and the sailing club 90 m to the south east.
- 7.14 Emissions from the facility will be vented from a stack 10-12 m high located to the east of the building. The emissions from the stack will be released at a high level, and at a speed of approximately 10m/s, meaning that pollutants will be well dispersed and effectively diluted.



Figure 4: Stack Location

Imagery @2022 Google, Imagery Bluesky, Infoterra Ltd & COWI

- 7.15 The wind rose for the Mumbles Head meteorological station in 2021 (Figure 5) shows that the dominant wind direction is from the south west, suggesting that emissions from the stack would be expected to be dispersed predominantly to the north east, which is not directly towards the sensitive receptors. Winds from the northwest and west directly towards the sensitive receptors occurs infrequently.

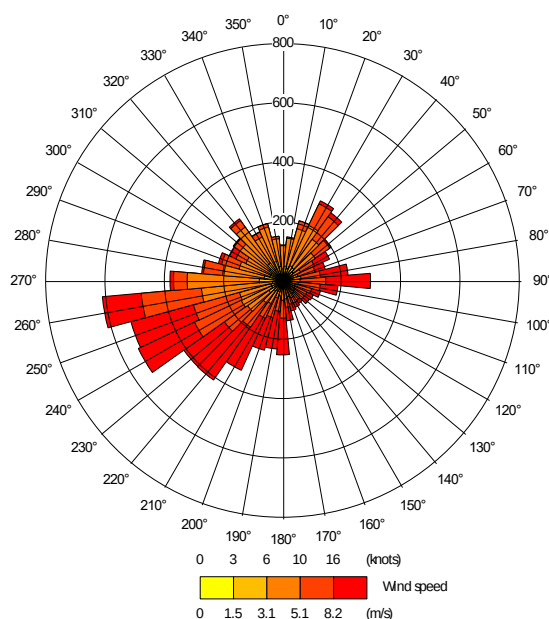


Figure 5: Wind Rose for Mumbles Head in 2021

Receptors

- 7.16 The two residential properties are highly sensitive receptors with respect to the annual mean, 8hr and 24hr mean PM, CO and PAH objectives. They are also judged to be highly sensitive with respect to odour nuisance.

Summary and Assessment

- 7.17 The CFBT will generate emissions of particulate matter, carbon monoxide, PAHs and odours, which are comparable to those from a relatively small number of domestic fires, such as are already likely to be in use in the area, and across Wales, without significant local concerns.
- 7.18 The burns will be undertaken within a building with all emissions extracted to a smoke control unit which comprises a series of filters to remove particulate matter before being discharged from a 10-12m stack. Emissions will be released from the stack at a speed of approximately 10m/s resulting in the good dispersion of pollutants. This will provide much more effective dilution than releases from domestic fires, and so the impacts, for each gramme of pollutant emitted, will be much smaller.
- 7.19 The larger giraffe building will usually be under negative pressure during the training sessions and therefore is limited potential for fugitive releases from the building.
- 7.20 The nearest sensitive receptors are located 50 m from the stack, and not within the prevailing wind direction. The facility is anticipated to burn material for approximately 500 hours per year. This corresponds to less than 6% of the year in which pollutants will be emitted from the facility. Therefore, the proportion of the time sensitive receptors are located downwind of the stack while

burns are taking place will be small. Coupled with the good dispersion from the stack it is considered that the emissions from the facility are unlikely to significantly increase annual mean and 24-hr and 8 hour mean concentrations of particulate matter, CO, PAHs or odours at the receptors. Therefore the impacts of the proposed development are judged to be 'not significant'

8 Conclusions

- 8.1 The impacts of emissions arising from combustion within the proposed CFBT facility have been assessed. The assessment has taken account of the proposed use and proximity to sensitive receptors.
- 8.2 In terms of the principal pollutants of concern generated within the training rooms, total emissions will be comparable with those from a relatively small number of domestic fires such as are already likely to be in use in the area, and across Wales, without significant local concerns. The CFBT will only operate for short periods of time, with the release of emissions from a 10-12 m stack with a high velocity. Given the distance of the facility from residential properties, and the good dispersion conditions, the risk of emissions leading to large increases in concentrations of PM, CO, PAHs and odours at the nearby residential properties is judged to be low and, as such, the impacts are considered to be not significant.
- 8.3 The overall air quality impacts are thus considered to be not significant. The proposed development is consistent with PPW and also conforms with both Policy Sp16 of the NPT Local Plan and Policy EN8 of the NPT Pollution SPG as it will not adversely affect air quality.

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10 Glossary

AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CO	Carbon Monoxide
Defra	Department for Environment, Food and Rural Affairs
EPUK	Environmental Protection UK
EU	European Union
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HMSO	Her Majesty's Stationery Office
IAQM	Institute of Air Quality Management
kph	Kilometres Per hour
LAQM	Local Air Quality Management
µg/m³	Microgrammes per cubic metre
NAEI	National Atmospheric Emissions Inventory
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PAH	Polyaromatic Hydrocarbons
PM₁₀	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
PM_{2.5}	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPW	Planning Policy Wales
SPG	Supplementary Planning Guidance
Standards	A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal
TAN	Technical Advice Note
WHO	World Health Organisation

11 Appendices

A1	EPUK & IAQM Planning for Air Quality Guidance.....	30
A2	Professional Experience.....	36

A1 EPUK & IAQM Planning for Air Quality Guidance

- A1.1 The guidance issued by EPUK and IAQM (Moorcroft and Barrowcliffe et al, 2017) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

Air Quality as a Material Consideration

“Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations”.*

Recommended Best Practice

- A1.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

“The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions”.

- A1.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m² of commercial floorspace;
- are carried out on land of 1 ha or more.

- A1.4 The good practice principles are that:

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new “street canyon”, as this inhibits pollution dispersion;

- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) “rapid charge” point per 10 residential dwellings and/or 1000 m² of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;
- All gas-fired boilers to meet a minimum standard of <40 mgNO_x/kWh;
- Where emissions are likely to impact on an AQMA, all gas-fired CHP plant to meet a minimum emissions standard of:
 - Spark ignition engine: 250 mgNO_x/Nm³;
 - Compression ignition engine: 400 mgNO_x/Nm³;
 - Gas turbine: 50 mgNO_x/Nm³.
- A presumption should be to use natural gas-fired installations. Where biomass is proposed within an urban area it is to meet minimum emissions standards of 275 mgNO_x/Nm³ and 25 mgPM/Nm³.

A1.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

“It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the “damage cost approach” used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential”.

A1.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and
- Improvements to cycling and walking infrastructures.

Screening

Impacts of the Local Area on the Development

“There may be a requirement to carry out an air quality assessment for the impacts of the local area’s emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:

- the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- the presence of a source of odour and/or dust that may affect amenity for future occupants of the development”.*

Impacts of the Development on the Local Area

A1.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m² of floor space for all other uses or a site area greater than 1 ha.

A1.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A1.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A1.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A1.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

“Typically, any combustion plant where the single or combined NO_x emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NO_x gas boiler or a 30kW CHP unit operating at <95mg/Nm³.

In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.

Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable”.

- A1.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

“The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive ‘trigger’ for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality”.

- A1.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

“The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer”.

- A1.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

Assessment of Significance

- A1.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

- A1.16 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either ‘significant’ or ‘not significant’. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A1.17 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A1.18 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A2.

A2 Professional Experience

Dr Ben Marner, BSc (Hons) PhD CSci MEnvSc MIAQM

Dr Marner is the Director of Air Quality Modelling and Assessment at AQC and has over 20 years' relevant experience. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has acted as expert witness at public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has developed a range of widely-used air quality models and contributed to the development of best practice. Dr Marner has provided support and advice to foreign governments, Highways England, Transport Scotland, Transport for London, Greater London Authority, the Joint Nature Conservation Committee, the Environment Agency, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist. He currently advises the UK Government on air quality as part of its Air Quality Expert Group (AQEG), where his specific area of expertise relates to air quality assessment in the development control process.

Lucy Hodgins, BSc (Hons) CSci MEnvSc MIAQM

Miss Hodgins is a Principal Consultant with AQC with over ten years' experience in the field of air quality. She has extensive experience in the assessment of air quality impacts for a range of industrial, commercial and residential projects, using qualitative and quantitative methods to assess road traffic and point source emissions utilising a variety of models, including ADMS-Roads, Breeze Roads, ADMS-5 and Breeze Aermod. She has prepared assessments for energy from waste, anaerobic digestion and waste biomass facilities for a range of air pollutants, along with nuisance dust and odour assessments. Lucy has also been involved in air quality management and assessment work for local authorities, including air quality modelling for Clean Air Zones as well as microsimulation modelling for junction improvement schemes. She has also undertaken numerous operational dust assessments for mineral and waste facilities, as well as assessments of construction dust emissions. She is a Chartered Scientist and a Member of the Institute of Air Quality Management and the Institution of Environmental Sciences.

Jack Buckley, BSc (Hons) MSc AMEnvSc AMIAQM

Mr Buckley is a Senior Consultant with AQC. He has over four years' experience in the field of air quality, carrying out technical work for a range of projects, including road and rail infrastructure schemes, residential and mixed-use developments and industrial facilities. Jack has produced air quality, greenhouse gas and climate change assessments for numerous EIA schemes, using qualitative and quantitative methods, and has air quality monitoring experience. He has also has a strong understanding of relevant local, regional and national policies, having been seconded to the

Greater London Authority to undertake technical reviews of planning applications, and has assisted in the development of new Air Quality Neutral and Air Quality Positive guidance. Jack completed a BSc (Hons) in Chemistry and an MSc in Environmental Science and Management, with both dissertations investigating the performance of low-cost air quality sensors. He is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.