

Green Plan, Energy Biomass Facility, Wrexham

Air quality, noise and vibration assessment

Green Plan Energy

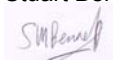
29 June 2010

Final Report

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SUMMARY

An assessment has been undertaken of the potential air quality, noise and vibration impacts in respect of the proposed redevelopment of land off Bryn Lane, Wrexham.

The assessment identified that:

- There will be no significant construction noise impact and no specific mitigation beyond the application of best practice measures is needed.
- There will be no adverse noise or vibration impact associated with operational road traffic movements on the existing road network.
- There will be no significant adverse air quality impact associated with operational road traffic movements on the existing road network.
- Impacts on air quality due to construction phase emissions are likely to only impact upon one receptor. In this case the development has been highlighted to be of 'medium risk' for dust emissions, and through following best practice guidelines the impact of construction dust is likely to be reduced to 'low risk'.
- Screening of air pollutants from biomass boiler emissions has shown that they are unlikely to cause ground level increases in pollutant concentration in excess of $1 \mu\text{g.m}^{-3}$ or an hourly mean NO_2 concentration in excess of $40 \mu\text{g.m}^{-3}$. Therefore, in accordance with relevant technical guidance, it was not considered necessary to proceed to a more detailed assessment of these emissions.

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1 INTRODUCTION

Royal Haskoning was commissioned by Green Plan Energy Ltd, to undertake an air quality and noise and vibration assessment in relation to a proposal for the development of a biomass plant facility at Bryn Lane, Wrexham.

The assessment comprises a mix of quantitative and qualitative assessment. The report is intended to support a Planning Application to Wrexham County Borough Council.

A glossary of acoustic and air quality terminology used in this report is presented at Appendix C and G respectively.

2 EXISTING SITUATION AND PROJECT UNDERSTANDING

Currently, the development site is predominantly brown-field land adjoining an established industrial area located to the east of Wrexham. The site is adjacent to Bryn Lane which runs parallel to the western site boundary with the existing Kellogg's industrial facility to the northwest and predominantly agricultural land to the north east. Immediately adjacent to the site's eastern boundary is the existing TDG commercial operation whilst to the west, on the opposite side of Bryn Lane, is green-field land on which is sited a community recycling facility. To the south of the site is a mixture of commercial and industrial uses.

There are no residential properties in close proximity to the proposed development site. The closest residential properties are those at the junction of Bryn Lane and Ridley Wood Road, approximately 580 m north of the closest part of the proposed plant building site's northern boundary; these properties have the Kellogg's industrial plant to their rear (southwest). To the east/northeast of the proposed development site is the B5130 road, along which are scattered residential properties; the closest of these, with direct line of sight of the proposed facility buildings, are approximately 860 m east-northeast of the proposed sites eastern boundary. To the northeast of the proposed biomass plant facility, the closest residential property on Ridley Wood is approximately 1000 m from the northern side of the plant building.

Noise from the Kellogg's facility is dominant at the nearest residential properties at all hours of the day and night, most likely originating from air cooling plant equipment. Occasional contributions from mobile plant or impulsive noise events from the TDG site and other adjacent industrial and commercial uses can also be heard. Additionally, there are contributions from road traffic on Bryn Lane. At the properties along the B5130 to the east of the development site, the noise from the Kellogg's facility and other industrial sources is audible but is not necessarily dominant.

The plans provided (Antonio Garcia Architecture drawings, Li:56:86_500 "Proposed site plan_chip store" and Li:56:86_500 "Proposed site plan_chipping on site") indicate that there is flexibility within the design for raw material importation and preparation. The plans show that the proposed development will incorporate two boiler-plant buildings located either side (north and south) of a central vehicle manoeuvring area, with traffic access to the site directly off Bryn Lane on the western side of the development. The woodchip storage / preparation

area will be east of the vehicle manoeuvring area will be the wood-chip storage area. It is our understanding that this area will be covered and that all building heights on-site will be 8.5 m (above local datum) at the roof-ridges¹ such that all operations and vehicle movements would be contained within buildings or within the partially enclosed central yard and woodchip storage areas. We understand that the facility will operate 24 hours per day but that deliveries of raw material and removal of waste material will be spread out throughout the day. The Transport Assessment prepared by Crowd Dynamics² indicates that the development-generated traffic will comprise three heavy goods vehicle movements per day. In addition to the raw material movements, the TA predicted that up to 5 employee vehicle movements at peak hours during shift change-over periods might be generated.

¹ E-mails from E Lees (HOW Planning) to Stuart Bennett (Royal Haskoning) dated 10 June 2010.

² Transport Assessment from Crowd Dynamics, 21 June 2010.

3 NOISE AND VIBRATION

3.1 Potential impacts

The potential noise and vibration impacts from this type of development may arise due to:

- The movements of construction-related traffic, particularly heavy goods vehicles, on the principal site access route(s).
- Construction activities such as piling.
- The operation of the biomass boiler(s) and wood chipping / storage areas.
- The movements of operational traffic, particularly heavy goods vehicles, on the principal site access routes.

Initial examination of the data enabled several aspects of the development to be effectively 'scoped out' with regard to potential noise and vibration impacts, as described below:

- In view of the considerable separation distance between the plant facility and the closest residential properties, the partial enclosure of the vehicle manoeuvring/wood chip storage area and the dominance of existing industrial activities in the area, particularly the Kellogg's operations, it is reasonable to infer that on-site operational noise will not be a cause of any significant noise disturbance at the residential properties. It is unlikely that the boiler exhaust-stack will give rise to significant levels of elevated noise which tend to be associated with very high rates of hot gas emission through narrow apertures, such as occurs with gas flare stacks etc.
- With regard to operational development-generated traffic movements, the Transport Assessment (TA)² indicates that existing traffic movements on Bryn Lane, as derived from automatic traffic count data obtained during May 2010, are 2650 vehicles per day of which approximately 20% are heavy goods vehicles (greater than 1500 kg). The TA also accounted for other proposed or Permitted Developments in the local area to derive a 'future base year' traffic situation. The TA identified that the proposed biomass facility would add approximately 3 heavy goods vehicles per day to the network, and 12 to 15 site operative vehicles per day. In view of the relatively large volumes of existing (or future base year traffic) on Bryn Lane, it is, therefore, reasonable to infer that the few additional development-generated vehicles will have no significant noise or vibration impact on residential properties adjacent to Bryn Lane or other local roads servicing the industrial estate.
- Similarly, the assessment of off-site construction vehicle noise and vibration impacts was examined in the context of existing traffic movements: the construction phase was predicted to give rise to a maximum of 10 additional heavy goods vehicles per day and up to 12 site contractor vehicles at the start and end of the day, travelling on the local road network. In view of the existing traffic volumes provided in the TA, it was evident that there would be no significant noise or vibration impacts associated with the movement of construction-related vehicles on the local road network.
- The separation distance between construction site and residential receptors positively indicates that vibration from on-site construction activities will not give rise to perceptible levels of vibration at the receptors.

The remaining potential aspects to be considered, are principally the on-site construction effects, associated with on-site operation of plant equipment and vehicles within the boundary of the proposed development site.

3.2 Assessment methodology

The on-site construction noise and vibration impacts are generally assessed by predictive calculation of noise levels at nearby potentially noise sensitive premises (NSPs) due to the operation of a range of plant equipment.

The assessment utilises the guidance provided in British Standard (BS) 5228: Part 1: 2009 "Code of practice for noise and vibration control on construction and open sites – Part 1: Noise". This document gives guidance on the causes and control of noise from construction sites, provides methods for calculating construction noise levels, gives guidance on setting suitable noise limits, advises on potential control of noise effects and provides Tables of typical construction plant equipment and their associated noise emissions.

Predictive construction calculations are based on various assumptions which have been made regarding the probable equipment to be used and the type of activities to be conducted, based on previous experience of undertaking such assessments. The assumptions made were:

- Construction activities will be limited to daytime hours only with a 12-hour construction day from 07:00 to 19:00;
- The principal construction activities will be: (1) site preparation and excavation; (2) foundation concreting; (3) general construction; (4) piling. It is not clear if piling for foundations will be required but, it has been assumed that pressure piling will occur to provide a conservative assessment. Table 1 details the assumed plant equipment that will be utilised in each phase of the construction the associated noise emissions (measured at 10 metres from the equipment), obtained from Annex C of BS 5228-1. Note that this details the principal noise-generating activities that might give rise to adverse off-site effects.

Table 1: Assumed construction activities, plant equipment and equipment noise levels

Phase	Activity	Equipment	Annex C reference	Noise level (dB(A))
1	Site preparation & excavation	Wheeled Backhoe loader (62kW - 8t)	C.2.8	68
		Dozer (142kW - 20t)	C.2.12	75
		3 x Art. Dump Truck (187kW - 23t)	C.2.33	86
		2 x Tracked Excavator (107kW - 22t)	C.2.21	74
		Vibratory Roller (29kW - 4t)	C.2.39	74
2	Concrete for foundations	Truck mounted concrete pump + boom arm (17t)	C.4.30	79
3	General Construction	Cutting concrete blocks (petrol cutter)	C.4.72	79
		Angle grinder cutting steel	C.4.93	80
		3 x Diesel Generator	C.4.84	79
4	Piling	Driven precast concrete piles	C.12.35	89

- BS 5228 provides various corrections to account for the proportion of the assessment period that equipment operates at full power; for the purpose of this assessment, it was assumed that equipment operating during phases 1 and 2 would have an on-time of 30%. General construction activities would have an on-time of 20% except for diesel generators which were assigned an on-time of 100%. Piling was assigned an on-time of 40%.
- The general construction activities and piling operations give rise to noise which is distinctive in character and therefore has a greater potential for perceived disturbance. BS 4142: 1997 "Method for rating industrial noise affecting mixed residential and industrial areas" (BSI, 1997) suggests that such noises should receive an additional +5dB 'character correction' and this is applied to the calculations for these aspects.
- It was assumed, for the purposes of undertaking a conservative assessment, that on-site construction activities were occurring at the closest point of the proposed development site to each receptor and that all equipment would be operating concurrently.
- The terrain between construction noise sources and receptors was assumed to be soft potentially noise absorbing ground and no allowance was made for screening by barriers or terrain.

3.3 Impact significance criteria

There are no statutorily prescribed or standardised criteria within the UK by which relative changes in noise may be assigned 'significance'.

For the purposes of assessing on-site construction noise affecting nearby noise sensitive premises (NSPs), Annex E of the Standard discusses the use of various methods to set acceptable receptor noise levels. The simplest, described at Chapter E.2 of the Standard discusses the use of the Department of the Environment Advisory Leaflet 72 “Noise control on building sites” (DOE, 1976). This guidance is no longer in print but the noise levels represented are conventionally accepted as being appropriate to apply to general construction activities. The guidance suggests that a receptor (external) noise level of 70 or 75 dB(A) may be applied according to the setting and local environment; the setting of the receptors in this instance is variable, being generally industrial in nature for the properties on Bryn Lane but more rural for those on Ridley Wood Road and the B5130. For the purposes of this assessment we have conservatively taken the lower limit of 70 dB(A) as the permissible construction noise limit at all receptors (note that dB(A) is generally taken to mean dB L_{Aeq} – see Glossary).

With regard to ‘significance’ of impacts, the subjective nature of noise and its perception creates difficulty in attempting to define quantitative significance criteria. It is conventionally accepted that a change in ‘steady’ environmental noise of 3 dB is the least audible to the average human and this is, therefore, often taken as the limit of significance for noise changes (in steady noise); different considerations apply to night time or varying noise sources but these are not relevant to this assessment. It is also conventionally accepted that a 5 dB change in noise levels may be clearly perceived whilst a 10 dB change may be perceived as a doubling (or halving) of a noise.

In view of these considerations, for the purpose of this assessment, the impact significance of relative changes in noise level is described according to the criteria defined in Table 2.

Table 2: Noise impact significance criteria

Noise level impact	Significance
< 3 dB change	Negligible
3 to 4.9 dB change	Minor
5 to 9.9 dB change	Moderate
≥ 10 dB change	Major

3.4 Impact assessment, mitigation and residual impacts

3.4.1 Impact assessment

The calculated receptor noise levels associated with on-site construction activities are presented in Table 3.

Table 3: Calculated closest receptor (external) noise levels

Phase	Activity	Receptor noise level (dB L _{Aeq, 12h})		
		Bryn Lane	B5310	Ridley Wood Road
1	Site preparation & excavation	48	42	45
2	Concrete for foundations	39	34	35
3	General Construction	50	46	47
4	Piling	55	50	51

The results of the assessment predicted that no significant construction noise impact would occur at the nearest residential properties and no specific mitigation will be required beyond the application of best practice in construction operations.

3.4.2 Mitigation

No specific mitigation will be required but it would be expected that best practice in construction operations will be applied. This suggests the use of the most modern equipment available, fitted with suitable noise attenuation measures and includes staff training on the proper use of equipment and awareness raising in order to minimise noise for local residents.

3.5 Conclusions

The assessment has demonstrated that the only aspect of the proposed development that might give rise to perceptible noise effects, the on-site construction activities, is predicted to have no significant impact for the closest residential properties.

No mitigation will be required beyond the application of standard best practice in construction operations.

4 AIR QUALITY

4.1 Introduction

This section of the report describes the potential impacts on air quality associated with the construction and operational phases of the biomass plant facility.

This section contains the following sections:

- A description of the potential impacts as a result of the development (section 4.2);
- A statement of the current legislative air quality standards, Objectives and guidelines which apply to the pollutants of concern (section 4.3);
- An assessment of the current air quality within the vicinity of the site, using UK mapped pollutant background concentrations (section 4.4);
- An assessment of the impact of emissions from on-site electricity generation through biomass burning on local air quality (section 4.5);
- An assessment of the impact significance for the construction and operational phase of the development, including the operation of the proposed biomass boilers, and any mitigation required (section 4.6);
- Discussion and summary (section 4.7).

4.2 Potential impacts

The potential air quality impacts associated with this development are:

- Construction dust and fine particulate matter affecting existing properties;
- Exhaust emissions from construction traffic affecting existing properties adjacent to the public road network;
- Road traffic air quality impacts associated with occupation of the development and the subsequent increased numbers of vehicles on the public road network;
- Emissions from the proposed biomass boilers impacting the local air quality, specifically at nearby residential receptors.

Initial examination of the traffic data enabled operational development-generated traffic movements to be effectively scoped out. The Transport Assessment (TA)² indicates that existing traffic movements on Bryn Lane, as derived from automatic traffic count data obtained during May 2010, are 2650 vehicles of which approximately 20% are heavy goods vehicles (greater than 1500 kg). The TA also accounted for other proposed or Permitted Developments in the local area to derive a 'future base year' traffic situation. The TA identified that the proposed biomass facility would add approximately 3 heavy goods vehicles to the network, of which up to 12 to 15 would be site operative vehicles. In view of the relatively large volumes of existing (or future base year traffic) on Bryn Lane, it is, therefore, reasonable to infer that the few additional development-generated vehicles will have no significant air quality impact on residential properties adjacent to the Bryn Lane or other local roads servicing the industrial estate.

The atmospheric pollutants considered in this assessment are nitrogen dioxide (NO₂) and particulate matter- normally assessed as the fraction of airborne particles of aerodynamic diameter less than ten (PM₁₀) or 2.5 micrometres (PM_{2.5}). These are the main pollutants associated with the construction and biomass burning emissions which may potentially have an impact on local ambient air quality. The potential for the generation of larger particulate dust from construction activities is also assessed. Table 4.1 provides a description of these pollutants.

Table 4.1: Description of pollutants

Pollutant	Description
NO_x	A term used to describe the mixture of nitrogen oxides which is present in the atmosphere as a result of combustion reactions in both industry and vehicle engines. Nitrogen dioxide (NO ₂) is the primary concern for effects on health, and is the species for which the health-based standard is expressed. The various oxides of nitrogen can also react with hydrocarbons in the atmosphere to contribute to photochemical smog.
PM₁₀	Fine airborne particles of variable chemical composition, but consisting in urban air of minerals, combustion (carbon) products, or natural materials (eg pollen) which are small enough to be inhaled and many of which will reach the lower (gas exchange) region of the lungs. PM ₁₀ particles are those with a mean aerodynamic diameter of less than 10 micrometres, µm (one-hundredth of a millimetre). Exposure to elevated levels has been linked to different health indicators, including hospital admission rates for both respiratory and coronary conditions.
PM_{2.5}	Particles with a mean aerodynamic diameter of less than 2.5 micrometres.
Dust	defined as all particulate matter up to 75 micrometres, µm, in diameter (according to BS6069) and comprising both suspended and deposited material.

4.3 Legislative Framework

4.3.1 The Environmental Act

The Environment Act 1995 introduced a framework of Local Air Quality Management (LAQM) and placed a duty on local authorities to formally assess air quality in their area. The Government published statutory guidance detailing how local authorities were to undertake the 'review and assessment' (R&A) process, in consideration of Air Quality Objectives (AQOs) in the UK National Air Quality Strategy (AQS) first published in March 1997³. A

³ Department of the Environment (1997). *United Kingdom National Air Quality Strategy*, March 1997 (Cm 3587)

revised strategy was published in 2000⁴ and an Addendum to the strategy was published in 2003⁵. The Government's latest Air Quality Strategy was published in July 2007⁶.

4.3.2 Local Air Quality Management

If a local authority predicts that any of the Objectives are not likely to be achieved, the location must be designated as an Air Quality Management Area (AQMA). Whilst the existence of an AQMA is not necessarily a presumption against development, the potential air quality impact of a scheme within or around a designated AQMA will be subject to detailed consideration by the local planning authority.

There are currently no AQMAs in the Wrexham County Borough Council boundary.

4.3.3 Planning and Policy

In 2004 the Office of the Deputy Prime Minister (ODPM) published its Planning Policy Statement 23 (PPS 23): Planning and Pollution Control⁷, advising that any air quality consideration that relates to the use and development of land is capable of being a material planning consideration. Whether it is a material planning consideration or not and the weight which should be accorded to it by the decision-maker will depend on the facts of the individual case⁸.

4.3.4 Standards and Objectives

The Strategy defines "standards" and "objectives", and as defined in paragraph 17 of the AQS:

'For the purposes of the strategy

Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on an assessment of the effects on sensitive subgroups or on ecosystems.

Objectives are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedences, within a specified timescale.'

⁴⁴ Department of the Environment, Transport and the Regions (2000). *The Air Quality (Wales) Regulations 2000 (SI2000 No 928)*; London, The Stationery Office.

⁵ Department for Environment, Food and Rural Affairs (2003). *The Air Quality (Wales)(Amendment) Regulations 2002 (SI 2002 No 3043)*; London, The Stationery Office

⁶ Department for Environment and Rural Affairs (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*. July 2007. (Cm 7169)

⁷ Office of the Deputy Prime Minister (2004), Planning Policy Statement 23: *Planning and Pollution Control*, The Stationary Office.

⁸ Planning Policy Wales and Minerals Planning Policy are supplemented by a series of topic-based Technical Advice Notes (TANs). However, a there is no TAN specific to air quality to date and so PPS 23 is referenced.

The current Limit Values for NO₂ and particulates in Wales are shown in Table 4.2:

Table 4.2: The Air Quality Standards (Wales) Regulations 2007

Pollutant	Objective		Date to be achieved
	Concentration	Measured as	
Objectives for the protection of human health			
Nitrogen dioxide ^a	200µg/m ³ not to be exceeded more than 18 times a year	hourly mean	31 December 2005
	40µg/m ³	Annual mean	31 December 2005
Particles, PM ₁₀ (gravimetric)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	40µg/m ³	Annual mean	31 December 2004

The Air Quality Strategy takes into account the European and wider international context in which the UK's domestic policies are set. As a member of the European Union, the UK is required to meet EU Limit Values⁹ set for individual pollutants. EU Limit Values on ambient air quality comprise of a concentration value, an averaging time over which it is to be measured, the number of exceedences allowed per year, if any, and a date by which it must be achieved. Some pollutants have more than one Limit Value covering different endpoints or averaging times. The Limit Values have been implemented by the Air Quality Strategy (Wales) Regulations 2007 (SI 2007 No.717(W.63)).

4.4 Background Environment

The biomass development lies in a semi-rural setting adjacent to the Wrexham industrial estate. It can therefore be expected that background levels of key atmospheric pollutants will be typical of a mixed rural/urban area. In order to predict the impacts of traffic generated pollution on air quality at sensitive receptor locations, estimates of background pollutant concentrations were obtained from the UK Air Quality Archive¹⁰ a gridded data set of background pollutant values. Annual mean 2010 background NO₂ and total PM₁₀ values were used for grid square (339500, 350500) containing the application site.

The background values used in the study are outlined in Table 4.3:

Table 4.3: Estimated total background concentrations (µg.m⁻³)

Year	NO ₂	PM ₁₀
2010	14.0	12.9
Annual mean Objective	40	40

⁹ EU Limit Values are legally binding EU parameters that must not be exceeded

¹⁰ Air Quality Archive: (<http://www.airquality.co.uk/archive/index/php>),

The background pollutant concentrations in Table 4.3 indicate that levels of NO₂ and PM₁₀ are well below their respective annual mean air quality Objectives in 2010, the target year for the completion of the development.

4.5 Assessment of biomass boiler emissions

For the assessment of emissions from the biomass boilers, Technical Guidance on the screening of emissions from biomass plant from AEA Energy and Environment has been followed¹¹. The methodology is intended to provide an initial assessment of pollutant emissions from the biomass boilers to determine whether there is a risk of exceeding the AQS Objectives. The assessment is intended to provide a conservative estimate of the potential impacts. More detailed assessment is required where the screening assessment indicates that there is a risk of exceeding the Objectives.

Empirical results from atmospheric dispersion modelling, undertaken to determine the emission rate from a biomass boiler that would lead to an increase in maximum ground level pollutant concentration of 1 µg.m⁻³ or an hourly mean NO₂ concentration of 40 µg.m⁻³, are represented by nomograms in Appendix H. These nomograms are used by local authorities for emissions screening purposes and were employed in this assessment.

4.5.1 Methodology

Screening requires the calculation of the following variables to enable the use of the nomograms:

- The effective stack height (m) (C)
- The actual height (m) above the ground (U)
- The height of the tallest building (m) within a distance of 5 times the stack height (H)
- The emission rate (g.s⁻¹) for the plant operating at capacity (E)
- The 'background adjusted' emission rate (g.s⁻¹) for the plant operating at capacity (E_A)
- The annual average background concentration (µg.m⁻³) (G)

The 'background adjusted' emission rate is then compared against the nomogram 'threshold' emission rate that would cause an increase in ground level concentration of 1 µg.m⁻³ or an hourly mean NO₂ concentration in excess of 40 µg.m⁻³. If the background adjusted emission rate exceeds the threshold emission rate, then further assessment through atmospheric dispersion modelling is required to quantify the impact.

Appendix G provides a summary of the algorithms used to determine the variables required to inform the screening assessment.

¹¹ AEA Energy & Environment (2008). Technical Guidance: Screening assessment for biomass boilers. ED48673005/R2655. July 2008.

4.5.2 Input data and assumptions

The proposal for on-site biomass electricity generation consists of six 500 kW capacity boilers which will be fed by virgin woodchip delivered to the site by road. It is assumed that each boiler will exhaust through the same exit stack, and so the screening assessment is based upon a nominal 3000 kW capacity biomass boiler.

The design details summarised in Table 4.6 have been identified for the exit stacks:

Table 4.6 – boiler stack parameters

Parameter	Value
Actual stack height above ground (U)	23
Height of the tallest building within a distance of 5*U	8.5
Effective stack height	23.2

To determine the pollutant emission rates from the biomass boilers, they were classified as 'advanced automatic boilers' according to the Corinair classification. Emission rates have then been estimated on the basis of emission factors provided by the EMP/CORINAIR Emission Inventory Guidebook – 2006¹². The factors are shown in Table 4.7.

Table 4.7 – emission factors

Pollutant	Emission factor (g.GJ ⁻¹)	Emission rate (E) (g.s ⁻¹)
PM ₁₀	66	0.198
PM _{2.5}	66	0.198
NO _x	150	0.45

4.5.3 Impact Assessment

Table 4.8 and shows the results of the screening assessment:

Table 4.8 – screening of biomass emissions

Parameter	PM ₁₀	PM _{2.5}	NO ₂ (annual mean)	NO ₂ (hourly mean)
Effective stack height (C)	23.2	23.2	23.2	23.2
Diameter	0.9	0.9	0.9	0.9
Emission rate operating at capacity (E)	0.198	0.198	0.45	0.45
Background	12.9	8.1	14.0	14.0
Background adjusted emission rate (E _A)	0.0104	0.117	0.0173	0.105
Threshold emission rate	0.06	0.18	0.18	0.7
Background > threshold emission rate?	x	x	x	x

¹² The Core Inventory of Air Emissions in Europe (CORINAIR) 2006. Atmospheric inventory emission guidebook-December 2006 UPDATE.

For each of the pollutants assessed, it has been shown that the background adjusted emission rate is below the threshold emission rate. This indicates that the biomass boilers will not cause a ground level increase of $1 \mu\text{g.m}^{-3}$ in the vicinity of the application site or an hourly mean NO_2 concentration in excess of $40 \mu\text{g.m}^{-3}$.

Therefore, the screening assessment has shown that further assessment of emissions through complex atmospheric dispersion modelling is not required. The impact on local air quality from emissions produced by the boilers is likely to be **negligible**.

4.6 Qualitative assessment of construction dust

4.6.1 Methodology

There is no definitive source of information on the generation of fugitive dust from construction activities. The DEFRA Technical Guidance LAQM.TG(09) on air quality assessment for the purposes of local air quality management provides a screening approach for the determination of the likely contribution of various pollutant sources to ambient air quality. In addition, the Greater London Authority and London Councils (GLA) have produced Best Practice Guidance¹³ on the control of dust and emissions from construction and demolition. This includes a risk-based approach to assessment, which can be used with information about the construction activities and potential receptors. These guidance documents were used to carry out an assessment of the effect of fugitive construction dust emissions

4.6.2 Construction Phase Emissions

The primary potential air quality issues during the construction phase of the development will be the generation, suspension and deposition of particulate matter. Unmitigated, this has the potential to cause nuisance to residents living in close proximity to the development, or to those occupying the development before its completion.

Emissions from Non-Road Mobile Machinery (NRMM) and road traffic will also impact upon local air quality.

Fugitive construction dust emissions have the potential to cause significant nuisance at nearby receptors, such as residential properties, by causing soiling of surfaces. In addition, a proportion of dust emitted will be in the form of fine particles which can have an adverse effect on human health. However, studies have shown that typically only around 20% of total suspended particulate matter from construction activity is in the PM_{10} size range^{14,15}.

¹³ Greater London Authority and London Councils (2006). *The Control of Dust and Emissions from Construction and Demolition – Best Practice Guidance*. November 2006.

¹⁴ Quality of Urban Air Review Group (1996). *Airborne Particulate Matter in the UK. Third report for DoE*. ISBN 0 9520771 3 2.

Operations that often result in dust emission include:

- site preparation and earth moving;
- stockpiling and handling of loose materials; and
- movement of vehicles causing re-suspension of road dust, particularly on unmade roads.

The effect of demolition or construction dust is difficult to quantify accurately as it depends on a number of factors including the activity taking place, the type of dust emitted, the location and nature of sensitive receptors and meteorological conditions. This issue is, therefore, dealt with qualitatively. For the review and assessment of fugitive and uncontrolled PM₁₀ sources, including major construction works, TG(09) states:

“Emissions from these sources are not well quantified and it is therefore difficult to predict PM₁₀ concentrations with any accuracy”.

The guidance further states that, “concentrations fall off rapidly on moving away from the source” and the determination of public exposure should consider the distance to the actual source and not to the site boundary. Potential exposures beyond 200 m of the source can be ignored (for the purposes of assessment against the PM₁₀ Objective) if the background concentration is less than 26 µg.m⁻³.

Concentrations near the site are estimated by the UKAQA to be 12.9 µg.m⁻³ in 2010 (Table 4.3). The residential property at receptor 1 (Bryn Lane) and those at receptors 3 and 4 (Ridley Wood Road) lie beyond 200 m of the boundary of the centre of the development. However, receptor 2 (Bryn Lane / Ridley Wood Road Intersection) is approximately 30 m away from the development site boundary. Given the scale of the development and the distance to these locations, the development is considered to have the potential for *intermittent or likely* impacts on receptor 2 during the construction phase of the development. Following GLA guidance, the development is classified as a **medium risk** site¹⁶ for dust emissions to cause nuisance at residential receptors.

4.6.3 Mitigation of construction phase impacts

As the site is of medium risk for the impact of dust during the construction phase of the development, it is recommended that the good practice measures outlined in the GLA guidance are followed.

Measures should include the following:

- Erect effective barriers around dusty activities or the site boundary

¹⁵ Airborne Particles Expert Group (1999). *Source Apportionment of Airborne Particulate Matter in the UK*. DETR/AEA Technology. ISBN 0-7058-1771-7

¹⁶ The development site has an area of between 1000 and 15000m² and there is the potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.

- No bonfires
- Plan site layout—machinery and dust causing activities should be located away from sensitive receptors
- Hard surface site haul routes
- All vehicles should switch off engines – no idling vehicles
- Wash or clean all vehicles effectively before leaving the site if close to sensitive receptors
- All loads entering and leaving site to be covered
- No site runoff of water or mud
- All non road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available
- Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site
- Use water as dust suppressant
- Cutting equipment to use water as suppressant or suitable local exhaust ventilation systems
- Securely cover skips and minimise drop heights
- Minimise dust generating activities
- Enclose stockpiles, keep them securely sheeted and keep them for the shortest possible time
- If applicable, ensure concrete crusher or concrete batcher has permit to operate

If good practice mitigation measures are adopted, the impact of construction dust is likely to be reduced to **low risk**¹⁷ and the associated impact would be **negligible**. In such circumstances, a dust deposition monitoring programme should not be necessary.

4.7 Discussion and Summary

Screening of the generated traffic data predicted in the Transport Assessment (TA)² indicates the proposed biomass facility would add approximately 3 heavy goods vehicles to the road network per day, and 12 to 15 site operative vehicles per day. In view of the relatively large volumes of existing (or future base year traffic) on Bryn Lane, it is, therefore, reasonable to infer that the few additional development-generated vehicles will have no significant air quality impact on residential properties adjacent to the Bryn Lane or other local roads servicing the industrial estate.

A qualitative assessment of the impacts associated with the construction phase was undertaken. In accordance with relevant guidance, the site would be classified as medium risk for sensitive receptor 2 on the junction of Bryn Lane and Ridley Wood Road. However, the adoption of mitigation measures to manage the impact of construction generated dust, is likely to reduce this impact to low risk and the associated impact would be **negligible**.

¹⁷ The potential for infrequent impacts on sensitive receptors

Screening of emissions from the on-site biomass boilers has shown that further assessment of emissions through complex atmospheric dispersion modelling is not required. The maximum impact according to the screening approach is medium i.e. a 5-10% increase. In accordance with the impact significance criteria (Appendix F), the impact on local air quality from emissions produced by the boilers is likely to be **negligible**.

5 APPENDICES

APPENDIX A: PHOTOGRAPHS OF NOISE MEASUREMENT POSITIONS

Figure A1 Noise measurement location P1 – Bryn Lane close to Kellogs factory and approximately opposite proposed northern site access



Figure A2 Noise measurement location P2 – Ridley Wood Road



Figure A3 Noise measurement location P3 – Marsh Lea (B5130)



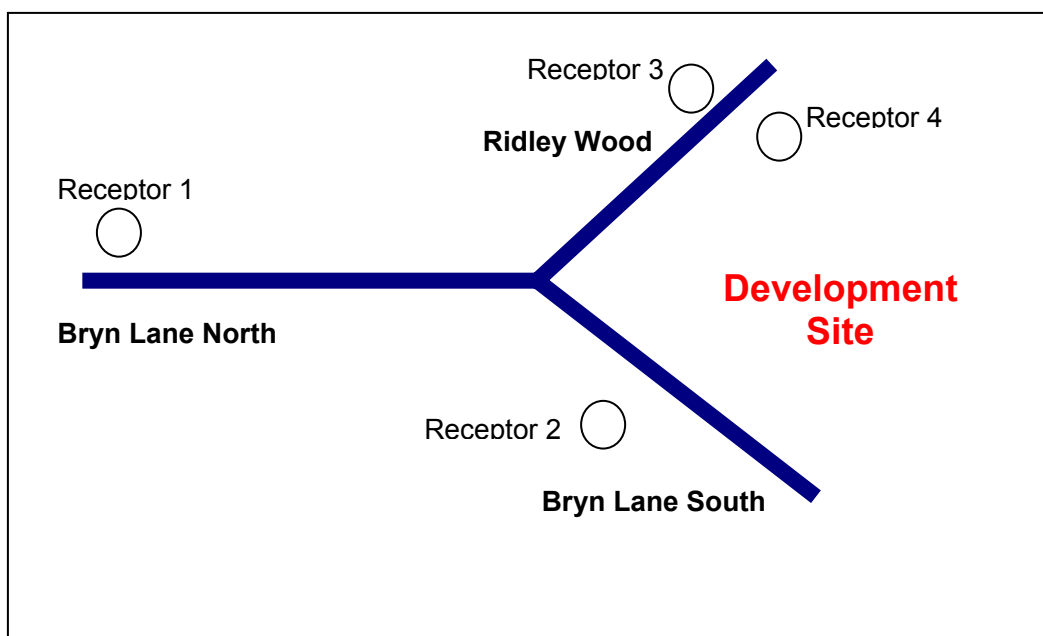
APPENDIX B: GLOSSARY OF ACOUSTIC TERMINOLOGY

	Description of terminology
Decibel (dB)	a unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μ Pa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A)	decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
L_{A10, T}	the A weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise such as that from road traffic. L _{A10, 18h} is the arithmetic average of the 18 hourly L _{A10, 1h} values from 06.00 to 24.00.
L_{A90, T}	the A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 1990 it is used to define background noise level.
L_{Aeq, T}	the equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). L _{aeq, T} is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is written as L _{eq} in connection with aircraft noise.
L_{Amax}	the highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated.
Rating level (L_{Ar, Tr})	the noise level of an industrial noise source which includes an adjustment for the character of the noise. Used in BS 4142: 1990.

APPENDIX C: APPLICATION OF AIR QUALITY OBJECTIVES

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual Mean	All locations where members of the public might be regularly exposed. For example: building facades of residential properties, schools, hospitals, libraries etc.	Building facades of offices or other places of work where members of the public do not have regular access. For example: gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean Objectives apply. Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour Mean	All locations where the annual mean and 24 and 8 hour mean Objectives apply. Kerbside sites (e.g. pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations to which the public might reasonably expect to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

APPENDIX D: INDICATIVE LOCATION OF SENSITIVE RECEPTORS



APPENDIX E: TRAFFIC DATA

Bryn Lane Northern Site								Daily Average		
Total	mon	tue	wed	thurs	fri	sat	sun	2008	2010 without development	2010 with development
HGV	854	923	840	826	778	282	212	674	688	838
CAR	3295	3040	3180	3196	3206	2213	2089	2888	2952	3432
total	4149	3963	4020	4022	3984	2495	2301	3562	3640	4270
%HGV	23	21	21	20	11	9	18	18	18	20
	mph	kmph								
7 DAY AVERAGE SPEED	43	69								

Bryn Lane Southern Site								Daily Average		
Total	mon	tue	wed	thurs	fri	sat	sun	2008	2010 without development	2010 with development
HGV	645	672	684	643	587	211	175	517	528	678
CAR	3224	3040	3106	3112	3137	2084	1977	2811	2873	3353
total	3869	3712	3790	3755	3724	2295	2152	3328	3401	4031
%HGV	17	18	18	17	16	9	8	15	15	17
	mph	kmph								
7 DAY AVERAGE SPEED	33	53								

Ridley Wood Road								Daily Average		
Total	mon	tue	wed	thurs	fri	sat	sun	2008	2010 without development	2010 with development
HGV	125	126	106	106	135	61	19	97	99	99
CAR	1096	1082	1133	1121	1061	503	493	927	947	947
total	1221	1208	1239	1227	1196	564	512	1024	1046	1046
%HGV	10	10	9	9	11	11	4	9	9	9
	mph	kmph								
7 DAY AVERAGE SPEED	40	65								

Future Traffic Factors	
2008-2010	1.022
Additional Traffic With Development	Per Day
HGVs	150
LGVa	480

APPENDIX F: DESCRIPTORS FOR CHANGES IN AMBIENT CONCENTRATIONS OF NITROGEN DIOXIDE AND PARTICULATE MATTER¹⁸

Table 1. Descriptors for Changes in Ambient Concentrations of Nitrogen Dioxide and PM₁₀

Magnitude of change	Annual mean
Large	Increase / decrease >10%
Medium	Increase / decrease 5-10%
Small	Increase / decrease 1-5%
Imperceptible	Increase / decrease <1%

Table 2. Air Quality Impact Significance

Absolute concentration in relation to Limit Value	Change in concentration		
	Small	Medium	Large
Increase with scheme			
Above limit value with scheme (>40 µg.m ⁻³)	Slight adverse	Moderate adverse	Substantial adverse
Just below limit value with scheme (36-40 µg.m ⁻³)	Slight adverse	Moderate adverse	Moderate adverse
Below limit value with scheme (30-36 µg.m ⁻³)	Negligible	Slight adverse	Slight adverse
Well below limit value with scheme (<30 µg.m ⁻³)	Negligible	Negligible	Slight adverse
Decrease with scheme			
Above limit value with scheme (>40 µg.m ⁻³)	Slight beneficial	Moderate beneficial	Substantial beneficial
Just below limit value with scheme (36-40 µg.m ⁻³)	Slight beneficial	Moderate beneficial	Moderate beneficial
Below limit value with scheme (30-36 µg.m ⁻³)	Negligible	Slight beneficial	Slight beneficial
Well below limit value with scheme (<30 µg.m ⁻³)	Negligible	Negligible	Slight beneficial

¹⁸ Environment Protection UK, September 2006, Development Control: Planning for Air Quality, 2006 Update.

APPENDIX G: GLOSSARY OF AIR QUALITY TERMINOLOGY

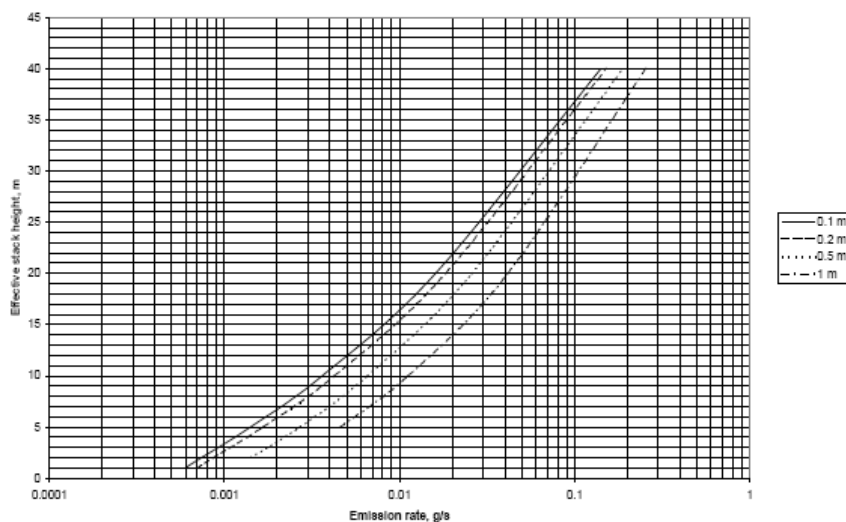
	Pollutants
NO_x	A term used to describe the mixture of nitrogen oxides which is present in the atmosphere as a result of combustion reactions in both industry and vehicle engines. Nitrogen dioxide (NO ₂) is the primary concern for effects on health, and is the species for which the health-based standard is expressed. The various oxides of nitrogen can also react with hydrocarbons in the atmosphere to contribute to photochemical smog.
PM₁₀	Fine airborne particles of variable chemical composition, but consisting in urban air of minerals, combustion (carbon) products, or natural materials (eg pollen) which are small enough to be inhaled and many of which will reach the lower (gas exchange) region of the lungs. PM ₁₀ particles are those with a mean aerodynamic diameter of less than 10 micrometres, µm (one-hundredth of a millimetre). Exposure to elevated levels has been linked to different health indicators, including hospital admission rates for both respiratory and coronary conditions.
Dust	defined as all particulate matter up to 75 micrometres, µm, in diameter (according to BS6069) and comprising both suspended and deposited material
	Units of Measurement
µg/m³	Microgrammes (of pollutant) per cubic metre of air. A measure of concentration in terms of mass per unit volume. A concentration of 1 µg/m ³ means that one cubic metre of air contains one microgramme (millionth of a gram) of pollutant.
ppb	Parts per billion. The concentration of a pollutant in air in terms of volume ratio. A concentration of 1ppb means that for every billion (10 ⁹) units of air, there is one unit of pollutant present.
ppm	Parts per million. The concentration of a pollutant in air in terms of volume ratio. A concentration of 1ppm means that for every million (10 ⁶) units of air, there is one unit of pollutant present.
	Data Descriptors
Annual mean	The average of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. (This period avoids splitting a winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.)
Data capture	Gives the percentage of all the possible measurements for a given period that were validly measured.
Exceedence	A period of time where the concentration of a pollutant is greater than, or equal to the appropriate air quality standard.
Running mean	This is a mean - or series of means - calculated for overlapping time periods, and is used in the calculation of several of the national air quality standards. For instance, an 8 hour running mean is calculated every hour, and averages the values for eight hours. The period of averaging is stepped forward by one hour for each value, so

	running mean values are given for the periods 00:00 - 07:59, 01:00 - 08:59 etc.
Percentile	A value that is the rank at a particular point in a collection of data. For instance, a 98th percentile of values for a year is the value that 98% of all the data in the year fall below, or equal.
Days with exceedence	The number of days in which at least one period has a concentration greater than, or equal to, the relevant air quality standard (the averaging period will be that defined by that standard). Since the national air quality standards cover different time periods (15 min average, 24 hour running mean etc.) this gives a useful way of comparing data for different pollutants.
	Measurement Sites (ref tg03)
Urban Centre	An urban location representative of typical population exposure in towns or city centres e.g. pedestrian precincts and shopping areas.
Urban Background	An urban location distanced from sources and therefore broadly representative of city-wide background conditions e.g. urban residential areas
Suburban	A location type situated in a residential area on the outskirts of a town or city
Roadside	A site sampling typically within 1-5 metres of the kerb of a busy road (although distances can be up to 15m from the kerb in some cases)
Kerbside	A site sampling within 1m of the kerb of a busy road
Industrial	An area where industrial sources make an important contribution to the total pollution burden
Rural	An open countryside location, in an area of low population density distanced as far as possible from roads, populated and industrial areas.
Other	Any special source-orientated or location category covering monitoring undertaken in relation to specific emission sources such a power stations, car-parks or tunnels.
	Construction Site and Dust Impacts (London Authority, 2006)
Low risk sites	• Development of up to 1, 000 square metres of land and; • Development of one property and up to a maximum of ten and; • Potential for emissions and dust to have an infrequent impact on sensitive receptors.
Medium risk sites	• Development of between 1, 000 and 15, 000 square metres of land and; • Development of between ten and 150 properties and; • Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors
High risk sites	• Development of over 15,000 square meters of land, or; • Development of over 150 properties or; • Potential for emissions and dust to have significant impact on sensitive receptors

APPENDIX H: NOMOGRAMS

Particulate matter (PM₁₀)

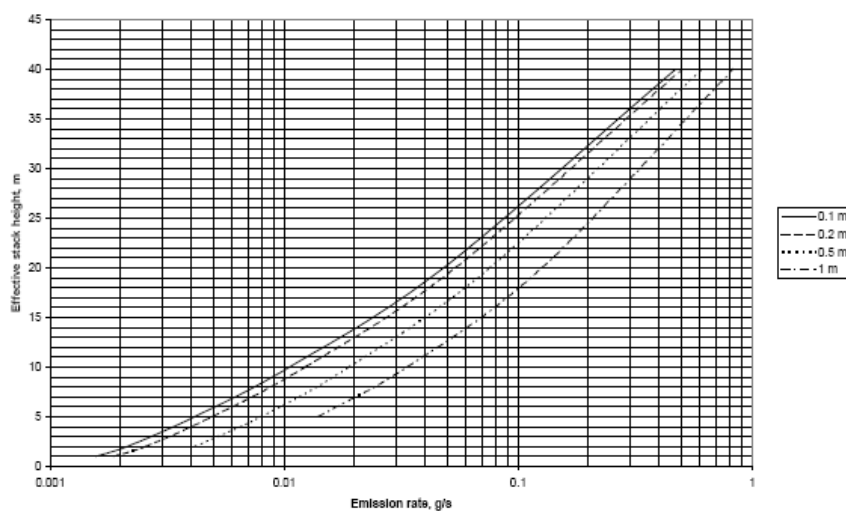
Figure 3.1: Particulate emissions necessary to give a 90th percentile of 24 hour mean ground level concentrations of 1 $\mu\text{g m}^{-3}$



AEA Energy & Environment (2008). Technical Guidance: Screening assessment for biomass boilers

Particulate matter (PM_{2.5})

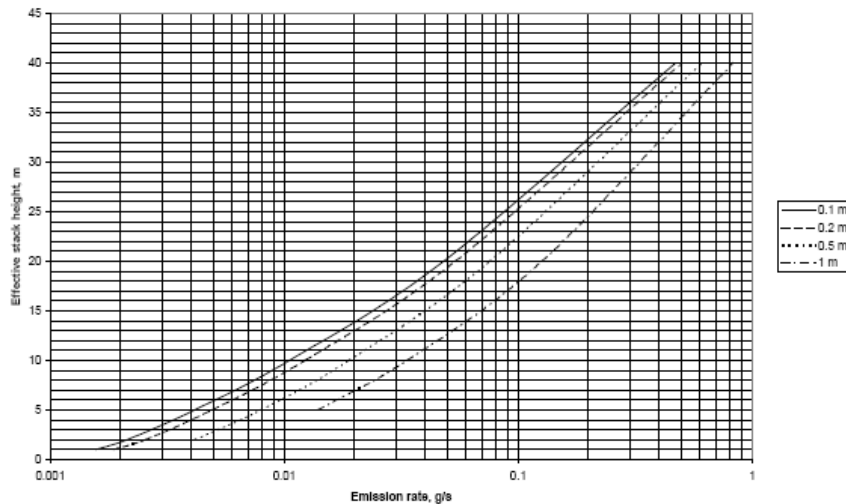
Figure 3.2: Emissions necessary to give an annual mean ground level concentration of 1 $\mu\text{g m}^{-3}$ of oxides of nitrogen or particulate matter



AEA Energy & Environment (2008). Technical Guidance: Screening assessment for biomass boilers

Annual mean NO₂

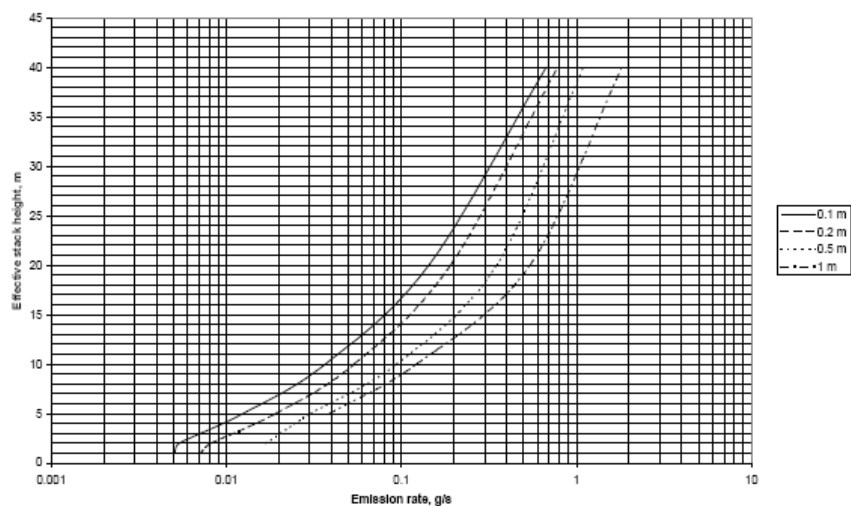
Figure 3.2: Emissions necessary to give an annual mean ground level concentration of 1 µg m⁻³ of oxides of nitrogen or particulate matter



AEA Energy & Environment (2008). Technical Guidance: Screening assessment for biomass boilers

Hourly mean NO₂

Figure 3.3: Emissions of oxides of nitrogen that will give a 99.8th percentile hourly mean concentration of 40 µg m⁻³



AEA Energy & Environment (2008). Technical Guidance: Screening assessment for biomass boilers

APPENDIX I: ALGORITHMS (6*500KW THERMAL INPUT CAPACITY)

Algorithms (6*500kW net thermal input capacity)

Parameter	Pollutant	Formula
Effective stack height	All	$C = 1.6 (U - H)$
Actual emission rate	All	$E = \text{Emission factor} * 3000\text{kW}$
Background adjusted emission rate	Particulate matter (PM ₁₀) ¹⁹	$E_A = E / (32 - G)$
	Particulate matter (PM _{2.5}) ²⁰	$E_A = E / (25 - G)$
	Nitrogen dioxide (annual mean) ²¹	$E_A = 40E / (200 - 2G)$

¹⁹ 32 represents the annual average concentration at which given a typical distribution of concentrations with time the 90th percentile of 24 hour means will exceed the objective

²⁰ 25 represent the annual average cap for PM_{2.5}

²¹ 40 represent the annual average objective and 200 represent the hourly mean objective