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Barry Waterfront

Environmental Statement
Chapter K

Air Quality

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1.0 Introduction

1.1 This chapter considers the potential air quality impacts associated with the proposed large-scale, mixed-use development at Barry Waterfront, South Wales.

1.2 This chapter presents the methodology and results of the study, along with a review of existing/background air quality, legislation, policy and guidance, and an assessment of potential air quality impacts resulting from the construction phase of the proposed scheme.

1.3 The study involves an assessment of the following key elements:

- Baseline characterisation of local air quality;
- Qualitative assessment of potential air quality impacts resulting from demolition/construction-related operations; and,
- Detailed dispersion modelling assessment of operational (post-construction) air quality impacts under three scenarios:
  - i Base Case Scenario (2008, the '**existing**' traffic situation)
  - ii Do Nothing Scenario (2020, **without** the proposed development)
  - iii With Development Scenario (2020, **with** the proposed development)

1.4 As the proposed development is large scale, generating significant vehicle movements (and associated emissions) on adjacent roads, air quality is considered to be a key environmental aspect of the proposed scheme requiring consideration through this Environmental Statement. This chapter considers potential impacts, highlights mitigation measures where required and then presents the resulting residual effects.

2.0 Planning Policy Context

Air Quality Legislative Context

2.1 UK air quality policy is published under the umbrella of the Environment Act, 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air, published in July 2007, sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

2.2 The air quality standards in the UK are derived from European Commission (EC) Directives. The EU Air Quality Framework Directive (1996)[1] established a framework under which the EU could set limit or target values for specified pollutants. The Directive identified twelve pollutants for which limit or target values have or will be set in subsequent Daughter Directives. The first of these Daughter Directives[2], relating to sulphur dioxide (SO_2), fine particles (PM_{10}), oxides of nitrogen (NO_x) and lead (Pb), was formally adopted in April 1999, and was required to be implemented by all Member States by July 2001.

2.3 Relevant regulations applicable in Wales are listed below in the following bullet points. Air quality objectives (including attainment dates for compliance) relevant to the proposed development are summarised in Table K1 below.

- The Air Quality (Wales) Regulations 2000 (S.I. 2000/1940) (W.138);
- The Air Quality (Amendment) (Wales) Regulations 2002 (S.I. 2002/3182) (W.298);
- The Air Quality Limit Values (Wales) Regulations 2001 (S.I. 2001/2683) (W.224);
- Air Quality Limit Values (Wales) Regulations 2002 (S.I. 2002/3183) (W.299);
- The Air Quality (Ozone) (Wales) Regulations 2003 (S.I. 2003/1848) (W.198);
- The Air Quality Limit Values Regulations (2003) (S.I. 2003/2121);
- The Air Quality Limit Values (Wales) (Amendment) Regulations 2005 (S.I. 2005/1157) (W.74); and,
- The Air Quality Standards (Wales) Regulations (2007) (S.I. 2007/717) (W.63).

[1] Council Directive 1996/62/EC Framework Directive on Ambient Air Quality Assessment and Management 27 Sept 1996.
[2] Council Directive 1999/30/EC of 22 April 1999 relating to limit values for SO_2, NO_2, NO_x, particulate matter and lead in ambient air.

Substance	Averaging period	Exceedences allowed per year	Air Quality Objective (μg m^{-3})	Target date
Nitrogen dioxide (NO_2)	1 year	N/A	40	31.12.05
	1 hour	18	200	31.12.05
Particles (PM_{10})	1 year	N/A	40	31.12.04
	24 hours	35	50	31.12.04
Particles ($PM_{2.5}$)(1)	1 year	N/A	25	31.12.20
Carbon monoxide (CO)	8 hour(2)	0	10000	31.12.03
1,3 Butadiene	1 year(2)	N/A	2.25	31.12.03
Benzene	1 year(2)	N/A	16.25	31.12.03
	1 year	N/A	5(3)	31.12.10

Table K1 National Air Quality Objectives and Attainment Dates

Note: (1) Applies to the UK (excluding Scotland) as a target. A target of a 15% reduction in background concentrations during 2010-2020 has also been included in the National Air Quality Strategy. (2) = running average. Objectives for other pollutants not relevant to the present study are not listed in the table. (3): Applicable for England and Wales

2.4 These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedences are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the Act, and produce an Air Quality Action Plan to outline how air quality is to be improved to meet the objectives under Section 84 of the Act. It should be noted that The Vale of Glamorgan Council (VoG) has not declared any AQMAs within its administrative area.

2.5 Dust nuisance can occur as a result of the perception of the soiling of surfaces by excessive rates of dust deposition, and is defined as a statutory nuisance in the Environmental Protection Act 1990. However, there are currently no standards or guidelines for the nuisance of dust in the United Kingdom, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. However, an informal criterion of 200-250 mg/m^2/day (as a monthly average) is often applied in the UK as an indicator of potential nuisance.

Construction dusts tend to settle very near to the emission source and therefore tend to be localised in impact.

Air Quality Policy and Guidance

2.6 The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concerns that relate to land use and its development can, depending on the details of the proposed development, be a material planning consideration in the determination of planning applications.

2.7 Planning policies particularly relevant to air quality management are set out in TAN18– Transport (TAN18, 2007), Planning Policy Wales (PPW, 2002), National Society for Clean Air[3] (NSCA) guidance (NSCA, 2006) and supplementary planning guidance. These policies are discussed in more detail below.

TAN18: Transport

2.8 TAN18 (Transport) was published in March 2007 and provides the Government's transport planning policies, with the objectives of delivering an integrated transport policy, extending transport choices and securing mobility in a way that supports sustainable development.

2.9 The aim is to integrate planning and transport at a number of levels to promote more sustainable transport choices (for people and freight), to promote accessibility to services and to reduce the need to travel, especially by car. TAN18 identifies that local air quality is a key consideration in the integration of planning and transport. This is particularly relevant in areas where the Government's national air quality objectives are not expected to be met and where air quality action plans are formulated. TAN18 advises that well designed traffic management measures are able to contribute to reducing local air pollution and improving the quality of local neighbourhoods.

PPW: Planning and Pollution Control

2.10 Planning Policy Wales (PPW) sets out the Government's core policies and principles on land use planning. It considers the links between the land use planning and pollution control systems and how the interaction should be dealt with within planning.

2.11 Policies and advice contained within PPW should be taken into account in preparing policies for the development and use of land in the region by Regional Planning Bodies, Regional Spatial Strategies and Local Planning Authorities and in determining applications for planning permission.

[3] The NSCA is now known as Environmental Protection UK. However, the planning guidance document was published under the former name, the NSCA.

NSCA Guidance – Development Control: Planning for Air Quality

2.12 The NSCA (now known as 'Environmental Protection UK') guidance note 'Development Control: Planning for Air Quality' responds to the need for closer integration between air quality and development control. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

2.13 The guidance includes a method for assessing the significance of the impacts of development proposals in terms of air quality and how to make recommendations relevant to the development control process. The need for early and effective dialogue between the developer and local authority is identified to allow air quality concerns to be addressed as early in the development control process as possible. The guidance also provides some clarification as to when air quality constitutes a material consideration. The approach for assessing the significance of air quality impacts associated with a given development has been used in this assessment, and is outlined in Section 3.

2.14 More recent NSCA guidance (2006) provides an update to the guidance originally published in November 2004. The updated guidance takes into account a number of new guidance documents issued since the previous version, such as BRE guidance on dust and mitigation and the London Code of Construction Practice.

Supplementary Guidance – National and Local Requirements for the Validation of Planning Applications

2.15 The aim of the supplementary guidance is to assist developers to ensure that all necessary information for validation by the planning authority is submitted. Air quality assessments are required where a development is proposed within an existing Air Quality Management Area (AQMA) or where it is considered to have an impact on an existing AQMA. Air quality assessments are also required for:

- Residential developments of 100 dwellings or more within 100 metres of an AQMA;
- Non-residential developments within 100 metres of an AQMA with more than 10 parking spaces or within 500 metres and with more than 300 parking spaces;
- Where the proposed development could itself result in a worsening of air quality in an area; and/or,
- The development is for the extraction of above-ground minerals, waste applications involving activities such as landfilling/raising or thermal treatment if the proposal is within 500 metres of a housing development.

Local Planning Policy Guidance

2.16 VoG's Unitary Development Plan (UDP, covering the period 1996 to 2011) provides the strategic and detailed policy framework within which provision will be made for development and conservation within the local authority area over the next two years.

2.17 UDP Policy 29 – Protection of Environmental Quality – is particularly relevant to the proposed development and potential air quality impacts. This is reproduced below for reference:

DEVELOPMENT WILL NOT BE PERMITTED IF IT WOULD BE LIABLE TO HAVE AN UNACCEPTABLE EFFECT ON EITHER PEOPLE'S HEALTH AND SAFETY OR THE ENVIRONMENT:

i BY RELEASING POLLUTANTS INTO WATER, SOIL OR AIR, EITHER ON OR OFF SITE; OR
ii FROM SMOKE, FUMES, GASES, DUST, SMELL, NOISE, VIBRATION, LIGHT OR OTHER POLLUTING EMISSIONS.

3.0 Assessment Methodology & Significance Criteria

3.1 The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative assessment of air quality impacts from construction operations;
- Detailed (advanced dispersion modelling) assessment of air quality impacts of the proposed development under three scenarios:
  - i Base Case scenario (2008, the '**existing**' traffic situation);
  - ii Do Nothing scenario (2020, the expected year of opening **without** the proposed development); and,
  - iii With Development scenario (2020, the expected year of opening **with** proposed development).
- Recommendations for mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

3.2 The following subsections provide further detail on the assessment methodology.

Methodology to Derive Significance of Impacts

Demolition/Construction Phase

Magnitude of Impact

3.3 Airborne dust has a limited ability to remain in the air, and readily drops from suspension as a deposit. The previous (2003) Local Air Quality Management Technical Guidance document (LAQM.TG(03)) identifies that PM_{10} concentrations fall-off rapidly with distance from source. Figure K1 shows the fall-off in PM_{10} concentration from source for a typical wind speed of 6 m/s. At 50 m from source, the PM_{10} concentration is predicted to be approximately 30% of that at the point of generation.

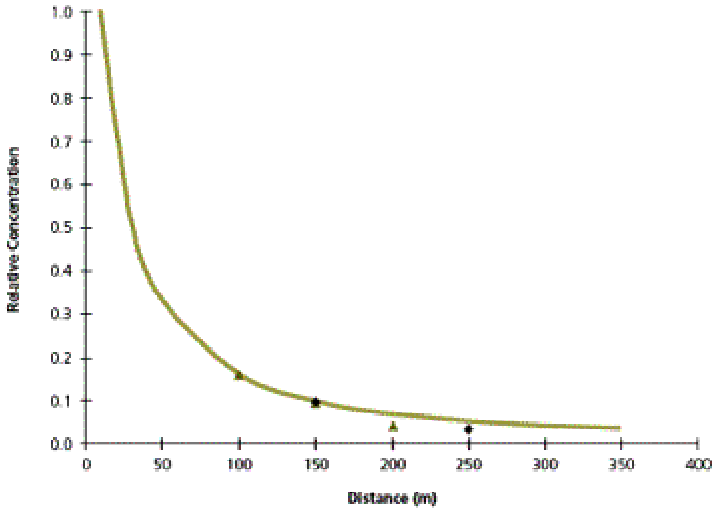


Figure K1 Modelled Fall-Off in PM_{10} Concentration with Distance from Source

3.4 US Environmental Protection Agency (US EPA) research suggests that the potential for dust effects is greatest within 100 m of construction activities. This is also true for fine particulate matter, PM_{10}, with the (perhaps greater) potential to impact upon human health.

3.5 The Greater London Authority (GLA) in partnership with London Councils has produced Best Practice Guidance (GLALC, 2006) on the control of dust and emissions from construction and demolition works. The guidance provided therein may be applied for any project for deriving the best practice measures to mitigate air quality impacts resulting from construction and demolition activities. This best practice guidance provides criteria that can be used by the developer and local planning authority to assess the risk posed by a demolition or construction site. The site evaluation guidelines from the Best Practice Guidance categorise sites as low, medium and high risk sites according to the size of the development, the number of properties being developed and the potential for emissions and dust to impact on sensitive receptors, as shown below in Table K2.

Risk Level	Site Evaluation Guidelines
Low Risk Site	Development of up to 1,000 square metres of land and; Development of up to 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 Site	Development of between 1,000 and 15,000 square metres of land and; Development of between ten to 150 properties and; Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.
High Risk Site	Development of over 15,000 square metres of land, or: Development of over 150 properties or; Major development defined by the local planning authority or; Potential for emissions and dust to have significant impact on sensitive receptors.

Table K2 Site Evaluation Guidelines

3.6 Based on the site evaluation guidelines identified in Table K2, the convention to classify the magnitude of impact resulting from the demolition and construction activities as shown in Table K3 has been adapted to maintain consistency with the methodology adapted throughout the remainder of the Environmental Statement.

Categories of Magnitude of Impacts	
As per GLA Guidance[Ŧ]	***As Adapted in the Air Quality Assessment for the Demolition/Construction Phase of the Proposed Development***
High Risk Site	*High*
Medium Risk Site	*Medium*
Low Risk Site	*Low*
'Negligible Risk Site' is not defined possibly because dust impacts are inevitable during demolition/construction activities and need to be effectively controlled by mitigation measures	*Negligible*

Table K3 Demolition/Construction Phase: Categories of Magnitude of Operational Impact

[Ŧ]Note: GLA: Greater London Authority.

Sensitivity of Receptors to Construction Phase Impacts

3.7 The sensitivity of receptors to dust may be categorised from low to high as shown below in Table K4.

Sensitivity	Description of the Receptor
High	Hospitals and clinics, high-tech industries, painting & finishing, food processing
Medium	Schools, residential areas, food retailers, greenhouses & nurseries, horticultural land use, offices
Low	Farms, light and heavy industry, outdoor storage
Negligible	Not defined

Table K4 Demolition/Construction Phase: Classification of Sensitivity of Potential Receptors to Dust

3.8 Depending on the magnitude of the impact (Paragraph 3.3) and the sensitivity of the receptor to the impact (Paragraph 3.7), the significance of the impact is determined. The criteria adapted for deriving the significance of the impact is discussed at paragraph 3.15.

Operational Phase

Magnitude of Impact

3.9 NSCA guidance provides an approach for assessing the significance of air quality impacts associated with a given development. This approach uses textual descriptors of significance, which are contained within a flowchart, as shown in Figure K2 below. These criteria have been applied to the quantified (modelled) traffic effects in this assessment.

3.10 The approach assumes that air quality impacts associated with a proposed development have been assessed and quantified. The significance of the impacts is then assessed through a series of questions with closed (yes and no) answers. Each question is addressed in descending order until the arrow points to one of the outcomes in the right hand column. This gives the relative priority with which air quality considerations should be afforded with respect to the development proposal.

3.11 The NSCA guidance also provides further direction on how to describe the significance of impacts predicted from air quality modelling for the pollutants NO_2 and PM_{10}. Two tables (from the NSCA guidance) are presented that set out examples of descriptors of magnitude of change and significance, as shown below in Table K5 and Table K6. The first step is to identify the descriptor of change in ambient concentrations for NO_2 and PM_{10} (Table K5) according to the

percentage change in the annual mean NO_2 concentration and the change in the predicted number of days greater than 50 µg m^{-3} for PM_{10}. The descriptor can then be used to assess the impact significance for the two pollutants in relation to changes in the absolute concentration predicted from modelling with the proposed development in place (Table K6).

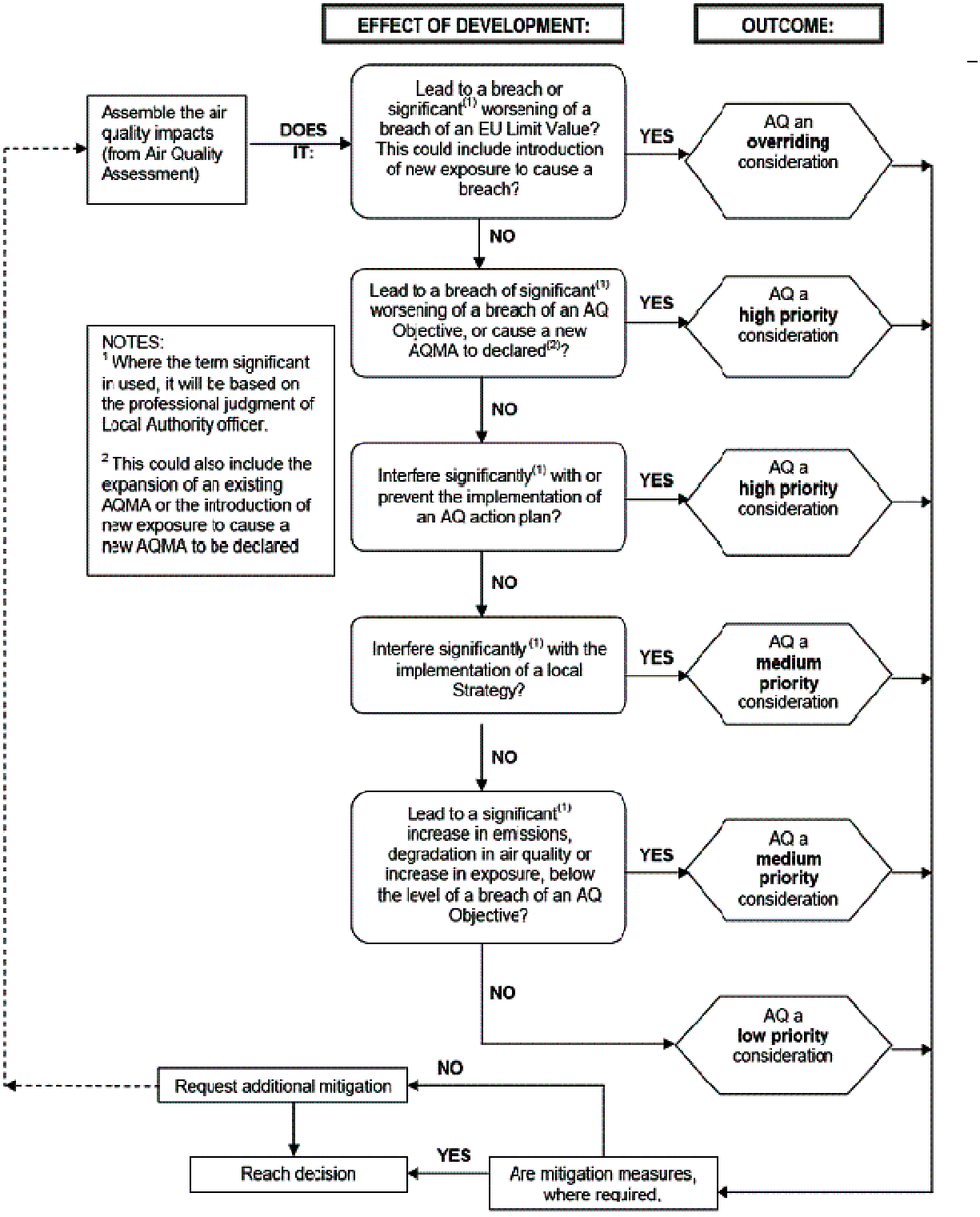


Figure K2 Assessment of Significance of Air Quality Impacts

Magnitude of Change	***Annual Mean NO_2***	***Days PM_{10} > 50 µg m^3***
Very Large	*Increase/Decrease > 25%*	*Increase/Decrease > 25 days*
Large	*Increase/Decrease 15-25%*	*Increase/Decrease 15-25 days*
Medium	*Increase/Decrease 10-15%*	*Increase/Decrease 10-15 days*
Small	*Increase/Decrease 5-10%*	*Increase/Decrease 5-10 days*
Very Small	*Increase/Decrease 1-5%*	*Increase/Decrease 1-5 days*
Extremely Small	*Increase/Decrease <1%*	*Increase/Decrease <1 day*

Table K5 Examples of Descriptors of Change in Ambient Concentrations of NO_2 & PM_{10}

Air Quality Impact Significant Criteria						
Absolute Concentration in Relation to Standard	Extremely Small	Very Small	Small	Medium	Large	Very Large
Decrease with Scheme						
Above Standard with Scheme	Slight beneficial	Slight beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Above Standard without Scheme, below with the Scheme	Slight beneficial	Moderate beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Below Standard without Scheme, but not well below	Negligible	Slight beneficial	Slight beneficial	Moderate beneficial	Moderate beneficial	Substantial beneficial
Well below the Standard without Scheme	Negligible	Negligible	Slight beneficial	Slight beneficial	Slight beneficial	Moderate beneficial
Increase with Scheme						
Above Standard without Scheme	Slight adverse	Slight adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard without Scheme, Above with Scheme	Slight adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard with Scheme, but not well below	Negligible	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well below Standard with Scheme	Negligible	Negligible	Slight adverse	Slight adverse	Slight adverse	Moderate adverse

Table K6 Examples of Descriptors of Impact Significance for NO_2 and PM_{10}

3.12 The magnitude of impact described in NSCA guidance (Table K5) is referred in four categories as identified in Table K7 to maintain consistency with the methodology adapted throughout the remainder of the Environmental Statement.

Categories of 'Magnitude of Impact'	
As per NSCA Guidance	***As Adapted in the Air Quality Assessment for the Proposed Development***
Very large and large impact	*High*
Medium impact	*Medium*
Small and very small impact	*Low*
Extremely small impact	*Negligible*

Table K7 Operational Phase: Categories of Magnitude of Operational Impact

Sensitivity of Receptors to Operational Phase Impacts

3.13 The criteria suggested in NSCA guidance (Table K6 above) are related to the sensitivity of the receptors with the convention identified in Table K8 below. For example, if the existing air quality conditions are poor even without the proposed development in place, the receptors are considered as 'highly sensitive' receptors and sensitivity is considered as 'High'. Conversely, if the air quality conditions with the proposed development in place are good (well below Standard with Scheme), the sensitivity of the receptors is considered as 'negligible'.

Categories of 'Sensitivity of the Receptor'	
As per NSCA Guidance	***As Adapted in the Air Quality Assessment for the Proposed Development***
Decrease with the Scheme	
Above Standard with Scheme	*High*
Above Standard without Scheme, below with the Scheme	*Medium*
Below Standard without Scheme, but not well below	*Low*
Well below the Standard without Scheme	*Negligible*
Increase with the Scheme	
Above Standard without Scheme	*High*
Below Standard without Scheme, Above with Scheme	*Medium*
Below Standard with Scheme, but not well below	*Low*
Well below Standard with Scheme	*Negligible*

Table K8 Operational Phase: Classification of Sensitivity of the Receptors

3.14 Depending on the magnitude of impact (Paragraph 3.9) and the sensitivity of receptor to the impact (Paragraph 3.13), the significance of impact is determined. The criteria adapted for deriving the significance of impact is discussed below.

Significance Criteria

3.15 The significance levels attributed to each impact has been assessed based on the magnitude of change as a result of the proposed development and the sensitivity of the affected receptor to that change. Both the magnitude of change and receptor sensitivity are assessed on a scale of negligible, low, medium and high as discussed in paragraphs 3.3 and 3.9

3.16 Institute of Environment and Management (IEMA) defines impacts of differing levels with the following terms:

- Major Impact: where the proposed development could be expected to have a very significant environmental impact, either positive or negative (for example, major change in public health conditions, alteration to the extent and status of Air Quality Management Areas during the construction and operational phases);

- Moderate Impact: Where the proposed development could be expected to have a noticeable environmental impact, either positive or negative, (for example, moderate change in public health conditions, alteration to the extent and status of Air Quality Management Areas during the construction and operational phases);
- Minor Impact: Where the proposed development could be expected to have a small, barely noticeable environmental impact, either positive or negative, (for example, minor change in public health conditions, alteration to the extent and status of Air Quality Management Areas during the construction and operational phases); and,
- Negligible: Where no discernable environmental impact is expected during the construction and operational phases.

3.17 Using these terms Table K9 will be used to determine the significance of effects.

		Sensitivity of Receptor/Receiving Environment to Change/Effect			
		High	Medium	Low	Negligible
Magnitude of Change /Effect	High	Major	Moderate to Major	Minor to Moderate	Negligible
	Medium	Moderate to Major	Moderate	Minor	Negligible
	Low	Minor to Moderate	Minor	Negligible to Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Table K9 Matrix for Determining Significance of Effects

3.18 The magnitude of change will generally be considered as the increase in air pollutant concentrations whilst the sensitivity will be considered the baseline operating conditions and the scope for mitigation works.

3.19 In assessing the effect of the Barry Waterfront development it is important to compare with the existing situation and that of the baseline conditions in future years, it will not be reasonable for the developers of Barry Waterfront to solve existing or future year issues that occur irrespective of the development, therefore a 'Nil Detriment' impact over these baselines conditions is appropriate.

Consultation with The Vale of Glamorgan Council

3.20 The Vale of Glamorgan Council (VoG), the relevant local authority, has reviewed the scoping document for undertaking an Environmental Impact Assessment (EIA) for the proposed development and made the following comments in relation to air quality assessment.

"Air Quality and Traffic Assessments shall include impact on the local main thoroughfares including data for anticipated traffic flows and contribution to air quality. The range of this assessment should include reference to knock on effects to all routes into Cardiff including Cogan and Merry Harrier intersections.

Dust: The EIA should include details of scheme to control dust during demolition, remediation and construction phases."

3.21 Subsequently, RSK EHS Ltd (RSK) has prepared a methodology to assess the construction and operational phase air quality impacts of the proposed development as discussed above and consulted the relevant officer, Mr. Kristian James, in the Pollution Team (Public Protection) at VoG on 15 June 2009. The Pollution Team informed RSK that the proposed methodology is acceptable, however, raised the following concerns.

- In-combination impacts of the proposed development when operational with two more nearby proposed developments (a gasification facility and a biomass power plant) on local air quality should be assessed; and,
- The impact of traffic to and from the development commuting east into Cardiff via Penarth and Dinas Powys.

3.22 Further details of consultation made with VoG are given in Appendix K1.

3.23 This chapter identifies the air quality impacts of the proposed development taking into account the aforementioned comments from the Pollution Team of VoG.

4.0 Baseline Conditions

4.1 Existing, or baseline, air quality refers to the concentration of relevant substances/pollutants that are already present in ambient air. These substances are released by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality information employed in this assessment has been obtained from VoG and the UK Air Quality Archive[4].

Emission Sources

4.2 In recent decades, transport-related emissions have become one of the main sources of air pollution in urban areas. The principal pollutants relevant to this assessment are considered to be NO_2 and PM_{10}, two key parameters released by vehicular combustion processes, and which are generally considered to have the greatest potential to result in human health impacts.

4.3 Ffordd y Mileniwm provides the main access into the development site from the east. The current daily average vehicle flow on this link is, based on data supplied by the traffic consultant for the development scheme, Arup, approximately 17,000 vehicles per day.

Local Authority Review and Assessment of Air Quality

4.4 As directed by the Environment Act 1995, local authorities are required to review and assess air quality with respect to the standards and objectives for the pollutants specified in the Government's National Air Quality Strategy (NAQS). Local authorities are required to carry out an Updating and Screening Assessment (USA) of their area every three years. If the USA identifies potential 'hotspot' areas where air quality objectives are likely to be exceeded, then a detailed assessment of those areas is required.

4.5 Where objectives are not predicted to be met, local authorities must declare this 'hotspot' region as an Air Quality Management Area (AQMA). In addition, local authorities are required to produce an Air Quality Action Plan (AQAP), which outlines measures aimed at improving air quality within the designated AQMA.

4.6 VoG has reviewed air quality within its administrative area and has not declared any AQMAs in the recent detailed assessment report. It is assumed, therefore, that air quality at the proposed development site is likely to meet relevant national air quality objectives.

[4] www.airquality.co.uk

Local Authority Air Quality Monitoring

4.7 VoG undertakes air quality monitoring for a variety of parameters at a number of locations using both automated and passive (diffusion tube) techniques. The nearest automatic monitoring station to the proposed Barry waterfront development site is located at the Highwayman Inn (Fonmon), Rhoose (grid reference: 305910, 167340). This monitoring station, which is classified as a rural site, is located approximately 6 km from the proposed development site and close to the Cardiff International Airport. Table K10 below shows annual average NO_X, NO_2 and PM_{10} concentrations as measured at this site in 2008.

4.8 The nearest background diffusion tube monitoring sites are located at Gwenog Court, Barry (grid reference: 310500, 168400) and St. Teilo Avenue, Barry (grid reference: 168900, 311500). Both monitoring stations are located approximately 1.5 km from the proposed development site. Table K10 below presents annual average NO_2 concentrations as measured at the two background locations in 2008.

Monitoring Site	2008 Annual Average NO_X ($\mu g/m^3$)	2008 Annual Average NO_2 ($\mu g/m^3$)	2008 Annual Average PM_{10} ($\mu g/m^3$)
Highwayman Inn, Rhoose (Fonmon)	17.7	11.4	20.1
Gwenog Court, Barry	No Data	15.5	No Data
St. Teilo Avenue, Barry	No Data	15.0	No Data

Table K10 Measured Annual Average NO_X, NO_2 and PM_{10} Concentrations – VoG Air Quality Monitoring (2008)

Note: Data obtained from Air Quality in Wales website (www.welshairqulaity.co.uk)

UK Air Quality Archive Data

4.9 The UK Air Quality Archive (www.airquality.co.uk), which is operated and maintained by AEA Energy & Environment on behalf of DEFRA and the devolved administrations, provides estimated background pollutant concentration maps on a 1 km^2 square basis across the UK. Background concentrations (for the 1 km^2 grid closest to the centre of the proposed development site) of pollutants of concern for the base year of 2008 and the projected operational year for the development of 2020 are presented below in Table K11. Background air quality is predicted to meet relevant air quality objectives at the grid reference presented, and is anticipated to improve over time.

Measurement Year	Estimated Pollutant Concentrations, µg m^{-3} Derived from the UK Air Quality Archive Website		
	NO_x	NO_2	PM_{10}
2008 (Base year)	16.6	13.2	17.0
2020 (Anticipated opening year of development)	12.0	9.9	16.2

Table K11 Estimated Annual Average NO_x, NO_2 and PM_{10} Concentrations at the Proposed Development Site (2008 and 2020)

Note: Data obtained from UK Air Quality Archive (www.airquality.co.uk); reported pollutant concentrations are for grid reference: 311500, 167500; approximate centre of proposed development site: 311700, 167350.

Background Air Quality Data Employed in Assessment

4.10 Table K12 below summarises the background air quality data employed in the assessment. The 2008 NO_X concentration has been derived by applying the 2008 NO_X/NO_2 ratio from the Fonmon continuous monitoring station to the 2008 annual average NO_2 concentration measured at Gwenog Court. Background pollutant concentrations for the 2020 assessment year have been factored from the 2008 data by applying relevant ratios based on the estimated (UK Air Quality Archive) data for 2008 and 2020.

Year	Annual Average Pollutant Concentration, µg m^{-3}		
	NO_X	NO_2	PM_{10}
2008	24.1	15.5	20.1
2020	17.4	11.6	19.2

Table K12 Background Air Quality Data Employed in the Air Quality Assessment

5.0 Potential Impacts

Demolition/Construction Phase Impacts

5.1 Atmospheric emissions from demolition and construction activities will depend on a combination of the potential for emissions (the type of activity) and the effectiveness of control measures. In general terms, there are two sources of emissions that need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles; and,
- Fugitive dust emissions from site activities.

Exhaust Emissions from Plant and Vehicles

5.2 The operation of vehicles and equipment powered by internal combustion engines results in the emission of waste exhaust gases containing the pollutants NO_X, PM_{10}, Volatile Organic Compounds (VOCs), and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition. The operation of site equipment, vehicles and machinery will result in emissions to atmosphere of exhaust gases, but such emissions are unlikely to be significant, particularly in comparison to levels of similar emission components from vehicle movements on the local road network surrounding the development site.

5.3 Construction traffic will comprise haulage vehicles, construction vehicles and vehicles used for employee trips to and from work. Traffic impact assessment (Chapter D of the ES) for the proposed development suggested that three routes could be considered for construction traffic access to the site:

- To the A4232 at Culverhouse Cross via Ffordd y Mileniwm, Barry Docks Link Road and Wenvoe;
- To the A4232 at Culverhouse Cross via Pontypridd Road, Waycock Cross, Port Road and Wenvoe; and,
- To the A4232 at Ferry Road Interchange via Ffordd y Mileniwm, Cardiff Road and the A4055 through Dinas Powys

5.4 However, the traffic assessment considered that the lowest traffic impact is to the A4232 at Culverhouse via Ffordd y Mileniwm, Cardiff Road, Barry Docks Link and the A4050 via Wenvoe. About 60-70 two-way HGV movements and 180-360 two-way LGV movements per day are anticipated during the construction phase. Further details on traffic considerations are provided in Section 5 of Chapter D. The abovementioned estimate suggests that, in the context of the scale of the proposed development, the volume of traffic associated with the demolition/construction phase is not considered to be significant.

Fugitive Dust Emissions

5.5 Fugitive dust emissions arising from demolition/construction activities are likely to be variable in nature and will depend upon type and extent of the activity, soil conditions (soil type and moisture), road surface conditions and weather conditions. Soils are inevitably drier during the summer, and periods of dry weather combined with higher than average winds have the potential to generate the most dust. Demolition/construction related activities that are considered to be the most significant potential sources of fugitive dust emissions are:

- Demolition activities, due to the breaking up and size reduction of concrete, stone and compacted aggregates;
- Earth moving, due to the excavation of underground tunnels, handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand);
- Movement of heavy site vehicles on dry untreated or hard surfaced haul routes; and,
- Movement of vehicles over surfaces where muddy materials have been transferred off site (for example, on to public highways).

5.6 Fugitive dust arising from demolition/construction activities is generally of a particle size greater than the PM_{10} fraction, which has a greater potential to impact upon human health. Appropriate dust control/mitigation measures are highly effective for the dust generating activities identified above, and adverse effects can correspondingly be greatly reduced or eliminated.

Significance of Demolition/Construction Activities

Magnitude of Impact

5.7 According to the criteria set out in Table K2, the proposed development site may be classified as a high-risk site as the development comprises more than 150 properties and covers an area greater than 15,000 m^2. The magnitude of impact during the demolition/construction phase as per Table K3 is ‘High’.

Sensitivity of Receptors

5.8 Referring to Table K4, the sensitivity of receptors adjacent to the proposed development site can be classified as ‘Medium’, as the land surrounding the development site is predominantly of a residential nature.

Significance of Impact

5.9 The significance of demolition/construction phase impacts is, therefore, ‘Moderate to Major’.

5.10 Mitigation measures that will help further reduce the impacts of demolition/construction activities at the development site are discussed in more detail in Section 6. Residual impacts after implementing the mitigation measures are assessed in Section 7.

Operational Phase Impacts

5.11 A detailed atmospheric dispersion modelling study has been undertaken to assess the potential impacts resulting from the operational phase of the development. The following subsections provide further information regarding emissions sources, the dispersion model used and the outcomes of the assessment.

Road Traffic Emissions

5.12 Traffic data for the proposed development, including Annual Average Daily Traffic (AADT) flows, the percentage of heavy duty vehicles (HDVs) and vehicle speeds were provided by the designated traffic consultant for the scheme, Arup.

5.13 In total, 24 junctions along key roads adjacent to, and leading to the development site, including Ffordd y Mileniwm and the A4055, were included in the model. All roads and sensitive receptors included in the dispersion modelling assessment are detailed in Appendix K2.

Vehicle Emissions Factors

5.14 Vehicular emissions factors are built into the ADMS-Roads dispersion model. The factors include the latest Design Manual for Roads and Bridges (DMRB) (2003) emissions factors, taking into account improvements in vehicle technology and fuels, whilst computing emission rates (in grams per vehicle per km) for each mode of transport assessed.

Queuing Traffic

5.15 Queuing traffic emits higher pollutant concentrations than normal moving traffic due to less efficient fuel burning/combustion. The designated traffic consultant, Arup, provided data on queue lengths for road junctions included in the dispersion model5. For ADMS-Roads modelling, an average vehicle length of 4 m was assumed, with vehicles assumed to be travelling at the lowest possible speed in the model (5 km/hr). An emission rate was then calculated for each queue length/junction, which is expressed as an Annual Average Daily Traffic (AADT) flow, as shown in the following equation[6].

[5] Queue length information was taken from the Transport Assessment, which was produced by Arup for the proposed development scheme

[6] From Cambridge Environmental Research Consultants (CERC): www.cerc.co.uk

$$AADT = [Speed(m/hr)/Vehicle\_length(m)] \times 24$$

Time Varying Traffic Profiles

5.16 Vehicle movements on the road network surrounding the development site will vary throughout day. In order to account for this daily variation, the average of diurnal traffic flow profiles for weekdays, Saturdays and Sundays (applied to all modelled roads) were developed from traffic data provided by Arup for the A48 and Ffordd y Mileniwm. Figure K3 below identifies the average diurnal profiles employed to all modelled roads.

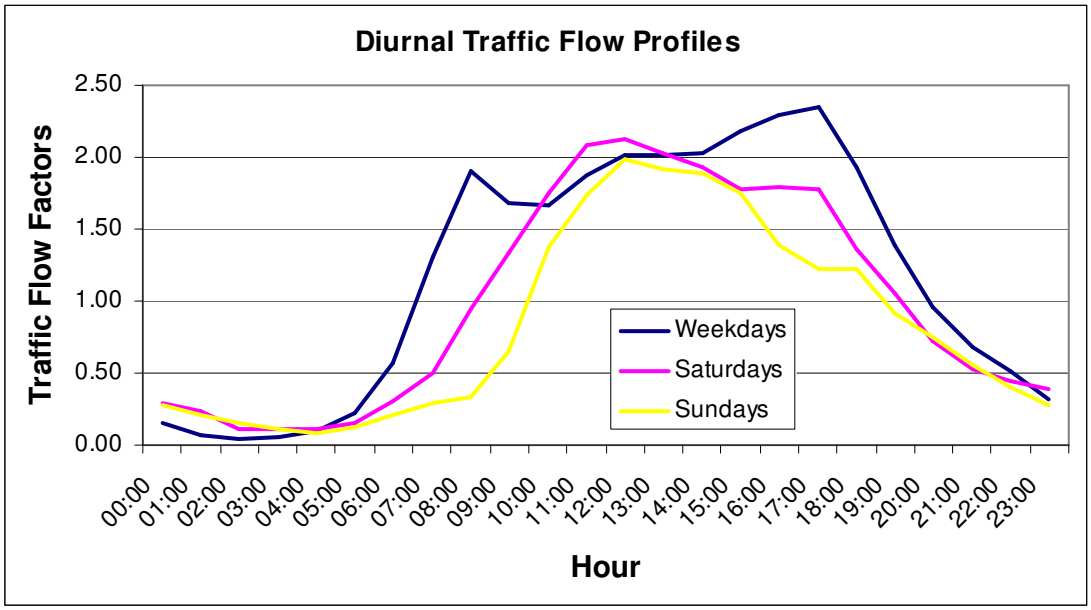


Figure K3 Diurnal Profile for Assessed Road Links

Dispersion Model

5.17 ADMS-Roads has been used for the air quality assessment as this model is widely tested and used within the UK and Europe. This is a 'new generation' dispersion model developed by the UK consultancy CERC (Cambridge Environmental Research Consultants). The model allows for the skewed nature of turbulence within the atmospheric boundary layer. An equivalent model, ADMS-Urban, is often used by local councils for air quality review and assessment work.

5.18 ADMS-Roads is an advanced model and is capable of processing hourly sequential meteorological data and background concentrations, whilst taking the turbulence caused by vehicles into account. ADMS-Roads enables the user to model line (road), point, area (surface car park) and volume emission sources simultaneously, and facilitates the prediction of ground level concentrations of pollutants of concern at multiple receptor locations.

Meteorological Data

5.19 Three years (2006 to 2008 inclusive) of hourly sequential meteorological data as measured at the Met Office's St Athan monitoring station were employed in the model. This monitoring station is approximately 12 km from the proposed development site, and is the nearest meteorological station from which the data required for advanced dispersion modelling is available.

Study Area and Receptor Location

5.20 Pollutant concentrations were predicted at a 230 m resolution over an area of 10 km x 10 km, approximately centred on the proposed development site. Pollutant concentrations were also predicted at a number of receptors in and around the development site. Details of all specific receptors included in the modelling study (and hence the air quality impacts assessed) are summarised below in Table K13. The location of all assessed receptors are shown in Annexure K2.

5.21 The locations chosen represent the closest residential and/or public properties and council's diffusion tube monitoring sites in and around the proposed development site.

Receptors Included In the Assessment	Description	Easting	Northing
1	Façade of residential property close to the junction of Park Avenue/ St Nicholas Road	310551	167034
2	Façade of property close to the junction of Broad Street/ Gladstone Road	311402	167912
3	Façade of residential property close to junction of Buttrills Road/ Barry Road	311270	168561
4	Façade of residential property close to the junction of Ty-newydd Road/ Barry Road	311607	168709
5	Façade of residential property close to the junction of Gladstone Road/ Holton Road	312957	168680
6	Façade of property close to the junction of Palmerston Road/ Cardiff Road	313743	168812
7	Façade of residential property close to the junction of Pontypridd Road/ Port Road West	309794	168491
8	Façade of property at Ffordd y Mileniwm	311499	167568
9	Façade of property at Subway Road	312249	167645
10	Façade of proposed property 1	310983	167004
11	Façade of proposed property 2	312459	167447
12	Façade of proposed property 3	311692	167586
13	Façade of residential property close to the junction of Murch Road/ Cardiff Road	315822	171442
14	Façade of residential property close to the junction of Andrew Road/ Cardiff Road	316860	172376
15	Diffusion tube monitoring (VGBC007) at Millbrook Road/ Cardiff Road	315773	171514
16	Diffusion tube monitoring (VGBC024) at Port Road East	310835	169721
17	Diffusion tube monitoring (VGBC061) at Railway Terrace	316433	171932

Table K13 Receptors Included in the Air Dispersion Modelling Assessment

NO_X/NO_2 Chemistry

5.22 A new approach to calculate NO_2 from NO_X concentrations at roadside sites has been published in LAQM.TG(09). The NO_X/NO_2 conversion spreadsheet/tool downloaded from the UK Air Quality Archive has been used to convert predicted roadside NO_X concentrations into NO_2 concentrations resulting from modelled road traffic emissions. The calculator is only applicable to the calculation of annual average concentrations of NO_2.

5.23 For short-term NO_2 predictions, the chemical reaction scheme built into the ADMS-Roads model has been used. Here, in addition to the background NO_X/NO_2 data presented above in Section 4, a background ozone (O_3) concentration of 60.3 µg/m^3 was included in the chemical reaction scheme/calculation. This is the 2008 annual average O_3 concentration as measured at the VoG's continuous monitoring station at the Highwayman Inn, Rhoose.

Predictions of Pollutant Concentrations

5.24 Long- and short-term concentrations of NO_2 and PM_{10} were, taking into account current and predicted background air quality, predicted at each receptor, for each modelled scenario and for each of the three years of meteorological data employed in the assessment. The results of the dispersion modelling assessment are presented below. Isopleths or pollution concentration contour plots for short- and long-term NO_2 and PM_{10} predictions for the opening year of the development are presented in the Air Quality Technical Appendix 3.

Sensitivity Analysis

5.25 Sensitivity analysis of the model to meteorological data employed in the dispersion model was conducted. For the majority of modelled receptors, the worst-case meteorological years for long- and short-term NO_X and PM_{10} predictions is 2006 and 2007.

Model Validation

5.26 The model was verified according to the procedures described in DEFRA Technical Guidance TG(09), by comparison with measured data from the Local Authority. The verification is presented in the Air Quality Technical Appendix 3.

Dispersion Modelling Outcomes

5.27 Table K14 presents maximum predicted long and short-term NO_2 and PM_{10} concentration (2006 and 2007 meteorological data) at each receptor location for all of the assessment scenarios.

5.28 Table K15 shows the change in annual mean NO_2 concentrations and the change in the number of days the 24-hour average PM_{10} concentration is greater than 50 µg/m^3 between the 'do nothing' and 'with development' scenarios at the opening year of 2020.

5.29 The modelling results indicate that short and long-term NO_2 and PM_{10} concentrations for the 2020 assessment scenarios are predicted to be less than those predicted for the baseline year of 2008. This is due to anticipated improvements in background air quality and vehicle emissions with time.

5.30 All modelled pollutant concentrations are predicted to meet relevant long- and short-term air quality objectives at all assessed receptors. Between 'do nothing' and 'with development' scenarios, increases in long- and short-term NO_2 and PM_{10} concentrations at the assessed receptors are not predicted to be significant.

Sensitive Receptor Reference Numbers (Refer to Table K13)	Short-term			Long-term			Short-term			Long-term		
	NO_2 99.79th Percentile of Hourly Average Concentrations			NO_2 Annual Average Concentrations			90.41th Percentile of PM_{10} 24-Hour Average Concentrations			PM_{10} Annual Average Concentrations		
	Base Case	Do Nothing	With Development	Base Case	Do Nothing	With Development	Base Case	Do Nothing	With Development	Base Case	Do Nothing	With Development
1	101.81	89.56	91.03	27.91	21.1	23.84	23.83	21.82	22.49	21.06	19.88	20.09
2	135.00	109.67	112.11	29.32	21.68	22.51	26.33	23.34	23.66	21.27	19.98	20.05
3	94.14	83.44	85.02	26.36	20.04	20.66	23.21	21.46	21.64	20.96	19.83	19.88
4	104.97	91.60	93.52	28.04	21.13	21.83	24.16	22.06	22.25	21.09	19.90	19.95
5	146.40	119.09	124.15	35.76	27.46	28.31	28.51	25.16	25.55	22.00	20.57	20.63
6	125.99	104.43	109.17	35.67	26.44	28.36	25.89	23.01	23.49	21.65	20.22	20.36
7	138.81	110.99	117.25	36.35	26.85	29.52	27.34	23.79	24.60	21.98	20.41	20.66
8	130.14	108.04	114.51	31.19	23.25	24.79	26.55	23.52	24.62	21.44	20.11	20.32
9	114.30	96.45	101.67	30.08	22.45	24.92	24.69	22.29	23.12	21.30	20.02	20.24
10	86.90	78.65	79.57	19.78	14.75	15.15	21.43	20.13	20.23	20.40	19.41	19.44
11	103.02	88.09	89.77	24.55	17.72	18.33	23.01	20.96	21.25	20.71	19.58	19.65
12	139.30	115.05	120.63	37.61	28.28	30.25	29.02	25.19	26.31	22.11	20.55	20.83
13	121.16	100.31	105.12	36.92	27.42	29.08	27.06	24.11	24.52	21.95	20.51	20.63
14	126.04	102.53	104.63	35.67	26.57	27.28	26.93	23.75	23.94	21.87	20.38	20.43
Air Quality Objective	**200**			**40**			**50**			**40**		

Table K14 ADMS-Roads Predicted Highest Pollutant Concentrations (μg m^{-3}) at Discrete Receptor Locations (Maximum of 2006 and 2007 meteorological data, background concentrations included)

Note: The reported long-term pollutant concentrations have been calibrated as per the LAQM TG (09) methodology.

Receptor	Percentage Change in Annual Average NO_2 Concentration	Change in Number of Days 24 Hour Average PM_{10} Concentration > 50µg/m^3
1	12.99%	0
2	3.83%	0
3	3.09%	0
4	3.31%	0
5	3.10%	0
6	7.26%	0
7	9.94%	0
8	6.62%	0
9	11.00%	0
10	2.71%	0
11	3.44%	0
12	6.97%	0
13	6.05%	0
14	2.67%	0

Table K15 Change in Highest Predicted Long-term NO_2 Concentrations and Short-term PM_{10} Concentrations Between 'Do Nothing' and 'With Development' Scenarios

Interpretation of Operational Impacts with NSCA Guidance

5.31 Under both the 'Do Nothing and 'With Development' scenarios, NO_2 and PM_{10} concentrations are predicted to meet the short term and annual mean air quality objectives.

5.32 Referring to the Environmental Protection UK (formerly, NSCA) guidance outlined in Section 3.9, the magnitude of change at the assessed receptors in relation to long-term NO_2 ranges between 'very small' to 'medium'.

5.33 In terms of the PM_{10} 24-hour objective, the magnitude of change is 'extremely small' at all receptors. Under both the 'Do Nothing and 'With Development' scenarios, PM_{10} concentrations are predicted to meet the relevant short-term air quality objective i.e. there are no days when the 24-hour average air quality objective for PM_{10} is exceeded.

5.34 Using the descriptors of impact significance outlined in Table K6, the effect of the proposed development is considered to be 'negligible' for short-term PM_{10} and 'negligible' to 'moderate adverse' for long-term NO_2.

5.35 At all assessed receptor locations, pollutant concentrations are predicted to meet relevant long- and short-term air quality objectives.

5.36 Interpreting the assessment results with Figure K1, the proposed development:

- will not lead to a breach or significant worsening of a breach of an EU Limit Value;
- will not lead to an extension of an existing AQMA and will not cause the declaration of a new AQMA;
- will not interfere significantly with, and will not prevent the implementation of, an Air Quality Management Plan;
- will not interfere significantly with the implementation of a local strategy; and,
- will not lead to a significant increase in emissions, degradation in air quality or increase in exposure, below the level of a breach of an Air Quality Objective.

Significance of Demolition/Construction Activities

Magnitude of Impact

5.37 Referring to the above, the highest magnitude of impact was predicted in terms of increased NO_2 concentrations and as per NSCA guidance the magnitude is 'Medium'. This equates to an impact of magnitude 'Medium' as per Table K7.

5.2.14.2 Sensitivity of Receptors

5.38 As the pollutant concentrations have been predicted to increase with the development, but still within the air quality objectives, referring to Table K8, the sensitivity of receptors may be considered as 'Low'.

5.2.14.3 Significance of Impact

5.39 Referring to Table K9, the significance of impact during operational phase of the proposed development is 'Minor'.

Cumulative Impact Assessment

5.40 In order to assess the potential cumulative air quality impacts associated with the proposed development, in-combination impacts of the proposed development and two nearby proposed power stations have also been assessed. Emissions data for the two proposed power stations, comprising a gasification facility (proposed to be developed by Biogen) and a biomass power plant (proposed to be developed by Sunrise Renewables) have been obtained from the planning portal of the VoG website (www.valeofglamorgan.gov.uk). It should be noted that the cumulative impact assessment has been undertaken as per the request made by VoG and it is an addition to the scope of the Environmental Impact Assessment required for the proposed development.

5.41 In order to arrive at a conservative (pessimistic) prediction of potential air quality impacts, it has been assumed that both installations were operating continuously and simultaneously during the operational phase of the proposed development. It must be emphasised, however, that at the time of writing, the two proposed power station developments are not built, and are still going through the VoG planning process.

5.42 Table K16 below outlines grid references for the two power station stacks and associated emissions parameters included in the dispersion model.

Emission Parameter	Biogen Gasification Plant	Sunrise Renewables Biomass Power Plant
Grid Reference	312775, 167195	312647, 167668
Stack Height, m	45	20
Stack Diameter, m	1.04	0.9
Exit Gas Velocity, m/s	13.03	14
Exit Gas Temperature, C	130	325
NO_X Emission Rate, g/s	3.69	0.81
PM_{10} Emission Rate, g/s	0.18	0.04

Table K16 Emission Parameters for Point Sources Included in the Model

5.43 The cumulative impact assessment identified that there is no appreciable change in the predicted pollutant concentrations when the proposed development is operational along with the abovementioned two proposed power plants. No exceedence of any of the air quality objectives at any of the assessed sensitive receptor locations has been predicted. Further details on cumulative impact assessment are placed in the Air Quality Technical Appendix 3.

5.44 In view of the above, air quality is considered to be a **low priority concern** for the proposed development.

6.0 Mitigation Measures

Demolition/Construction Phase Mitigation

6.1 The dust emitting activities outlined in Section 5 can be effectively controlled by appropriate dust control/mitigation measures and any adverse effects can be greatly reduced or eliminated. Effective dust mitigation measures prevent dust becoming airborne or contain dust within enclosures to prevent dispersion beyond the emission source.

6.2 Prior to commencement of demolition/construction activities, agreement on the scope of a Construction Environmental Management Plan (CEMP) for the construction phase should be reached with VoG to ensure that the potential for adverse environmental effects on local receptors is minimised. The CEMP should include, among others, measures to control traffic routing, site access points and methods for controlling dust and general pollution nuisance from site construction operations. Controls should be applied throughout the construction period to ensure that dust emissions are mitigated. Thus the construction activities will be controlled to reduce as far as possible any potential environmental impacts. Such mitigation is anticipated to include:

- Damping down of site haul roads by water bowsers during prolonged dry periods;
- Regular cleaning of hard-surfaced site entrance roads;
- Ensuring that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage is away from site boundaries, drop heights of materials are minimised, water sprays are used where practicable to reduce dust emissions);
- Ensuring that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials);
- Confinement of vehicles to designated haul routes within the site;
- Restricting vehicle speeds on haul roads and other unsurfaced areas of the site;
- Hoardings and gates to prevent dust breakout;
- Visual monitoring is included within site management practices to inform site management of the success of dust control measures used; and,
- Wheel washing of vehicles at the exit of the construction site.

6.3 Furthermore, site-specific mitigation measures for this kind of development sites according to available Best Practice Guidance should be implemented. Such measures include:

- Site planning to carry out main dust causing activity in spring/autumn, where possible, though the likelihood is that the activities will take place throughout the year;

- Planning of the site layout to locate dust activity away from sensitive receptors and minimise the movement of construction traffic around the site;
- No bonfires;
- Trained manager on site during working times to maintain logbook and site inspections and all site personnel to be fully trained;
- All vehicles to switch off engines to ensure no idling vehicles;
- No site runoff of water/mud;
- Cutting equipment to use water as suppressant;
- If a concrete crusher is to be used, ensuring this has a permit to operate;
- Minimising earth-moving works other dust generating activities on dry windy days, where practicable; and,
- Re-vegetate earthworks and exposed areas.

6.4 If contaminated soils are present, dust control measures will be applied to limit emissions of these materials. In cases where soils are identified as particularly hazardous, then excavation and removal will take place within temporary enclosures.

6.5 The traffic effects of the proposed development during the construction phase will be limited to a finite period and will be along the traffic routes employed by haulage vehicles, construction vehicles and employees. Implementation of the agreed CEMP will ensure that effects will be reduced as far as practicable.

6.6 Overall, construction effects on air quality will be minimised through the implementation of mitigation measures through the CEMP. This should significantly reduce the amount of dust that escapes the site boundary and additional dust measures may be employed where construction activities are in very close proximity to sensitive receptors. Any construction effects on air quality will be temporary (i.e. during the construction period only, phased over ten years).

6.7 Residual impacts when the abovementioned mitigation measures are adapted are described in Section 7 below.

Operational Phase Mitigation

6.8 As discussed in Section 5, the operational impact of the proposed development in terms of short and long-term NO_2 and PM_{10} concentrations is 'Moderate adverse' to 'Negligible' as per the NSCA guidance and 'Minor' as per the significance criteria identified in Table K9. It is not anticipated, therefore, that mitigation measures will be required once the development is operational.

7.0 Residual Impact Assessment

Construction Phase

7.1 Mitigation measures discussed in detail in Section 6 will be put in place to further reduce the impacts of demolition/construction activities at the development site. The impacts are considered as 'direct' (no indirect impacts), temporary, medium-term (during the phased ten years of construction period) and local (to the construction site and haulage routes). The residual impacts during the demolition/construction phase are likely to be of 'Moderate to Minor' significance.

Operational Phase

7.2 The air quality impact assessment described in Section 5 identified no exceedence of any of the air quality objectives designed to protect the human health. No mitigation measures are hence considered necessary. The residual impacts during the operational phase of the proposed development likely to be long-term having 'Minor' significance.

7.3 The residual impacts resulting from the demolition/construction phase and operational phase of the proposed development are identified in Table K17.

Environmental Topic	Description of Impact		Description of Mitigation Measures	Description of Residual Impact	
	Description	Significance		Description	Significance
Air Quality: Construction Impacts	Fugitive dust nuisance, construction plant /vehicles exhaust emissions	Moderate to Major Direct, Temporary Medium-Term Local	Design and implementation of a Construction Environmental Management Plan (CEMP) along with the mitigation measures recommended in Section 6.	Short term. No long-term residual effects.	Moderate to Minor Direct, Temporary Medium-Term Local
Air Quality: Operational Impacts	Vehicle exhaust emissions and operational plant emissions	Minor Long-term	None proposed.	Long term	Minor Long-term

Table K17 Summary of Residual Effects of the Proposed Development Together with Mitigation Measures

8.0 Summary and Conclusions

8.1 The air quality assessment for the proposed development on Barry Waterfront examined existing air quality in the local area, outlined relevant air quality legislation, policy and guidance, and assessed potential changes in air quality arising from the proposed scheme.

8.2 The demolition/construction effects of the proposed development on local air quality will primarily be from dust emissions during the period of demolition and construction. These impacts will, however, be controlled through mitigation measures outlined in a Construction Environmental Management Plan for the site, ensuring that any adverse effects of the demolition/construction phase of the proposed development on local air quality are minimised or avoided. The residual impacts of demolition/construction phase are likely to be 'Moderate to Minor'. No long-term residual effects are expected as a result of the demolition/construction works.

8.3 The primary air quality impacts once the proposed development becomes fully operational will be from traffic associated with the scheme. A detailed assessment of operational effects has been undertaken using the ADMS-Roads atmospheric dispersion model. Various assumptions that are designed to over-predict pollutant concentrations were employed to arrive at the most conservative impact assessment. Data on anticipated changes in traffic flows resulting from the operation of the proposed development have been used to predict air pollutant concentrations for comparison with relevant air quality objectives.

8.4 The primary pollutants assessed were NO_2 and PM_{10}. Concentrations of these parameters were predicted at the most relevant receptor locations for the years 2008 and 2020, both with and without the proposed development. Under all modelled scenarios and all meteorological years assessed, relevant short- and long-term air quality objectives were achieved.

8.5 Interpretation of model predictions with planning guidance provided by Environmental Protection UK indicates that the overall impact of the proposed development is 'negligible' to 'moderate adverse'. The significance of residual impacts during operational phase of the development are likely to be 'Minor'.

8.6 Cumulative impact assessment addressing the in-combination effects when the proposed development operates concurrently with the nearby proposed industrial developments identified no exceedence of any of the air quality objectives at any of the assessed sensitive receptor locations. It should however be noted that the industrial developments assessed in the cumulative impact assessment are not a part of the Barry Waterfront development and are only assessed on the request of the Pollution Team of VoG. Furthermore, the aforementioned industrial developments are currently at proposal stage and are not committed developments.

8.7 Overall air quality is considered to be a low priority concern for the proposed development.

9.0 Abbreviations

AADT	Annual Average Daily Traffic
AQ	Air Quality
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BRE	Building Research Establishment
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CO	Carbon Monoxide
CoCP	Code of Construction Practice
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EC	European Commission
EIA	Environmental Impact Assessment
EP-UK	Environmental Protection UK (formerly NSCA)
EU	European Union
GLA	Greater London Authority
HDV	Heavy Duty Vehicles
IEMA	Institute of Environment and Management
LAQM	Local Air Quality Management
NAQS	National Air Quality Strategy
NLP	Nathaniel Lichfield and Partners
NO_2	Nitrogen dioxide
NO_x	Oxides of Nitrogen
NSCA	National Society for Clean Air (now Environmental Protection UK)
O_3	Ozone
Pb	Chemical symbol for lead
$PM_{2.5}$	Particulate matter of size fraction approximating to <2.5µm
PM_{10}	Particulate matter of size fraction approximating to <10µm.

PPW	Planning Policy Wales
SI	Statutory Instrument
SO_2	Sulphur Dioxide
TAN	Technical Advice Notes
UDP	Unitary Development Plan
UK	United Kingdom
US	United States
USA	Updating and Screening Assessment
VOC	Volatile Organic Compounds
VoG	The Vale of Glamorgan Council

10.0 References

- Air Quality in Wales website: www.welshairqulaity.co.uk
- DEFRA (2003). Part IV of the Environment Act 1995: Local Air Quality Management: Policy Guidance.
- DEFRA (2009). Part IV of the Environment Act 1995: Local Air Quality Management: Policy Guidance.
- DEFRA (2003). Part IV of the Environment Act 1995: Local Air Quality Management: Technical Guidance.
- DEFRA (2009). Part IV of the Environment Act 1995: Local Air Quality Management: Technical Guidance.
- GLALC (2006). Greater London Authority and London Councils. The control of dust and emissions from construction and demolition, Best Practice Guidance, November 2006.
- LAQM TG (09). Local Air Quality Management Technical Guidance Notes (2009) published by DEFRA.
- NAQS (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in July 2007 by Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland.
- PPW (2002). Planning Policy Wales, Welsh Assembly Government, March 2002.
- TAN18 (2007). Technical Advice Note (TAN) 18: Transport, Welsh Assembly Government, March 2007.
- NSCA (2006), Development Control: Planning for Air Quality, 2006.
- UK Air Quality Archive website: www.airquality.co.uk
- The Vale of Glamorgan Council website: www.valeofglamorgan.gov.uk
- AEA (2008), Vale of Glamorgan Council Air Quality Review and Assessment – Detailed Assessment

Appendix K1

Consultation with the Vale of Glamorgan Council on the Methodology to Undertake an Air Quality Assessment for the Proposed Barry Waterfront Development

The Vale of Glamorgan Council (VoG), the relevant local authority, has reviewed the scoping document for undertaking an Environmental Impact Assessment (EIA) for the proposed development and made the following comments in relation to air quality assessment.

"Air Quality and Traffic Assessments shall include impact on the local main thoroughfares including data for anticipated traffic flows and contribution to air quality. The range of this assessment should include reference to knock on effects to all routes into Cardiff including Cogan and Merry Harrier intersections.

Dust: The EIA should include details of scheme to control dust during demolition, remediation and construction phases."

Subsequently, RSK EHS Ltd (RSK) has prepared a methodology to assess the construction and operational phase air quality impacts of the proposed development and consulted the concerned officer, Mr. Kristian James, in the Pollution Team (Public Protection) at VoG on 15 June 2009 by the below mentioned Email 1. The Pollution Team informed RSK (Email 2 below) that the proposed methodology is acceptable, however, raised the following concerns.

- In-combination impacts of the proposed development when operational with two more nearby proposed developments (a gasification facility and a biomass power plant) on local air quality should be assessed; and,
- The impact of traffic to and from the development commuting east into Cardiff via Penarth and Dinas Powys.

Email 1: Consultation with the Pollution Team at the Vale of Glamorgan Council dated. 15.06.2009

From: jferguson-moore@rsk.co.uk [mailto:jferguson-moore@rsk.co.uk]
Sent: 15 June 2009 16:38
To: James, Kristian
Subject: Air Quality Assessment - Barry Waterfront Development

Hello Kristian - thanks for speaking with me earlier today.

As discussed, the attached document briefly outlines RSK's suggested approach to assessing potential air quality impacts associated with the proposed Barry Waterfront development.

In terms of construction-phase impacts, we intend to focus the assessment on dust mitigation/control measures. In terms of operational impacts, we will focus the assessment on traffic-related emissions, the geographical extent of which will be determined by the transport study for the proposed scheme.

Looking at local monitoring data for 2008, background concentrations of NO_2 and PM_{10} are significantly below relevant long-term air quality objectives, so in terms of 'head room' there does appear to be scope for cumulative development in this part of Wales. However, any comments on this aspect would be appreciated.

We are looking to get the dispersion model running as soon as possible really, so if you could confirm that you agreeable (or not) to our assessment methodology, it would be greatly appreciated.

Kind regards,

Jim.

Attachment to Email 1: Methodology for Assessing Potential Impacts on Local Air Quality Resulting from the Proposed Barry Waterfront Development

1. Introduction

RSK has been commissioned to undertake the air quality impact assessment for the proposed Barry Waterfront mixed-use development (approximate grid reference for the centre of the site: 311700, 167350). The following document briefly outlines RSK's proposed approach to assessing potential air quality impacts associated with the development scheme.

2. Prevailing Air Quality Conditions

The development site falls within the administrative boundary of the Vale of Glamorgan Council (VGC). VGC has not declared any Air Quality Management Areas (AQMAs) at any location, including Barry Town, within their local authority area. It is anticipated, therefore, that local air quality at the proposed development site is currently meeting relevant air quality objectives.

3. Background Air Quality

The nearest automatic monitoring station to the proposed Barry Waterfront development is located at the Highwayman Inn (Fonmon), Rhoose (grid reference: 305910, 167340). This monitoring station, which is classified as a rural site, is located approximately 6 km from the

proposed development site. Table 1 below shows annual average NOX, NO2 and PM10 concentrations as measured at this site in 2008.

The nearest background diffusion tube monitoring sites are located at Gwenog Court, Barry (grid reference: 310500, 168400) and St. Teilo Avenue, Barry (grid reference: 168900, 311500). Both monitoring stations are located approximately 1.5 km from the proposed development site. Table 1 below presents annual average NO2 concentrations as measured at the two background locations in 2008.

Monitoring Site	2008 Annual Average NO_X (ug/m^3)	2008 Annual Average NO_2 (ug/m^3)	2008 Annual Average PM_{10} (ug/m^3)
Highwayman Inn, Rhoose (Fonmon)	17.7	11.4	20.1
Gwenog Court, Barry	No Data	15.5	No Data
St. Teilo Avenue, Barry	No Data	15.0	No Data

Table 1 Measured Annual Average NO_X, NO_2 and PM_{10} Concentrations at Local (Vale of Glamorgan) Monitoring Stations

Note: Data obtained from Air Quality in Wales website (www.welshairqulaity.co.uk)

In addition to local monitoring data, background air quality data available from the UK Air Quality Archive (www.airquality.co.uk) can also be used to establish likely background air quality conditions at the proposed development site. The UK Air Quality Archive website provides estimated annual average background concentrations of NOX, NO2 and PM10 (and other pollutants) on a 1 km2 grid basis.

Table 2 below presents estimated annual average background NOX, NO2 and PM10 concentrations at the proposed development site in 2008 (base year) and 2020 (anticipated opening year of the proposed development).

Measurement Year	Estimated Pollutant Concentrations, µg m^{-3} Derived from the UK Air Quality Archive Website		
	NO_x	NO_2	PM_{10}
2008 (Base year)	16.6	13.2	17.0
2020 (Anticipated opening year of development)	12.0	9.9	16.2

Table 2 Estimated Annual Average NO_X, NO_2 and PM_{10} Concentrations at Proposed Development Site (2008 and 2020)

Note: Data obtained from UK Air Quality Archive (www.airquality.co.uk); reported pollutant concentrations are for grid reference: 311500, 167500; approximate centre of proposed development site: 311700, 167350.

Background air quality data employed in the air quality impact assessment for the base year of 2008 and the future operational year of 2020 will be obtained from a combination of the local air quality monitoring data and estimated background air quality data presented above in Tables 1 and 2.

4. Outline of Assessment Approach

The assessment will address impacts during both construction and operational phases of the proposed development. During construction, the impacts are likely to be temporary and local to the development. The assessment will identify a range of mitigation measures aimed at suitably minimising construction impacts (fugitive dust emissions).

Impacts during the operational phase of the development will be assessed by undertaking a detailed atmospheric dispersion modelling study. An advanced air dispersion model, ADMS-Roads (developed by Cambridge Environmental Research Consultants, Cambridge), will be used to model the dispersion of emissions from vehicles travelling on all key roads identified in the transport study for the proposed development.

This type of assessment requires detailed traffic input data, along with hourly sequential meteorological data. Ground level concentrations of NO_2 and PM_{10}, including background air quality concentrations will be predicted at all identified sensitive receptors.

6. Meteorological Data

Three years (2006 to 2008 inclusive) of hourly sequential meteorological data as measured at the Met Office's St Athan monitoring station, which is approximately 12 km from the proposed development site, will be obtained from UK Met Office and included in the dispersion modelling study.

7. Terrain

Ordnance Survey digital terrain elevation data will be included in the assessment to account for terrain effects.

8. Sensitive Receptors

Sensitive receptor locations (for example, residential properties) will be included in the assessment. These will represent worst-case exposure locations, for example, near traffic junctions.

9. Car parks

ADMS-Roads is capable of incorporating cold-start emissions from the car parks. Major car park(s) associated with the development will be included in the assessment.

10. Traffic Data

The developer has appointed a traffic consultant for the proposed scheme's transport study. The air quality assessment will be based on traffic data provided by the traffic consultant. Queue lengths at junctions will be included in the assessment to account for high pollutant releases from standing vehicles near junctions.

11. Validation of Predicted Air Pollutant Concentrations

Predicted pollutant concentrations, specifically annual average NO2 concentrations, will be validated using data, if available, from a roadside type diffusion tube monitoring site operated by VGC.

The assessment results will be interpreted with reference to national and local legislation, policy and guidance (in particular the Review and Assessment Reports of VGC, National Society for Clean Air (NSCA, now known as Environmental Protection UK) guidance, and the National Air Quality Strategy.

12. Reporting

A standalone air quality impact assessment report/ES chapter will be prepared. The report/chapter will include the methodology followed for the assessment and any assumptions made. The predicted pollutant concentrations will be presented in the form of tables and isopleth plots (pollutant concentration contour maps).

Email 2: Response from the Pollution Team at the Vale of Glamorgan Council dated. 19.06.2009.

From: James, Kristian [mailto:KJames@valeofglamorgan.gov.uk]
Sent: 19 June 2009 13:01
To: James Ferguson-Moore
Cc: Choo Yin, Candido
Subject: RE: Air Quality Assessment - Barry Waterfront Development

Hello Jim

The method is fine. I would however advise you of two relevant planning applications for developments at the locality.

Both if granted will impact upon local AQ

- Biomass plant at Woodham Rd, Barry Application ref 08/01203/FUL (Sunrise Renewals Ltd)
- Biogen at Barry Dock 09/00021/FUL

Both submitted AQ assessments can be derived form Vale of Glamorgan Planning Portal

http://www.valeofglamorgan.gov.uk/system_pages/directory_a_to_z.aspx?catid=9017&id=P

Our overall concern is the impact of traffic to and from the development commuting east into Cardiff via Penarth and Dinas Powys where we are monitoring AQ closely.

I will also ask my AQ officer to review next week and highlight any additional considerations

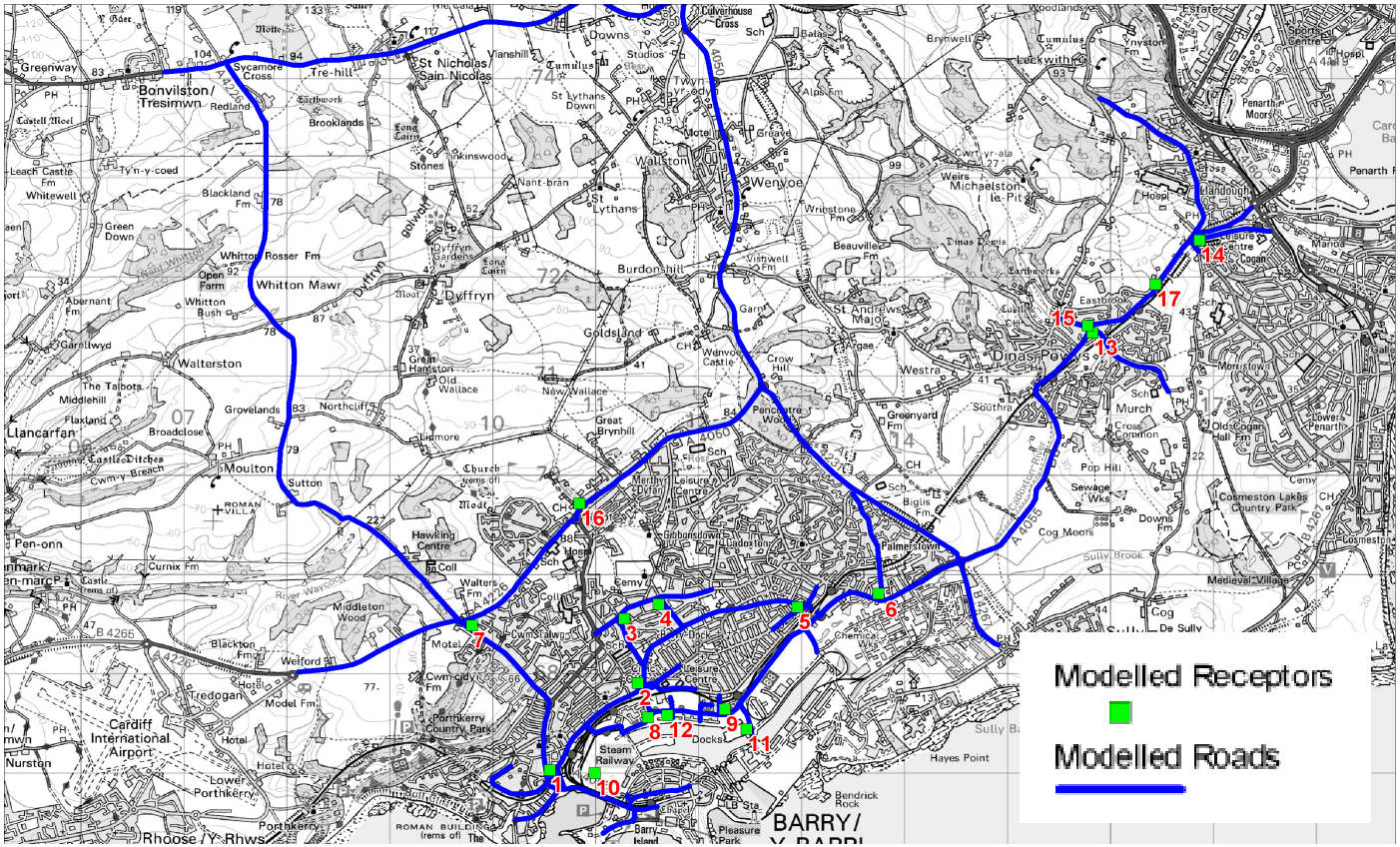
Many thanks

Kristian James

01446 709 761 direct

Appendix K2

Road Network and Sensitive Receptors Assessed for Operational Impacts of the Proposed Barry Waterfront Development



Note: Sensitive receptor locations (marked with green squares and numbered in red) included in the assessment are described in Table K13.