Cyngor Bwrdeisdref Sirol
Blaenau Gwent
County Borough Council

LOCAL AIR QUALITY
REVIEW AND ASSESSMENT

Progress Report 2007

Environment Directorate
Public Protection Division
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Executive Summary

This progress report is the latest in a series of reports relating to air quality and has been compiled and published by Blaenau Gwent County Borough Council. This report contains the latest air quality data for the calendar year of 2006 applicable to the County Borough, and provides current information relating to any new local developments that may have an impact on air quality.

The UK's National Air Quality Strategy sets air quality standards and objectives for seven pollutants which Local Authorities are required to have regard to. These include benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, particulate matter (PM10) and sulphur dioxide.

Local Authorities are obliged to periodically review the air quality within their area to determine the risk of the air quality objectives set out in the national strategy being exceeded. If a Local Authority identify the risk of any of the objectives for each pollutant being exceeded then they must proceed to a Detailed Assessment for that pollutants.

To-date the following reports have been produced by Blaenau Gwent County Borough Council (BGCBC):

- 1999 First Stage Review and Assessment
  Initial screening of sources of air pollution sources within the Borough

- 2003 Updating and Screening Assessment
  Report on air quality within the Borough and consideration of any new sources with potential to impact on air quality

- 2004 Progress Report
  Outlining any significant changes that may affect air quality

- 2005 Progress Report
  Outlining any significant changes that may affect air quality

- 2006 Updating and Screening Assessment
  Review of all local developments, industry, air quality monitoring and traffic data to-date since the last review concluded

The previous reports produced by BGCBC have concluded that none of the objectives for any of the pollutants are likely to be exceeded within the Borough and therefore no Detailed Assessment for any pollutant has been carried out to-date.

This 2007 Progress Report does not identify the requirement for a Detailed Assessment to be carried out for any of the seven pollutants identified in the UK's National Air Quality Strategy.

The next Progress Report is scheduled to be published in April 2008.

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List of Tables & Graphs

Abbreviations & Glossary

AQMA	Air Quality Management Area
AQO	Air Quality Objectives
BGCBC	Blaenau Gwent County Borough Council
CO	Carbon
EIA	Environmental Impact Assessment
mg/m^3	Milligrams per cubic metre of air
$\mu g/m^3$	Micrograms per cubic metre of air
NO_2	Nitrogen Dioxide
PM_{10}	Particulate Matter
‘PPC’ Regulations	Pollution Prevention and Control Regulations 2000
SO_2	Sulphur Dioxide
USA	Updating and Screening Assessment

1.0 Introduction

1.1 The Administrative Area of Blaenau Gwent

The County Borough of Blaenau Gwent is located in south east Wales and was formerly part of the County of Gwent. It is approximately 20 miles south to the city of Newport, 30 miles south west to the City of Cardiff and directly north is the Brecon Beacons National Park.

Blaenau Gwent is the smallest of all the Welsh local authorities, at about 10,900 hectares. In Blaenau Gwent there are three distinctive valleys supporting the five main towns or settlements of Abertillery, Brynmawr, Ebbw Vale, Nantyglo and Blaina, and Tredegar.

The Borough is predominantly urban in character and has witnessed steady population loss over recent years. The most recent figures suggest that there are 68,400 people living in the area (Mid Year Estimate 2005). This compares to 70,064 in 2001, and 72,254 in 1991 (Censuses).

The main trunk route that runs through the County Borough is the A465, Heads of the Valleys road which provides good communication to the Midlands and the North via the M50/M5 and to London via the M4.

Much of the traditional coal and steel industry that historically populated the Borough has been replaced by a diverse industrial base comprising of businesses such as pharmaceuticals, battery and computer systems, electronic and high tech engineering companies. The closure of much of the heavy industry in the area has had an adverse impact on the local economy but conversely it has meant the removal of significant sources of air pollution.

Map 1 provided in Appendix One outlines the administrative area of Blaenau Gwent.

1.2 The Legislative Background to Local Air Quality Management

Part IV of the Environment Act 1995 Act places a statutory duty on each local authority in the UK to periodically to review air quality in its area. The primary objective of the review is to identify areas where air quality is unlikely to meet the Air Quality Objectives (AQO) prescribed for seven key pollutants in the Air Quality (Wales) Regulations 2000 and the Air Quality (Amendment) (Wales) Regulations 2002.

The seven key pollutants that Local Authorities must have regard to include the following:

- Benzene
- 1,3-butadiene
- Carbon monoxide (CO)
- Lead
- Nitrogen dioxide (NO_2)
- Particulate matter (PM_{10})
- Sulphur dioxide (SO_2)

Local Authorities are required to assess risk of exceedance of any of the AQO's in relation to areas where there is relevant public exposure, this is defined as being *'locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present*'. Relevant public exposure does not include occupational exposure.

The areas that have been identified at risk of exceeding any of the AQO's are then required to be designated as an Air Quality Management Area (AQMA) and the Local Authority must then prepare an action plan outlining the measures they intend to use to improve air quality within that area.

When considering each of the seven pollutants the Local Authority must consider not only present pollutant levels, but also future levels. Technical Guidance (LAQM TG (03)) and Policy Guidance (LAQM PG (03)) has been produced by Central Government which Local Authorities must have regard to when undertaking their assessments.

The AQO for each of the seven pollutants can be found in Table 1 below:

Table 1: The Air Quality (Wales) Regulations 2000 for the purpose of local air quality management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31st December 2003
	5 µg/m^3	Running annual mean	31st December 2010
1,3-butadiene	2.25 µg/m^3	Running annual mean	31st December 2003
Carbon Monoxide	10 mg/m^3	Maximum daily running 8-hour mean	31st December 2003
Lead	0.5 µg/m^3	Annual mean	31st December 2004
	0.25 µg/m^3	Annual mean	31st December 2008
Nitrogen Dioxide	200 µg/m^3 not to be exceeded more than 18 times per year	1 hour mean	31st December 2005
	40 µg/m^3	Annual mean	31st December 2005
Particulate Matter (PM_{10}) *	50 µg/m^3 not to be exceeded more than 35 times per year	24 hour mean	31st December 2004
	40 µg/m^3	Annual mean	31st December 2004
Sulphur Dioxide	350 µg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31st December 2004
	125 µg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31st December 2004
	266 µg/m^3 not the be exceeded more than 35 times a year	15 minute mean	31st December 2005

** A provisional AQO for PM_{10} in England and Wales (outside London) has been set at 50 µg/m^3 as a 24 hour mean with the number of exceedances allowed reduced to 7 days to be achieved by 2010, and an annual mean in the same areas of 20 µg/m^3 to be achieved by the end of 2005.*

1.3 The Phased Approach to Review and Assessment in Blaenau Gwent

The Government seeks to ensure that the burdens placed upon Local Authorities with regards to the management of Local Air Quality are fair and reasonable, and so has developed a 'phased approach' to the review and assessment of local air quality. Local Authorities are only required to undertake a level of assessment commensurate with the risk of an air quality objective being exceeded within their area.

Local Authorities are required to take an in-depth look at the air quality within their areas every three years via the production of an Updating and Screening Assessment (USA). Progress Reports are then required each intervening year until the next USA is required.

Where there are risks identified that any of the AQO's may not be met during the review and assessment cycle, then a Detailed Assessment of air quality for the particular pollutant of concern must be carried out. The purpose of a Detailed Assessment is to provide an accurate assessment of the likelihood of an AQO being exceeded at locations with relevant public exposure.

If the Detailed Assessment indicates that the exceedance of the AQO is likely then the Local Authority must declare that area within the Borough as an AQMA.

The process of continuous review and assessment started in Blaenau Gwent with the first report being produced in 1999. This report concluded that the likelihood of the Air Quality Objectives for any of the seven key pollutants being exceeded within the administrative area of Blaenau Gwent was negligible.

In 2003 a further USA was carried out. Using the additional data gathered in the period between the previous report it was established that the likelihood of exceeding the Air Quality Objectives for any of the seven key pollutants was again negligible.

Progress Reports were produced in 2004 and 2005 using the then current monitoring data and information regarding any significant developments or which could have an impact on air quality. Both reports concluded that the likelihood of any of the Air Quality Objectives for the seven pollutants being exceeded were negligible.

In 2006 a further USA was carried out, undertaking a comprehensive review of all local developments, industry, current air quality monitoring and traffic data from the conclusion of the last review. Again the report concluded that the likelihood of exceeding the Air Quality Objectives for any of the seven key pollutants was negligible.

To date it has not been necessary to proceed to a Detailed Assessment for any of the seven pollutants or to declare an Air Quality Management Area within Blaenau Gwent.

All the reports that are produced by BGCBC are submitted to the Welsh Assembly Government for assessment to demonstrate that the Local Authority is fulfilling its statutory obligations with regards to local air quality management.

BGCBC will produce a further Air Quality Progress Report in 2008 and the next USA is scheduled for 2009.

1.4 The Purpose of BGCBC Progress Report 2007

Progress Reports have been introduced into the review and assessment process to provide greater continuity and a longer-term vision to local air quality management. The overall aim of a Progress Report is to report progress on local air quality management within a local authority's area and progress in achieving the Air Quality Objectives.

Progress Reports are also intended to assist the Local Authority by the following:

- To help retain a profile for LAQM within the authority.
- To provide a means of communicating air quality information to members and the public.
- To maximize the usefulness and interpretation of the monitoring effort being carried out by the Local Authority.
- To maximize the value of the investment in monitoring equipment.
- To make the next round of review and assessment easier, as relevant information will be readily available.
- To help respond to requests for up-to-date information on air quality.
- To provide information to assist other policy areas, such as transport and land use planning.
- To provide a ready source of information on air quality for developers carrying out environmental assessments for new schemes.
- To demonstrate progress with implementation of Air Quality Action Plans and/or air quality strategy, rather than delaying until the next full round of review and assessment.

This document represents the third progress report for Blaenau Gwent County Borough Council and covers the calendar year 2006.

The objective of this latest Progress Report is to identify those matters that have changed since the previous USA produced in 2006, which may lead to a risk of any of the AQO being exceeded.

This report has been written in accordance with the guidance set out in LAQM.PRG(03).

The previous air quality reports that have been produced can be viewed on BGCBC website at http://www.blaenau-gwent.gov.uk

1.5 Useful Air Quality Information

Further information regarding the UK's National Air Quality Strategy and supporting documentation can be found at http://www.defra.gov.uk

National air quality monitoring data, forecasts additional air quality information can be obtained at the National Government Air Quality website at http://www.airquality.co.uk/archive/

Information relating to Air Quality in Wales can be accessed at http://www.welshairquality.co.uk/index.php

2.0 New Monitoring Results

2.1 Benzene – Introduction and Objectives

AQO:

Benzene	16.25 µg/m^3	Running annual mean	31st December 2003
	5 µg/m^3	Running annual mean	31st December 2010

Benzene is a Volatile Organic Compound (VOC) that is a minor constituent of petrol. The main sources of benzene in the atmosphere are due to the distribution and combustion of petrol, and petrol refining. Of these, combustion by petrol vehicles is the single biggest source.

2.2 New Monitoring Data for Benzene

The USA 2006 produced by BGCBC reported that background concentrations of Benzene within the Borough are below 0.3µg/m^3 for 2003 and were projected to be below 0.3µg/m^3 for 2010.

The 2006 report concluded for Benzene that there was little risk of any of the AQO's for this pollutant being exceeded within the relevant time periods, therefore no local monitoring for this pollutant has been undertaken by BGCBC to-date.

The nearest continuous monitoring station for Benzene is located in Cardiff Centre. The latest data available from this monitoring site indicates that there were no exceedences of the running annual mean concentrations for Benzene at the monitoring location during 2006.

The running annual mean reported for the Cardiff Centre Monitoring site for 2006 is significantly below the UK AQO at 0.79µg/m^3.

The results above are almost half that reported in BGCBC USA 2006 for the running annual mean of 2003 which was 1.2µg/m^3 at the same site demonstrating that levels for this pollutant are steadily decreasing as expected.

The monitoring information held by the UK National Air Quality Archive indicates that there were no exceedences within Wales during 2006 of the 2003 or 2010 AQO for Benzene.

2.3 1,3 – Butadiene – Introduction and Objectives

AQO:

1,3-butadiene	2.25 µg/m^3	Running annual mean	31st December 2003

The 1, 3 - butadiene in air derives solely from human activity. It is an important industrial chemical being used particularly in the manufacture of synthetic rubber for tyres. Apart from accidental releases from such industrial activities, the 1,3 - butadiene in the ambient air comes mainly from motor vehicle exhausts.

There is little or no preformed 1, 3 - butadiene in diesel or in petrol, either leaded or unleaded; the emissions in the exhaust gases being produced by the combustion process itself. The chemicals in petrol from which the 1,3 - butadiene is derived, higher olefins, have been present in increasing proportion in petrol over the last decade, and it is likely that the amounts of 1,3 - butadiene released into the atmosphere have therefore been rising. However 1,3 - butadiene is removed efficiently by catalytic converters on motorcars and this is likely to counteract any such trend.

2.4 New Monitoring Data for 1,3 – Butadiene

BGCBC USA 2006 reported that there is little risk of the existing Air Quality Objective for 1,3-Butadiene being exceeded.

As a result of the above no monitoring for 1,3-Butadiene has been or is being carried out in the Borough.

1,3-Butadiene is monitored at Cardiff Centre using an automatic Gas Chromatograph based analyser. Monitoring was also being carried at Cwmbran using diffusion tube samplers (this site is no longer actively measuring for this pollutant). Running annual mean concentrations reported in BGCBC USA 2006 for 1,3-Butadiene in 2003 was significantly below the UK Air Quality Objective of 2.25µg/m^3 at 0.15µg/m^3.

The latest data available from the Cardiff Centre monitoring site indicate that the running annual mean concentrations for 1,3 Butadiene have decreased and are again significantly below the UK AQO of 2.25 µg/m^3 at 0.09µg/m^3.

There were no exceedances within Wales during 2006 of the AQO for 1,3 Butadiene.

2.5 Carbon Monoxide – Introduction and Objectives

AQO:

Carbon Monoxide	10 µg/m^3	Maximum daily running 8 hour mean	31st December 2003

Carbon Monoxide is produced by the incomplete combustion of organic substances or those that are essentially just carbon, such as coke. Complete combustion, in the presence of sufficient oxygen, leads to the production of carbon dioxide, whereas, if there is a slight deficiency of oxygen some carbon monoxide is formed. The main combustion processes produce some carbon monoxide depending on the efficiency of the process and the availability of oxygen.

The major source of carbon monoxide is road traffic with the highest concentrations occurring at roadsides on winter days with low wind speeds.

Recently there has been evidence of a decline in vehicle emissions following improved engine design, introduction of catalytic converters and adoption of emissions standards in the MOT test. Any future increase in traffic would of course oppose this trend.

2.6 New Monitoring Data for Carbon Monoxide

BGCBC does not currently monitor for Carbon Monoxide.

Background concentrations for Carbon Monoxide for Blaenau Gwent in 2001 were in the region of 0.2mg/m^3. Using projection tools it was estimated that the background concentration in 2005 will be in the region of 0.14mg/m^3 as identified in BGCBC USA 2006.

Some neighbouring local authorities undertake monitoring for Carbon Monoxide. BGCBC USA 2006 reported that during the period of 2004 at the three closest monitoring sites to Blaenau Gwent namely Cardiff Centre, Cwmbran and Pontypridd, the UK AQO for Carbon Monoxide was not breached.

The latest data available from the Cardiff Centre and Cwmbran monitoring sites, which are still actively monitoring Carbon Monoxide indicate no exceedances of the UK AQO for this pollutant during 2006.

The areas where the data was obtained have significantly higher traffic flows than in Blaenau Gwent so it reasonable to assume that levels within Blaenau Gwent will also still be below the objective level.

There were no exceedances within Wales during 2006 of the UK AQO for Carbon Monoxide.

2.7 Lead – Introduction and Objectives

AQO:

Lead	0.5 µg/m^3	Annual mean	31st December 2004
	0.25 µg/m^3	Annual mean	31st December 2008

Lead occurs in the earth's crust and is released naturally through various processes including weathering of rocks, volcanic activity and uptake and subsequent release from plants.

Lead is also released into the atmosphere through the mining and smelting of ores, the production use, recycling and disposal of lead containing products, the production of non-ferrous metals and the burning of fossil fuels.

The use of tetraethyl-lead was used as a petrol additive to increase the octane rating. The use of leaded petrol was discontinued from January 2000, and it is predicted that ambient levels of lead in air should continue to fall as a result.

2.8 New Monitoring Data for Lead

Blaenau Gwent County Borough Council do not current undertake monitoring for atmospheric lead. There are no other Local Authorities nearby who monitor for lead.

It was reported in BGCBC USA 2006 that the air quality archive provides data that at a lead in petrol site in Cardiff the Annual mean for 2004 was 0.017µg/m^3, well below the AQO for lead for both 2004 and 2008.

The information held by the UK Air National Air Quality Archive indicates that there were no exceedances within Wales during 2006 of the UK AQO for Lead.

2.9 Nitrogen Dioxide – Introduction and Objectives

AQO:

Nitrogen Dioxide	200 µg/m^3 not to be exceeded more than 18 times per year	1 hour mean	31st December 2005
	40 µg/m^3	Annual mean	31st December 2005

Nitrogen Dioxide is a gas produced by the reaction of nitrogen and oxygen in combustion processes. By far the largest amount of Nitrogen Dioxide in the atmosphere is formed as a consequence of combustion of fossil fuels – petrol, oil, coal and gas, especially by motor transport and non-nuclear power stations.

Generally, ground level concentrations of nitrogen dioxide outdoors are influenced more by emissions from motor vehicles than from other sources, such as power stations, which disperse pollutants from tall stacks. Urban traffic Nitrogen Dioxide emissions are estimated to fall by about 20% between 2000 and 2005 and by 46% between 2000 and 2010.

2.10 New Monitoring Data for Nitrogen Dioxide

The Public Protection Division of BGCBC currently undertakes diffusion tube monitoring at 17 sites throughout the County Borough.

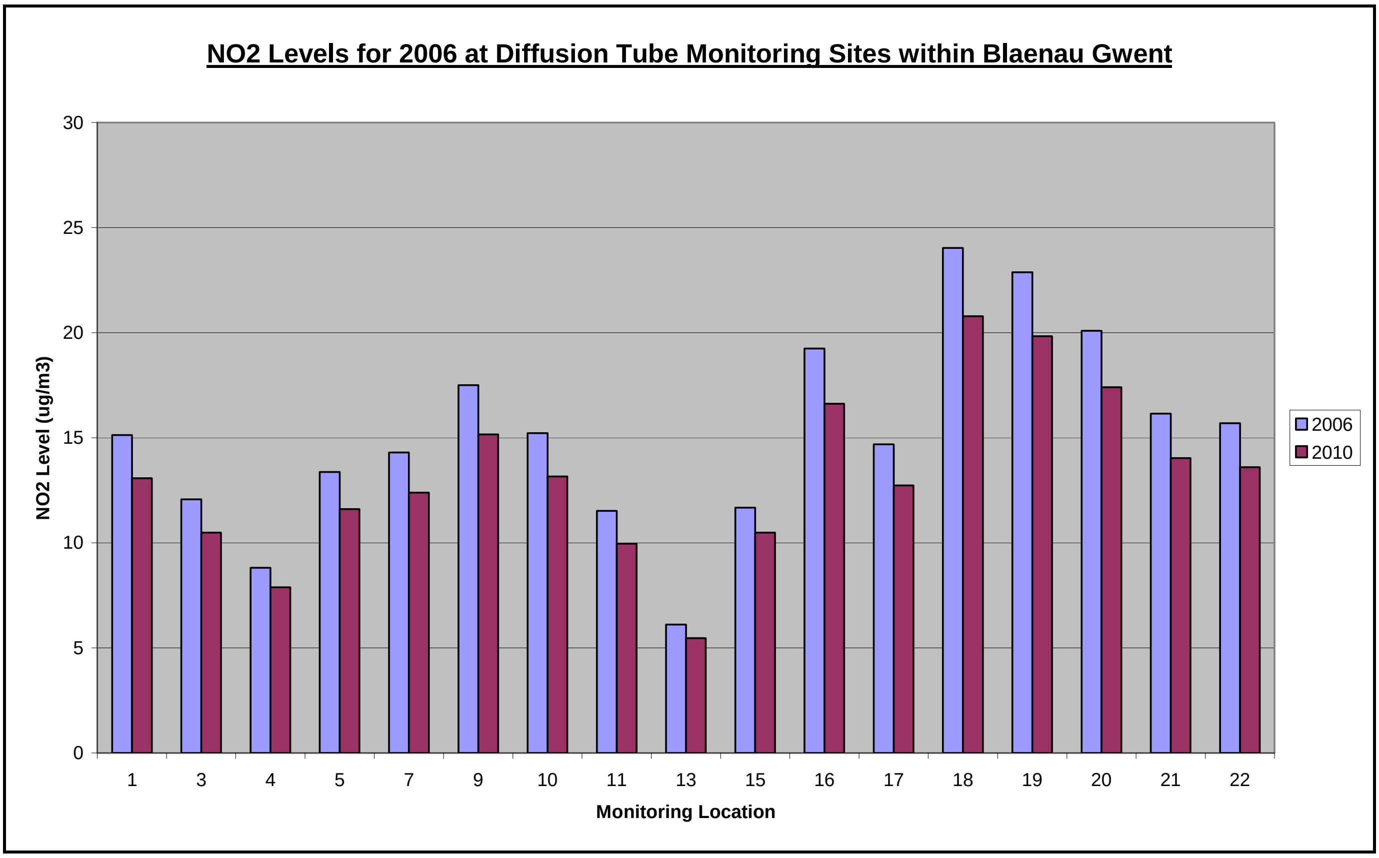
Table 2 below lists all sites currently in operation for 2006 and the current data available

Table 2: NO_2 Levels for 2006 at Diffusion Tube Monitoring Sites within Blaenau Gwent

WAQF Reference	Location	Annual Mean 2006 [µg/m^3] (1 decimal place)	Projected Annual Mean 2010 [µg/m^3] (2 decimal place)
BGBC-01	The Darren, Darenfelin Road, Brynmawr	15.1	13.07
BGBC-03	272 King Street, Brynmawr	12.1	10.48
BGBC-04	Parkhill, Beaufort, Ebbw Vale	8.8	7.88
BGBC-05	Willow Tree Bungalow, Aberbeeg	13.4	11.6
BGBC-07	Aberbeeg Medical Centre, Aberbeeg	14.3	12.38
BGBC-09	Ynys Dawel, Darenfelin Road, Brynmawr	17.5	15.15
BGBC-10	Mill Terrace, Cwm, Ebbw Vale	15.2	13.16
BGBC-11	Cwm Craig, Cwm, Ebbw Vale	11.5	9.96
BGBC-13	Kings Arms Cottages, Trefil, Tredegar	6.1	5.46
BGBC-15	Bush Bach, Nantybwch, Tredegar	11.7	10.48
BGBC-016	Aberbeeg Road, Aberbeeg	19.2	16.62
BGBC-017	Cwmyrdderch Court, Station Terrace, Cwm, Ebbw Vale	14.7	12.73
BGBC- 018	Welfare Hall, Beaufort Hill, Ebbw Vale	24	20.78
BGBC-019	The Rise, Beaufort, Ebbw Vale	22.9	19.83
BGBC-020	Beaufort Road, Tredegar	20.1	17.4
BGBC-021	Bryn Rhosyn, Tredegar	16.2	14.03
BGBC-022	King Street, Brynmawr	15.7	13.59

Figure 1 presents the information provided in Table 2 in a graphical format.

Figure 1:



A plan indicating the approximate location of each current monitoring site is provided in Appendix 2.

This Authority currently uses two laboratories to analyse the data diffusion tubes. This is due to an historical arrangement where the four of the seventeen sites namely, BGBC1,3,4 and 9, were originally part of a national survey and the remainder were locally determined monitoring sites. With the demise of the national survey the same arrangements were maintained for 2006.

The laboratory for the four former national survey sites, Harwell Scientifics, uses the 50% TEA in Acetone method. The recorded bias from this laboratory for 2006 was 0.75.

The laboratory for the remaining sites, Cardiff Scientific Services, also uses the 50& TEA in Acetone method. The laboratory has advised that the bias to be used for the results provided from them for 2006 is 0.85.

The laboratories bias adjustment factors are therefore 0.75 and 0.85 respectively. Therefore, the concentration results they provide both over read, this means that the levels of NO_2 at each monitoring site are being over-estimated and the actual level of the pollutant at the site is slightly lower that the results which have been adjusted for the bias and which are provided in Table 2.

Note: *The data provided for the monitoring sites in Table 2 (Excluding Monitoring sites at BGBC 1, 3, 4 and 9) do not include data for the period of 03/05/06/ through to 27/06/06 inclusive as there was a problem with the analysis at the laboratory. Therefore the annual mean for these sites is based upon 11 months of data which is accepted as being adequate as per the guidance given in LAQM. TG(03).*

It can be seen from the monitoring results provided in Table 1 that the levels for NO_2 at each site are considerably below the UK AQO for this pollutant. The projected 2010 concentrations based on the 2006 monitoring information are also still well below the UK AQO for NO_2.

Using the information reported in BGCBC USA 2006 (rounded to one decimal place) for the monitoring period of 2005 we can compare the annual mean for the years 2006 and 2005.

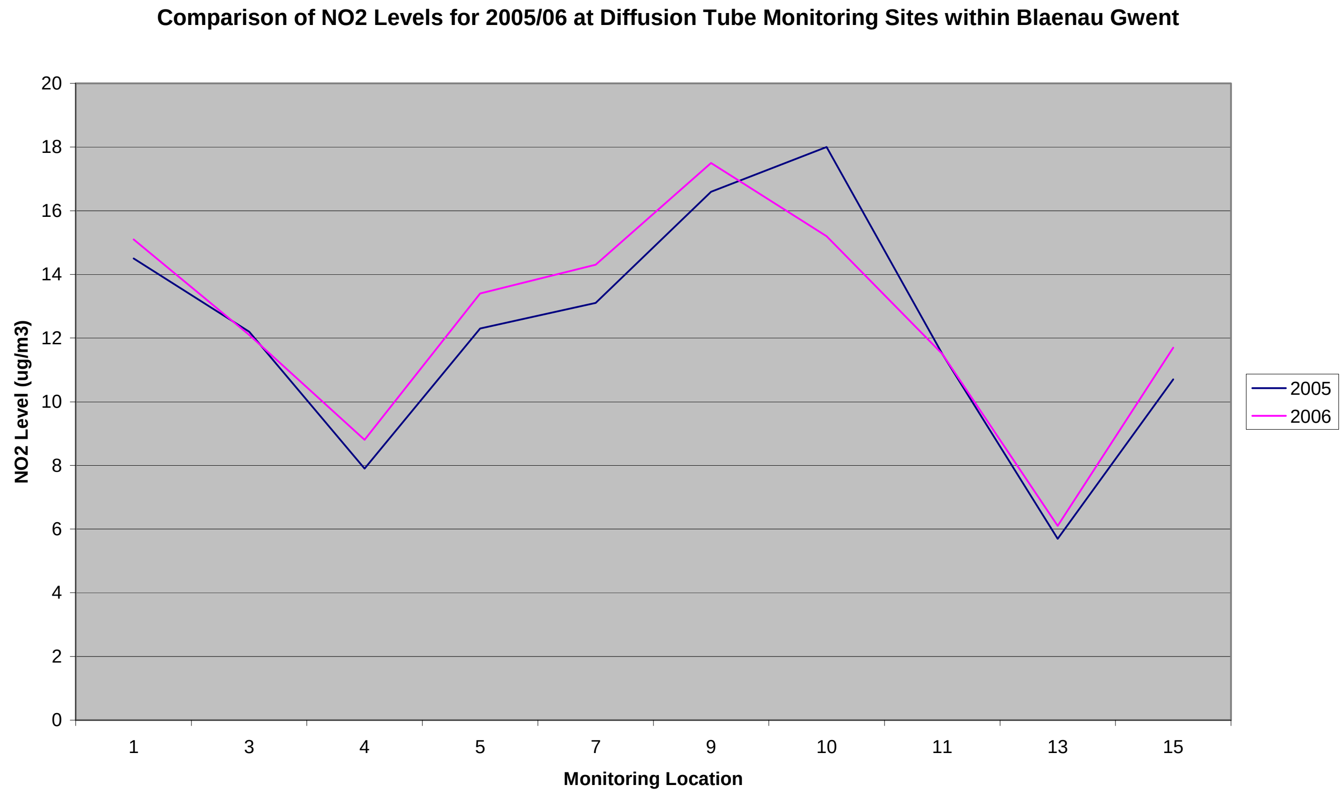
Note: *Seven of the monitoring sites that have been reported for 2006 were not present during 2005. Therefore a comparison has only been made between the sites that were existing during both 2005 and 2006. BGCBC reported in the Progress Report 2005 the details of the monitoring sites which were being discontinued and identified new sites for monitoring to be undertaken.*

Table 3: Comparison of NO_2 Levels for 2005/06 at Diffusion Tube Monitoring Sites within Blaenau Gwent

WAQF Reference	Location	Annual Mean 2005 [$\mu g/m^3$]	Annual Mean 2006 [$\mu g/m^3$]
BGBC-01	Darenfelin Road, Brynmawr	14.5	15.1
BGBC-03	King Street, Brynmawr	12.2	12.1
BGBC-04	Parkhill, Beaufort, Ebbw Vale	7.9	8.8
BGBC-05	Willow Tree Bungalow, Aberbeeg	12.3	13.4
BGBC-07	Aberbeeg Medical Centre, Aberbeeg	13.1	14.3
BGBC-09	Ynys Dawel, Darenfelin Road, Brynmawr	16.6	17.5
BGBC-10	Mill Terrace, Cwm, Ebbw Vale	18	15.2
BGBC-11	Cwm Craig, Cwm, Ebbw Vale	11.5	11.5
BGBC-13	Kings Arms Cottages, Trefil, Tredegar	5.7	6.1
BGBC-15	Bush Bach, Nantybwch, Tredegar	10.7	11.7

Figure 2 overleaf presents the information provided in Table 3 in a graphical format.

Figure 2:



It can be seen from the results reported in Table 3 and illustrated in Figure 3 that there have been no significant increases in NO_2 levels at the monitored locations for 2005/06, and there have been some marginal decreases in the NO_2 levels at some of the monitoring sites.

The National Air Quality Information Archive maps estimate that background concentrations for the whole of Blaenau Gwent are currently between 5 - 10μg/m^3, well below the UK AQO for NO_2.

2.11 PM_{10} – Introduction and Objectives

AQO:

Particulate Matter (PM_{10}) *	50 µg/m^3 not to be exceeded more than 35 times per year	24 hour mean	31st December 2004
	40 µg/m^3	Annual mean	31st December 2004

The ability of a particle to remain suspended in the air depends essentially on size, shape and density. Large heavy particles fall rapidly, while fine light particles remain suspended for longer. The same properties determine where in the human respiratory track a particle can penetrate. In general, spherical particles below 10µm in diameter (PM_{10}) have the greatest likelihood of reaching the furthest parts of the lung air spaces where delicate tissues involved in the essential processes of respiration are to be found.

Particles may arise from a wide variety of sources, either natural or man made. Biological sources are ubiquitous, and particularly in rural areas considerable numbers of pollen grains, fungal spores and their fragments contribute to the total mass of airborne particles. Man-made airborne particles result mostly from combustion processes, from the working of soil and rock, and from many other industrial processes and from the abrasion of road surfaces by motor vehicles.

2.12 New Monitoring Data for PM_{10}

The Review and Assessment carried out in 2003 concluded that it was unlikely that the 2004 Air Quality Objective would be exceeded.

No monitoring for PM_{10} has been or is currently being carried out in Blaenau Gwent.

It was reported in BGCBC USA 2006 that the estimated annual mean background gravimetric PM_{10} concentration for Blaenau Gwent was 15-20µg/m^3. In 2010 it was estimated that this level will drop to 10-15µg/m^3.

Torfaen County Borough Council currently monitor PM_{10} at Cwmbran. BGCBC USA 2006 reported that during 2004 the annual mean for this site was 18µg/m^3. The results at this site for 2006 indicate a slight increase at 19µg/m^3, this is still substantially below the UK AQO annual mean for PM_{10} of 40µg/m^3.

Merthyr Tydfil County Borough Council started monitoring for PM10 in 2005, It was reported in BGCBC USA 2006 that the estimated gravimetric concentration of PM10 for 2005 was 14.8µg/m^3. They have reported in their Progress Report for 2006 that there have been no exceedances of either of the UK AQO's for PM_{10} for the monitoring period of 2006.

Taking into account that this is the best data available and that both neighbouring authorities are similar in location, size and population density it is acceptable to conclude that the PM10 levels in Blaenau Gwent are also within the air quality objective levels.

The information held by the UK Air National Air Quality Archive indicates that there were no exceedances within Wales during 2006 of either of the UK AQO's for PM_{10}.

2.13 Sulphur Dioxide – Introduction and Objectives

AQO:

Sulphur Dioxide	350 µg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31st December 2004
	125 µg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31st December 2004
	266 µg/m^3 not the be exceeded more than 35 times a year	15 minute mean	31st December 2005

From the time of the industrial revolution until the early 1960's the main source of sulphur dioxide emissions in towns and cities was the domestic, commercial and industrial burning of coal. However, this pattern of emissions in the UK has changed significantly since the 1960's. Following the Clean Air Act 1956 and subsequent moves to the increased use of energy sources, such as natural gas and electricity, emissions in towns and cities have fallen significantly.

The generation of electricity by combustion of fossil fuel has now become concentrated mainly in rural areas rather than close to towns and cities.

In contrast to other pollutants, motor vehicles are a relatively unimportant source nationally, being responsible for only about 2% of the total sulphur dioxide emissions. However, the combustion of diesel fuels can make a significant contribution to background levels in urban areas.

2.14 New Monitoring Data for Sulphur Dioxide

The review and assessment carried out in 2003 concluded that the risk of the objectives for sulphur dioxide being exceeded was negligible.

No monitoring for Sulphur Dioxide is currently carried out in Blaenau Gwent.

BGCBC USA 2006 reported that the estimated annual mean background sulphur dioxide (SO_2) concentrations for 2001 were obtained from the Air Quality Archive. The results at that time estimated the annual mean background SO_2 concentration to fall to below 6 $\mu g/m^3$. It was then reported that based on this information the level was be assumed to fall to below 4.5 $\mu g/m^3$ by the end of 2004 and 2005 using the assumption (75% of 2001 values) using the methodology detailed in the DEFRA guidance.

The information held by the UK Air National Air Quality Archive indicates that there were no exceedances within Wales during 2006 of any of the UK AQO's for SO_2.

2.15 Other Air Quality Data

Blaenau Gwent County Borough Council ceased radiation monitoring in July 2004.

No monitoring is carried out within the Borough by BGCBC for any other air pollutants other than those already mentioned in the previous sections of this report.

2.16 Future Monitoring Plans

Envirowales Ltd is a lead acid battery recycling plant sited at the Rassau Industrial Estate in Ebbw Vale which was given planning permission on 21st June 2005. Further information regarding this development is given in the section of this Progress Report relating to New Developments.

It was reported in error in BGCBC USA 2006 (Pg 12) that as part of their permit to operate issued by the Environment Agency under the Pollution Prevention (England and Wales) Regulations 2000 (as amended) Envirowales Ltd were required to set-up a lead monitoring station at a nearby sensitive receptor to their site, namely Garnlydan Primary School.

Remote (i.e. off-site) monitoring at Garnlydan School is not a requirement of their Permit issued by the Environment Agency under the above mentioned Regulations.

However, formal agreement was secured under Section 106 of the Town and Country Planning Act 1990 with Envirowales Ltd during the planning process for remote monitoring of ambient levels of lead and meteorological data at a site to be determined in agreement with the Local Authority.

Discussions are ongoing with the company regarding the exact requirements of the Section 106 agreement and it is hoped that monitoring will commence shortly.

Further information is provided in relation to Envirowales Ltd in Section 3.2 of this report.

3.0 New Local Developments

3.1 New Industrial Sources

A list of the current Part A1, A2 and B Processes within the Borough regulated under the Pollution Prevention (England and Wales) Regulations 2000 (as amended) is provided in Appendix 3.

There have been no significant changes to any of the existing Part A1, A2 and B processes since the USA 2006 that would be likely to have a significant impact on air quality.

One new Low Impact Part A1 installation was permitted by the Environment Agency on the 21st June 2006, and is known as Tredegar Biodiesel, Bio Tech Oils UK Ltd, located at Tarfarnaubach Industrial Estate, Tredegar.

The installation produces up to 200 tonnes per week of Biodiesel. Used vegetable oil is converted into Fatty Acid Methyl Esters (FAME, aka Biodiesel) by transesterification with a methanol and sodium hydroxide mixture. In addition to the Biodiesel crude glycerine is also produced and sold.

As part of the permitting process the Local Authority was consulted and advised by the Environment Agency on the proposed installation and potential air quality impacts prior to issue of the permit. In light of the nature of the activities at the site and the information provided it has been determined that there is unlikely to be any significant impact on air quality in the Borough in relation to any of the key pollutants identified by the UK National Air Quality Strategy.

One new Part B process was permitted by BGCBC on 18th December 2006, namely Geith International UK Ltd at Crown Business Park, Tredegar. The installation carries out the preparation and coating of metal excavator buckets using a solvent based coating. Having reviewed the application information and relevant Process Guidance Notes issued by DEFRA, the emissions from the activities at the site are not considered significant in terms of the UK AQO's.

As this is a relatively new process the operator has not yet carried out any monitoring at the site, but this is a requirement of the Permit and is due to be carried out shortly. The information that will be provided by the operator in relation to monitoring will be used to reaffirm the conclusion that the process is insignificant in terms of local air quality and the UK AQO's.

One new Part B process has been identified by BGCBC since the USA 2006. The process involves adhesive coating and has been operating for sometime, but it is only recently that the process falls within the scope of the Pollution Prevention (England and Wales) Regulations 2000 (as amended) due to an increase in production, and therefore an increase in the amount of solvent they are using per annum.

Preliminary discussions have taken place between the Operator and BGCBC, and an application for the appropriate permit is due to be submitted shortly. There is insufficient information at this time to assess the likely impacts on local air quality, therefore the process will be considered during the next round of review and assessment.

3.2 Up-date on significant New Industrial Sources reported in USA 2006

BGCBC reported in the USA 2006 that on the 21st June 2005 a new lead acid battery recycling plant was given planning permission at the Rassau Industrial Estate in Ebbw Vale on a former Greenfield site. The plant was to be located on the same industrial state as a long established process, which also has the potential to emit significant quantities of lead, namely Yuasa Battery (UK) Ltd.

As part of the planning process the company, Envirowales Ltd, submitted to BGCBC an Environmental Impact Assessment (EIA). The EIA provided a report of the potential impact of the proposed development on local air quality also having regard to existing processes in the area.

The results of the EIA were scrutinised and accepted by BGCBC and an independent consultant, namely Dr Tim Chatterton, of the University of the West of England.

The EIA identified that the main pollutant of concern in terms of air quality was lead, and as a result the report also provided details of a modelling exercise which was carried out to predict ambient lead levels at the nearest locations where there may be relevant public exposure (as defined by the UK National Air Quality Strategy).

The relevant sections of the EIA (including the results of the modelling exercise and details of the input data used) are provided in Appendix 4.

It can be seen from the information provided in Appendix 4 that the report concludes that the impact of the process upon air quality is negligible and the resulting levels of lead at the nearest locations of relevant public exposure will not result in an exceedance of the UK AQO's for lead for 2004 and 2008.

The Envirowales Ltd installation at Rassau Industrial Estate is not yet fully operational and a significant proportion is still undergoing development. On-site monitoring of ambient levels of lead are a requirement of the installations Permit issued by the Environment Agency, current details of which are expected to be provided to the Local Authority shortly.

As previously mentioned in Section 2.16 discussions are ongoing with the company regarding off-site monitoring of ambient lead levels to further support the modelling data provided in Appendix 4.

3.3 New Local Developments

There have been no new local developments that may have a significant impact on air quality since the information reported in BGCBC USA 2006.

4.0 Planning and Policies

4.1 Planning Consultation Policy

Each week a list of new planning applications that are received by the Planning Division is provided to the Team Leader of Pollution Control & General Services. The Pollution Control & General Services Team will examine any applications that have the potential to impact of local air quality in further detail.

Consultation with the Planning Applicant and the Planning Division will take place for any developments that are identified as having the potential to have a significant impact on air quality. The applicant may then be required to submit an Environmental Impact Assessment or an air quality assessment as necessary prior to any planning permission being granted.

4.2 New Planning Applications

Each planning application is judged on its merits and due regard is given to the Planning Policy Wales document regarding Air Quality published by the Welsh Assembly Government, and other relevant guidance.

During 2006 there were no planning applications received that had the potential to have a significant impact on air quality.

5.0 Local Transport Planning

5.1 Local Transport Plan

Local Authorities are no longer required to develop and produce Local Transport Plans, they are now required to work with neighbouring Authorities to produce Regional Transport Plans in order to promote efficient and effective services.

The first Regional Transport Plan which will include Blaenau Gwent is being developed with publication scheduled for March 2009. This document will be a five year plan considering both local and regional transport networks.

Part of the process of the development of the Regional Transport Plan requires the production of a Strategic Environmental Assessment (SEA) which will give consideration to air quality issues.

The Pollution Control and General Services Team will liaise closely with Technical Services (which incorporates Highways) to offer assistance and input into the SEA.

5.2 Local Transport Developments

The A465 Heads of the Valley Road - Dualling Scheme reported upon in the USA 2006 is ongoing, this is currently the only ongoing development which has been identified as having the potential to affect the air quality within the Borough.

Monitoring for Nitrogen Dioxide is ongoing in the areas where there may be relevant public exposure as outlined in Section 2.10 of this report, and as reported upon in the USA 2006 and Progress Report 2005 also produced by BGCBC.

As the various sections of the dualling scheme are completed the location of the monitoring sites and the need for relocation or introduction of new sites will be continuously assessed using information provided by ongoing consultation between the Pollution Control and General Services Team and Highways Division.

There are no other significant transport related developments ongoing or proposed within the Borough at this time.

6.0 Conclusions

6.1 Conclusions of Progress Report 2007

Having considered the current information available regarding new monitoring data and new developments within the Borough of Blaenau Gwent it can be determined that it is unlikely that any of the UK AQO's for the seven key pollutants will be exceeded.

6.2 Future considerations

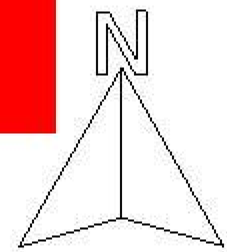
It is proposed that the following matters be given further consideration in preparation for the next round of review and assessment scheduled for 2008:

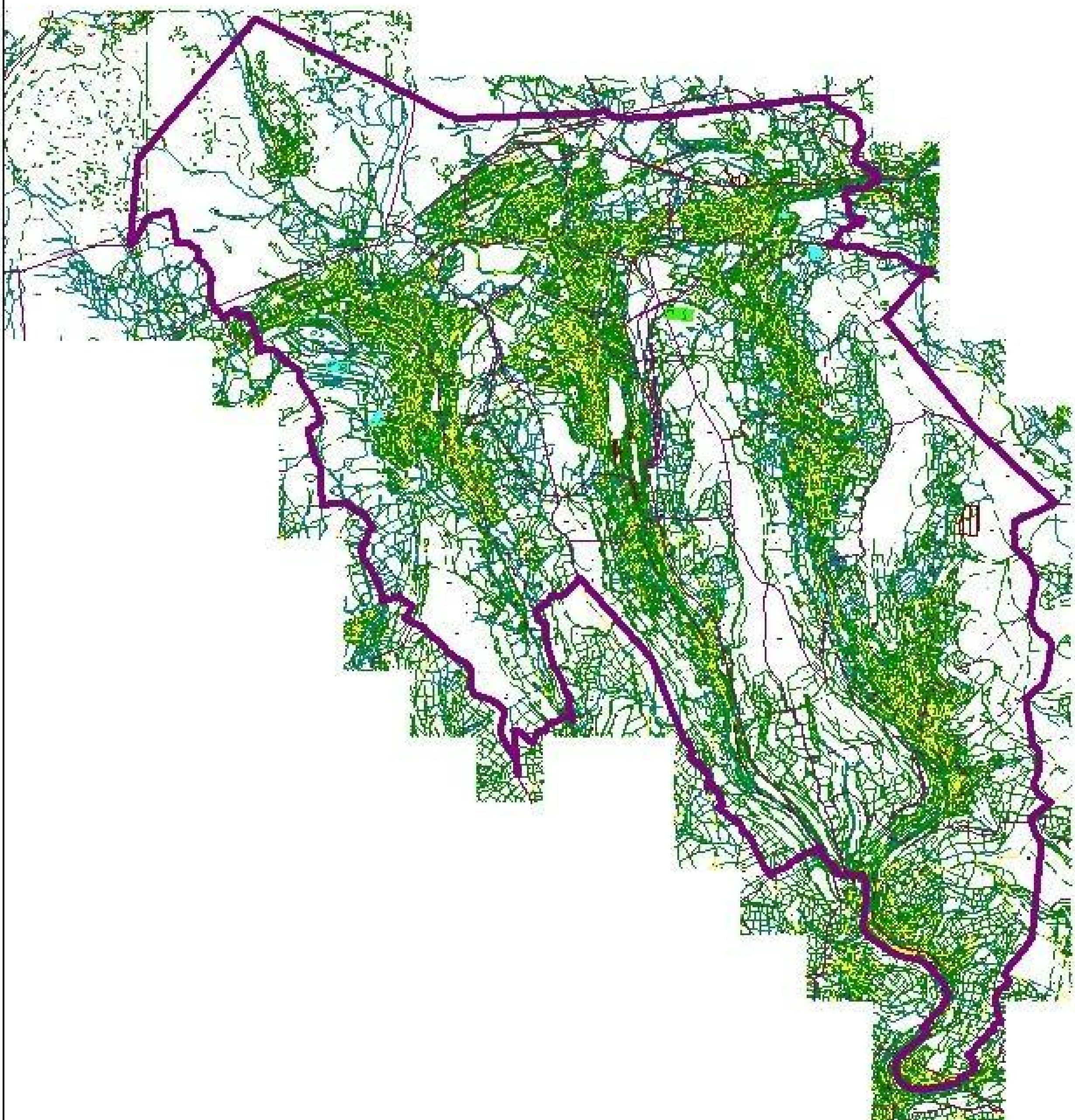
- Potential impact of the new Part B process identified (as outlined in Section 3.1 of this report)

- Continue discussions with operator of Envirowales to secure off-site monitoring of ambient lead levels

Appendix 1

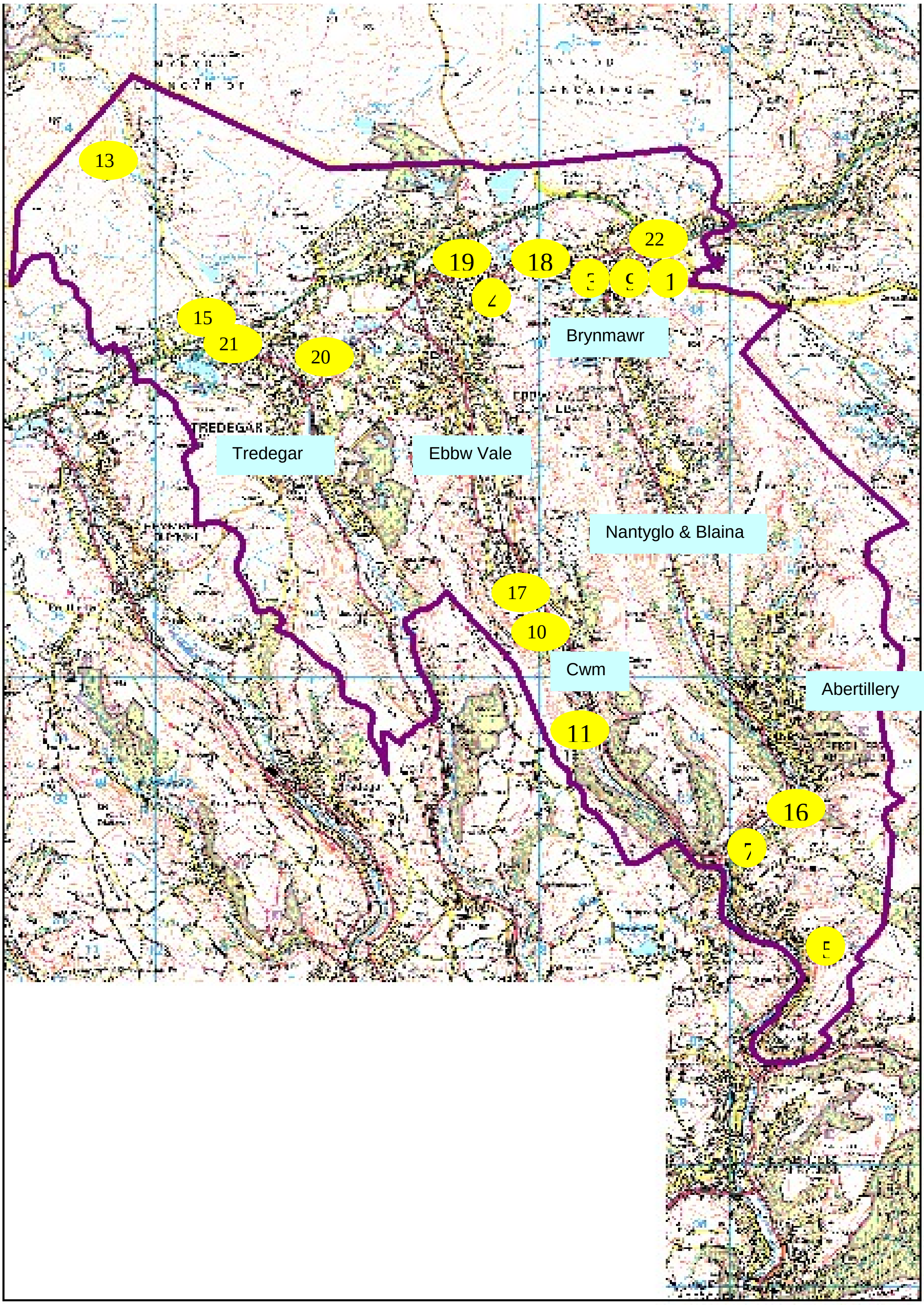
Administrative Area of Blaenau Gwent





Appendix 2

Location of NO_2 Monitoring Sites within Blaenau Gwent



Appendix 3

List of Part A1, A2 and B installations.

Part A1 Installations:

Company Name	Address of Installation	Activity Permitted
Silent Valley Landfill Site	Silent Valley Waste Services, Beechwood House, Cwm, Ebbw Vale, NP23 6PZ	Landfill Site
Continental Tea Leaves (UK) Limited	Waun Y Pound Industrial Est., Ebbw Vale, NP23 6PL	Surface Treatment of Metals
Yuasa Battery UK Ltd	Unit 22 Rassau Industrial Estate, Ebbw Vale, NP23 5SD	Melting of Non-Ferrous Metals
Envirowales Ltd	Rassau Industrial Estate, Ebbw Vale, NP23 5SD	Melting of Non-Ferrous Metals
High Chemicals	Tarfarnaubach Industrial Estate, Tredegar. NP22 3AA	Production of Ferric Chloride
Tredegar Biodiesel BioTech Oils Uk Ltd	Tarfarnaubach Industrial Estate, Tredegar, NP22 3AA	Production of bio-diesel

Part A2 Installations:

Company Name	Address of Installation	Activity Permitted
GTS Flexible Materials Ltd	Unit 41, Rassau Industrial Estate, Ebbw Vale, Blaenau Gwent. NP23 5SD	Film Coating
Corus Colours Consumer Products	Tarfarnaubach, Tarfarnaubach Industrial Estate, Tredegar. NP22 3AA.	Coil Coating

Part B Installations:

Company Name	**Address of Installation**	**Activity Permitted**
Tarmac Topmix Limited	Trefil Quarry, Trefil, Tredegar, NP22 4HF	Cement Batching
Hanson Premix Limited	Waun-y-Poud Industrial Estate, Ebbw Vale, NP23 6PL	Cement Batching
Thomas Waste Management	Hafod Garage Transfer Station, Old Abergavenny Road, Brynmawr, NP23 4BU	Mobile Crushing and Screening
Cardinal Packaging Limited	Unit 29 Rassau Industrial Estate, Ebbw Vale, NP23 5SD	Printing of Flexible Packaging
Blackwood Engineering Works Limited	Glandwr Industrial Estate, Aberbeeg, Abertillery, NP13 2LN	Coating of Metal Counterweights
Yamada Europe Limited	Festival Drive, Ebbw Vale, NP23 6XS	Casting of Aluminium
Cotech Senitising Ltd	Units 13-16 Tarfarnaubach Industrial Estate, Tredegar. NP22 3AA.	Film Coating
Gryphonn Quarries Ltd	Trefil Quarry, Trefil, Tredegar. NP12 4HG.	Mobile Crushing and Screening
Tandus Europe Ltd	Units 8 & 9, Rising Sun Industrial Estate, Blaina, NP13 3JW	Tar and Bitumen process
Lafarge Roofing Limited	Unit 15, Rassau Industrial Estate, Ebbw Vale, NP23 5SD	Fibre and Reinforced Plastics
Sogefi Filtration Ltd	Crown Business park, Tredegar, Blaenau Gwent, NP22 4EF.	Di-isocynate Process
Geith International UK	Crown Business Park, Tredegar, Gwent. NP22 4EE.	Coating of Metal
Chapel Road Garage	Blaina Road, Nantyglo, NP23 4PT	Unloading of Petrol at Filling Station
Central Garage,	Abertillery Road, Blaina, NP13 3DN	Unloading of Petrol at Filling Station
Festival Service Station	By-pass Road, Ebbw Vale, NP23 8UW	Unloading of Petrol at Filling Station

Part B Installations (Continued):

Company Name	Address of Installation	Activity Permitted
Nantybwch Service Station	Nantybwch, Tredegar, NP22 3SB	Unloading of Petrol at Filling Station
Central Depot Filling Station – BGCBC	Barleyfield Industrial Estate, Brynmawr.	Unloading of Petrol at Filling Station
Hilltop Garage	King Street, Brynmawr. NP23 4JD.	Unloading of Petrol at Filling Station
Tesco Service Station	Castle Street, Abertillery, NP13 1UR	Unloading of Petrol at Filling Station
Tesco Service Station	North Western Approach, Ebbw Vale, NP23 6TS	Unloading of Petrol at Filling Station
Park Road Garage	Bypass Road, Ebbw Vale, NP23 8UP	Unloading of Petrol at Filling Station
Roundabout Services, Sirhowy Bridge	Dukestown Road, Tredegar, NP22 4XL	Unloading of Petrol at Filling Station
Morrisons Service Station	Bryn Serth Road, Beaufort, Ebbw Vale, NP23 5YD	Unloading of Petrol at Filling Station

Appendix 4

14. AIR QUALITY

14.1 Introduction

14.1.1 This chapter summarises the findings of the atmospheric dispersion modelling assessment carried out for the proposed lead acid battery recycling plant (Envirowales Ltd) and cumulative impact assessment for lead emissions from the proposed plant in combination with the existing nearby lead acid production factory (Yuasa Battery (UK) Limited). The dispersion modelling, undertaken by Environmental Visage Ltd (Envisage), addressed the known emissions from the production factory and the predicted emissions for the proposed recycling plant planned for the Rassau Industrial Estate in Ebbw Vale.

14.1.2 The assessments sought to consider the proposed recycling plant, both in terms of EIA and the requirements of the Pollution Prevention and Control (PPC) Regulations 2000, as amended. PPC requires that emissions to all media, including the atmosphere, are prevented, reduced or minimised utilising the best available techniques for their control. This requirement will be incorporated in the PPC Permit to operate the installation.

14.1.3 The broad approach adopted was firstly to establish the baseline air quality situation, identify any locations that might be sensitive to emissions from the processes, and to identify the key pollutants associated with the processes during various activities, including the construction and operational phases. For operational activities, actual emissions data has been used for the Yuasa Battery factory and assumed worst case emissions data have been used for the proposed Envirowales Ltd plant. Emissions from the processes have then been assessed in the context of the existing air quality and the relevant standards and guidelines set to provide protection for susceptible members of the population and the environment.

The Proposed Development

14.1.4 Yuasa Battery manufacture lead acid batteries and activities at the site include, among others, lead melting and lead oxide production. As a result, the site has a number of permitted lead emission discharge points to atmosphere, serving process and local exhaust ventilation systems and these are fitted with abatement systems, to reduce the concentration of emissions from the site.

14.1.5 The processes to be undertaken at the proposed Envirowales Ltd plant include battery storage and breaking, and the smelting, casting and refining of the waste lead from the batteries.

14.1.6 The activities identified in paragraph 14.1.5 will result in the emission of pollutants such as particulates, lead and combustion gases. Thus the air quality assessment sought to model the likely dispersion of these emissions and their potential contribution to ground level concentrations. A cumulative impact assessment of lead emissions from both sites is also undertaken. This Chapter sets these findings in the context of baseline conditions in order to assess the likely impacts to the environment.

14.1.7 Specifically, this Chapter considers those pollutants with objectives set or proposed under the UK Air Quality Strategy and Addendum: lead, nitrogen dioxide, particulates, benzene and carbon monoxide.

Legislation and Policy Guidance

14.1.8 The UK Air Quality Strategy (AQS) [1] was published in January 2000 and describes the Government's strategy for improving air quality in the UK. One of the key aspects of the strategy was the setting of air quality objectives for 8 pollutants, namely: benzene, 1,3-butadiene, ozone, carbon monoxide, lead, nitrogen dioxide, particulates and sulphur dioxide. The Government has more recently announced tighter objectives for particulates, benzene and carbon monoxide and a new objective for polycyclic aromatic hydrocarbons in an Addendum to the Air Quality Strategy [2], published in February 2003. The new objectives for particulates are provisional at this stage.

14.1.9 The AQS objectives are summarised in Table 14.1.

14.1.10 Seven of the human health objectives published in the Strategy document have been implemented in Law through the Air Quality (Wales) Regulations, which came into force in August 2000 [3]. An amendment was published in 2002 [4].

14.1.11 It is expected that air quality in the UK will be assessed and controlled under the AQS for the foreseeable future. For this reason it is appropriate to use the objective levels specified under the Strategy for the purposes of an air quality assessment of this type.

14.1.12 Under the AQS, local authorities have a duty to review and assess local air quality to determine whether national objectives will be met. The Review & Assessment (R&A) process requires local authorities to undertake a phased assessment to identify any areas likely to experience exceedences of the air quality objectives. Any location likely to exceed the objectives must be declared an Air Quality Management Area (AQMA) and an action plan must be prepared and implemented, with the aim of achieving the objectives in the designated area.

14.1.13 Policy Guidance LAQM. PG(03) [5], issued under Part IV of the Environmental Act 1995, Local Air Quality Management, is designed to help local authorities with their local air quality management duties. The guidance requires that local authorities integrate air quality considerations into the planning process at the earliest possible stage. As a result, the land use planning system is integral to improving air quality.

14.1.14 Local Planning Authorities (LPAs), transport authorities and pollution control authorities should explore the possibility of securing mitigation measures that would allow the proposal to proceed. Road transport is recognised as a significant contributor to poor local air quality, particularly in urban areas. LPAs can limit this source by ensuring that developments encourage more sustainable travel choices. All applications should be supported by such information as is necessary to allow a full consideration of the impact of the proposal on the air quality of the area.

14.1.15 When considering planning applications, which may raise issues concerning ambient air quality, planning authorities should bear in mind the following:

- Where AQMAs cover regeneration areas developers should provide an air quality assessment as part of their application for planning;
- Air quality within AQMAs is subject to local variation e.g. increases are likely along heavily trafficked roads. Air quality assessment at the proposed development site can clarify its position within the AQMA and where possible may result in less onerous mitigation than the AQMA average might otherwise suggest;
- Where developments include housing, hospitals, schools, nurseries or elderly persons homes within or close to an AQMA the LPA needs to consider the location of opening windows and doors in relation to the local exposure source;
- Emissions from point sources may be more easily controlled and mitigated than an increase in diffuse pollution from vehicles associated with the new development. However, changing travel patterns may alter overall emissions;
- Any air quality assessment for a particular development should as far possible take account of congestion predictions, particularly at exits and entrances; and
- Air quality deterioration may be cumulative therefore LPAs will need to consider the effects of multiple developments, and effects of additional load from further development proposals.

14.1.16 Following discussion with Blaenau Gwent County Borough Council (BGCBC), it is understood that the Council has carried out Stage 1 of the R&A process. Following the findings of the R&A process, BGCBC did not declare any AQMAs in the Borough.

TABLE 14.1: SUMMARY OF AIR QUALITY OBJECTIVES

POLLUTANT	OBJECTIVE	MEASURED AS	TO BE ACHIEVED BY
Benzene	16.25 µg.m^{-3} (5 ppb)	Running Annual Mean	31 December 2003
	5 µg.m^{-3} (3.25 ppb)	Annual mean	31 December 2010
1,3-Butadiene	2.25 µg.m^{-3} (1 ppb)	Running Annual Mean	31 December 2003
Carbon monoxide	10 mg.m^{-3} (8.6 ppm)	Running 8 Hour Mean	31 December 2003
Lead	0.5 µg.m^{-3}	Annual Mean	31 December 2004
	0.25 µg.m^{-3}	Annual Mean	31 December 2008
Nitrogen dioxide (NO_2)	200 µg.m^{-3} (105 ppb) Not to be exceeded more than 18 times per year	1 Hour Mean	31 December 2005
	40 µg.m^{-3} (21 ppb)	Annual Mean	31 December 2005
Nitrogen Oxides	30 µg.m^{-3} (16 ppb)[1]	Annual Mean	31 December 2000
Ozone	100 µg.m^{-3} Daily maximum of running 8 hr mean not to be exceeded more than 10 times per year	Running 8 hour Mean	31 December 2005
Particles (PM_{10})	50 µg.m^{-3} Not to be exceeded more than 35 times per year	24 Hour Mean	31 December 2004
	40 µg.m^{-3}	Annual Mean	31 December 2004
	50 µg.m^{-3} Not to be exceeded more than 7 times per year	24 Hour Mean	31 December 2010
	20 µg.m^{-3}	Annual mean	31 December 2010
PAH	0.25 ng.m^{-3}	Annual mean	31 December 2010
Sulphur dioxide	266 µg.m^{-3} (100 ppb) Not to be exceeded more than 35 times per year	15 Minute Mean	31 December 2005
	350 µg.m^{-3} (132 ppb) Not to be exceeded more than 24 times per year	1 Hour Mean	31 December 2004
	125 µg.m^{-3} (47 ppb) Not to be exceeded more than 3 times per year	24 Hour Mean	31 December 2004
	20 µg.m^{-3} (8 ppb)	Annual Mean	31 December 2000
	20 µg.m^{-3} (8 ppb)	Winter Mean (01 October - 31 March)	31 December 2000

V - Vegetation Objective, which is not applied in this assessment.

[1] Vegetation Objective, which is not applied in this assessment.

Methodology

14.1.17 The air quality assessment has been carried out following consultation with the Environmental Health Department of Blaenau Gwent County Borough Council (BGCBC). The approach has involved the following key elements:

- Consultation with BGCBC and consideration of local AQMAs;
- Assessment of existing local air quality conditions through a review of available air quality monitoring data for the area;
- Qualitative assessment of the effect of the construction phase in terms of local air quality;
- Qualitative assessment of the effect of predicted vehicle flows for the operational phase of the proposed recycling plant in terms of local air quality;
- Quantitative assessment of the impact on local air quality from the proposed recycling plant for emissions of NO_2, PM_{10}, CO and benzene;
- Quantitative assessment of the cumulative impact on local air quality from the proposed recycling plant and existing production factory, in terms of lead emissions; and
- Qualitative consideration of the impact on regional air quality.

14.1.18 The following sources of information were assessed:

- Atmospheric dispersion modelling assessments for Envirowales Ltd and Yuasa sites;
- Details of emissions and release points supplied by Envirowales Ltd;
- St. Athan meteorological station data;
- Sennybridge meteorological station data;
- Discussions held with the Met Office;
- Landform Panorama tiles SO00 and SO20;
- Information provided through consultation with BGCBC; and
- National Air Quality Information Archive (NAQIA).

14.1.19 Reports on the atmospheric dispersion modelling assessments undertaken by Envisage are provided in Appendix 14.2 and Appendix 14.3.

14.1.20 The air quality of the surrounding area can be classified generally as very good. The site is located in a part industrial and part rural setting, with some residential properties in proximity to the site.

14.1.21 Version 3.2 the UK Atmospheric Dispersion Modelling System (ADMS) [6] was used to determine the contribution of emissions from the proposed Envirowales Ltd plant and existing Yuasa Battery factory to ground level concentrations of pollutants, taking into consideration the latest three years of meteorological (met.) data representative of the area. The ADMS model is one of a number of new generation atmospheric dispersion models that are available in the UK and is widely accepted for the assessment of impacts from a range of emissions sources associated with an industrial installation.

14.1.22 The assessment has been carried out by calculating the contribution of industrial emissions to air pollution. This has been combined with background pollution concentrations and compared to relevant air quality criteria. It has been assumed that the annual contribution will remain static from both the existing Yuasa factory and proposed Envirowales Ltd plant (when operational).

14.1.23 Background concentrations of NO_2, PM_{10}, benzene and CO have been calculated for 2004, 2006, 2008 and 2010 (where relevant) using National Air Quality Information Archive (NAQIA) data, NETCEN predictions and year adjustment factors provided by the Department for Environment Food and Rural Affairs (DEFRA) [7].

14.1.24 Levels for background lead concentrations were taken from monitoring data for Cardiff, which are likely to be somewhat higher than those that would be expected at the subject site and can be considered to represent the worst case. Specifically, a static background concentration of lead equal to the monitored results for 2003 has been assumed across the study area, since no adjustment factors have been provided by DEFRA for lead. This approach over estimates the 2006 and 2008 background concentrations due to a likely intervening fall in levels, albeit of a very small order.

14.1.25 Future concentrations were then predicted for each receptor for 2006 (first operational year), 2008 (proposed lead AQS objective year) and 2010 (proposed PM_{10} and benzene AQS objective year), with and without the proposed development.

14.1.26 Details of the release points at the proposed plant to be considered were supplied by Envirowales Ltd. The location of proposed emission points were taken from the current plans of the site, and information on the estimated emissions from each point has been included. Estimated emissions from the process stacks (A1 – A4) were supplied by

Envirowales Ltd. Estimated emissions from the combustion stacks (C1-C5) were calculated from the given fuel throughput of the burners.

14.1.27 Details of wind speed, direction, stability conditions and mixing height were collated and applied to the ADMS model.

14.1.28 Building downwash problems can occur where emissions are caught in the turbulent wake of wind blowing around a building. Therefore details of all of the buildings at the proposed Envirowales Ltd plant were included within the model. Each of the buildings proposed for the site was included, and their shapes were simplified for incorporation into the model.

Meteorological Data

14.1.29 Meteorological data for the area local to the site is limited. Data from the Cardiff Rhoose met. station was not considered to be representative of conditions within the area, and thus a combination set of data has been applied within the model. The three years worth of met. data used are a combination of data from the St. Athan met. station, which is the nearest station to the site able to supply data suitable for incorporation into the ADMS model, and wind speed and direction data from Sennybridge, which is approximately 30 km to the north-northwest of the site.

Significance Criteria

14.1.30 The criteria and terminology presented in Table 14.2 have been developed by RPS, in the absence of any formal guidance, to ensure consistency in the way local air quality impacts are described. The significance of an impact cannot be unambiguously defined as a fixed percentage of the AQS objective, as it is dependent on both the change in pollutant concentration and the sensitivity of a receptor with regards to the existing concentration of a pollutant. The following criteria are based on guidance given by the DMRB Screening Method [8] and the Association of London Government [9], but have been expanded to take into account the sensitivity of the receptors.

TABLE 14.2: SIGNIFICANCE OF AN IMPACT ON AIR QUALITY AS A PERCENTAGE OF THE AQS OBJECTIVE.

Significance of Impact	Classification of Receptor		
	Low sensitivity Existing conc. is less than 75% of AQS objective	**Medium sensitivity** Existing conc. is between 75 and 90% of AQS objective	**High sensitivity** Existing conc. is above 90% of AQS objective
Major beneficial	-25% or more	-20% or more	-10% or more
Moderate beneficial	-10% to -25%	-10% to -20%	-2.5 to -10%
Minor beneficial	-1 to -10%	-1 to -10%	-1 to -2.5%
Negligible	-1% to +1%	-1% to +1%	-1% to +1%
Minor adverse	1 to 10%	1 to 10%	1 to 2.5%
Moderate adverse	10 to 25%	10% or more with no exceedence of AQS objective	2.5 to 10%
Major adverse	25% or more with an exceedence of AQS objective	10% or more with an exceedence of AQS objective	10% or more

14.1.31 Based on the existing concentrations of all pollutants considered within the impact assessment (NO_2, PM_{10}, lead, benzene and carbon monoxide) in the vicinity of the subject site, proposed receptors have been classified as low sensitivity.

14.2 Baseline Situation

Blaenau Gwent County Borough Council's Review and Assessment of Air Quality

14.2.1 BGCBC has carried out Stage 1 of the R&A process and concluded that no areas of the Borough require to be designated as AQMA's. The Council had particularly considered the emissions to air from the existing Yuasa factory, which was undertaken within Stage 1 and required no further assessment.

14.2.2 Following discussion with BGCBC it is understood that the main pollutant of potential concern is lead, in relation to the proposed development. Specifically, this relates to the potential combined impact of emissions of lead to air from the existing Yuasa factory and proposed Envirowales Ltd plant.

Automatic Urban & Rural Monitoring Network (AURN)

14.2.3 Monitoring data for 2001, 2002 and 2003 were obtained from the nearest background rural AURN monitoring site to the subject site. The monitoring site selected is considered generally representative of the prevailing rural background and is located at Beech Farm, Princes Gate, Narberth, Pembrokeshire. The Narberth monitoring site is the only such rural station in south Wales. Of those pollutants relevant to the subject site, data were available for NO_2 and PM_{10}.

14.2.4 Table 14.3 shows the measured annual average pollutant concentrations at Narberth AURN Continuous Monitor, for 2001 to 2003. Additional information suggests that data capture was 59% during 2003 and therefore these results are subject to wider uncertainty than those for 2001 and 2002.

TABLE 14.3: ANNUAL AVERAGE POLLUTANT CONCENTRATIONS AT NARBERTH AURN CONTINUOUS MONITOR

Pollutant	2001	2002	2003
PM_{10}	14.031	14.129	22.539
NO_2	7.304	6.850	8.816

National Air Quality Information Archive Data and NETCEN Air Quality Predictions

14.2.5 Information on air quality in the UK is available from a variety of sources including local authorities, national network monitoring sites and other published sources. Data have been obtained from the National Air Quality Information Archive (NAQIA). These data have been used to provide an estimate of existing air quality in the vicinity of the subject site.

14.2.6 Background concentrations of NO_2, PM_{10}, benzene and CO have been calculated for 2004, 2006, 2008 and 2010 (where relevant) using National Air Quality Information Archive (NAQIA) data, NETCEN predictions and year adjustment factors provided by DEFRA [7].

14.2.7 Comparison of AURN monitoring data for NO_2 and PM_{10} with NETCEN predicted data shows that pollutant concentrations recorded at the Narberth monitoring site were lower, which reflects the influence on air quality at the subject site from major urban conurbations (i.e. Swansea, Port Talbot, Bridgend, Cardiff and Newport). Consequently, the NETCEN predictions appear to represent realistic assessments of predicted air quality at the subject site.

Cardiff City Council

14.2.8 A national network of monitoring sites has been established to monitor for lead-in-air and provide annual mean concentrations at sixteen UK locations. Monitoring data is available for 1999 to 2003 and is published in Local Air Quality Management – Technical Guidance (TG(03)) [7] and within the NAQIA. A kerbside monitor operated by Cardiff City Council is the closest to the subject site and has been used in the atmospheric dispersion modelling assessment. Due to the urban location of the monitor the results can be considered to represent a worst case for background concentrations in the area including the Yuasa factory and proposed Envirowales Ltd plant.

14.2.9 Table 14.4 provides data from the Cardiff lead-in-air monitoring site for 1999 to 2003.

TABLE 14.4: ANNUAL MEAN LEAD-IN-AIR CONCENTRATIONS AT CARDIFF MONITORING SITE (μG.M^{-3})

	Site Classification	1999	2000	2001	2002	2003
Cardiff	Kerbside	0.074	0.029	0.028	0.025	0.021

Summary of Baseline Conditions

14.2.10 Table 14.5 collates predicted background concentrations of pollutants for the baseline and relevant operational years.

TABLE 14.5: BACKGROUND PREDICTIONS: ANNUAL MEAN (μG.M^{-3})*

	Baseline	Operational			AQS objective
Pollutant	**2004**	**2006**	**2008**	**2010**	**(year)**
Lead	0.021	0.021	0.021	~	0.5 (2004) 0.25 (2008)
NO_2	14.925	14.214	~	~	40 (2005)
PM_{10}	16.600	16.333	~	15.500	40 (2004) 20 (2010)
Benzene	0.243	0.221	~	0.215	16.25 (2003) 5 (2010)
CO*	0.160	0.135	~	~	10 (2003)

* Annual mean values for carbon monoxide are in mg.m^{-3}

14.3 Impact Assessment – Operational Phase

14.3.1 The key impact with relation to air quality is likely to result from an increase in emissions of lead from the combined operations of the Yuasa factory and proposed Envirowales Ltd plant.

Process Emissions (Point Source)

14.3.2 Yuasa Battery manufacture lead acid batteries and activities at the site include, among others, lead melting and lead oxide production. As a result, the site has many lead emission discharge points to atmosphere, serving process and local exhaust ventilation systems and these are fitted with abatement systems, to reduce the concentration of emissions from the site.

14.3.3 The characteristics of the individual release points and the pollutant parameters modelled are presented in Table 14.6. Emissions data and details of the emissions points were obtained from information supplied to Envisage by Yuasa.

TABLE 14.6: EMISSION AND EMISSION POINT PARAMETERS, YUASA BATTERY (UK) LTD

Release Point	Emission Rate (lead g s^{-1} at STP)	Volumetric Flowrate	Temperature (°C)	Height (m)	Diameter (m)	Grid Reference	
		(m^3 s^{-1} at STP)				X (m)	Y (m)
A4	2.84E-05	0.13	86.0	12.5	0.147	314910	212091
A5	1.74E-06	0.04	21.0	12.5	0.147	314915	212088
A6	2.23E-04	0.72	25.4	10.0	0.464	314875	212088
A7	6.90E-05	0.19	33.0	12.0	0.19	314890	212095
A8	6.98E-05	0.37	20.2	9.1	0.38	314890	212090
A9	3.23E-03	3.33	31.3	12.0	0.89	314870	212084
A10	6.24E-03	3.54	31.7	10.0	0.89	314835	212055
A11	9.27E-03 g/s sulphuric acid	2.87	25.2	9.0	0.81	314920	212030
A14	5.02E-04	0.91	49	9.0	0.482	314900	212060
A16	2.07E-05	0.41	6.0	11.6	0.55	314853	212065
A19	2.18E-03	5.88	27.8	10.0	1.145	314930	212110
A20	2.34E-03	7.30	31.3	9.6	0.864	314970	212130
A22	1.00E-04	0.21	37.3	11.6	0.15	314935	212112
A24	1.03E-04	0.30	89.0	11.5	0.15	314916	212103
A25	3.91E-05	0.24	76.0	11.5	0.1	314925	212115
A26	2.83E-05	0.09	31.0	11.5	0.1	315180	212250
A26A	4.36E-06	0.07	31.0	10.0	0.1	315182	212247
A29	5.76E-04	1.69	28.8	7.3	0.51	314895	212093
A30	7.92E-03	12.98	19.0	12.2	1.1	314845	212060
A31	1.53E-04	0.28	102	12.5	0.147	314920	212085
A33	3.56E-05	0.27	21.0	11.0	0.15	315184	212244
A34	1.96E-03	1.32	89.3	12.4	0.4	314925	212075
A35	1.64E-03	4.57	33.0	11.5	0.6	314980	212134
A36	9.17E-05	0.32	46.7	9.0	0.15	314975	212132
A37	8.87E-04	1.18	42.0	7.0	0.5	314880	212093

14.3.4 The processes to be undertaken at the proposed Envirowales Ltd plant include battery storage and breaking, and the smelting, casting and refining of the waste lead from the batteries. These processes are described further below:

- Battery Breaking – A process whereby scrap batteries will be pulverised into small pieces using designated, custom-built machinery;

- Separation – A flotation process designed to separate and segregate component parts of the battery, i.e. metallic lead, battery paste and polypropylene chips;
- Smelting – The metallic lead and battery paste are smelted in two rotary furnaces of approximately 20 tonne capacity to produce lead bullion and dross in which impurities such as sulphur are fixed. The lead bullion is poured into bulk moulds of approximately 1 tonne, as is the dross which is recharged into the furnace to reclaim any remaining lead;
- Refining – The lead bullion is refined while molten by removing impurities via thermo-chemical methodologies and by adding various alloying materials to achieve the desired end product specification;
- Casting – The refined metals will be pumped whilst still molten to casting moulds of various sizes to produce ingots / slabs.

14.3.5 The characteristics of the individual release points and the pollutant parameters modelled are presented in Table 14.7. Emissions data and details of the emissions points were obtained from information supplied by Envirowales Ltd.

TABLE 14.7: EMISSION POINT PARAMETERS, ENVIROWALES LTD

Release Point	Process Description	Volumetric Flowrate	Temperature (°C)	Height (m)	Diameter (m)	Grid Reference	
		($m^3 s^{-1}$)				X (m)	Y (m)
A1	Battery Breaking	6.67	80	15	0.7	315373	212808
A2	Rotary Furnaces	30.56	80	30	1.8	315350	212748
A3	Refining Kettles and Scrap Melting	22.78	80	20 or 30	1.5	315397	212769
A4	Slag Preparation Area	18.64	80	25	1.25	315383	212760
C1	Combustion Stack 1	1.0139	300	15	0.3	315395	212780
C2	Combustion Stack 2	1.0139	300	15	0.3	315405	212776
C3	Combustion Stack 3	1.0139	300	15	0.3	315408	212778
C4	Combustion Stack 4	1.0139	300	15	0.3	315414	212780
C5	Combustion Stack 5	1.0139	300	15	0.3	315418	212782

Lead

14.3.6 Results of the model predictions, including background, have been presented in Table 14.8 for scenarios 2004 and 2006. Table 14.9 summarises the model predictions for the 2008 scenarios.

TABLE 14.8: ANNUAL AVERAGE LEAD CONCENTRATIONS AT SENSITIVE RECEPTORS (μG.M^{-3}) AS PREDICTED BY ADMS MODELLING (2004 / 2006)

	Total Lead Concentration (μg.m^{-3})			Absolute Difference 2006 w/o & w	Difference As % of AQS Objective
	2004 (Background)	2006 (Opening Year)			
Sensitive Receptors		w/o	w		2006
Rassau (NW)	0.021	0.021	0.060	0.040	7.9%
Rassau School	0.021	0.021	0.039	0.018	3.6%
Carmeltown School	0.021	0.021	0.033	0.012	2.4%
Carno Reservoir	0.021	0.021	0.049	0.029	5.7%
Glyncoed Hospital	0.021	0.021	0.027	0.007	1.3%
Glyncoed School 1	0.021	0.021	0.027	0.006	1.2%
Llangynidr Resvr (S)	0.021	0.021	0.049	0.029	5.7%
Rassau (N)	0.021	0.021	0.054	0.034	6.7%
Garnlydan (NW)	0.021	0.021	0.034	0.014	2.7%

w/o: without development
w: with development

TABLE 14.9: ANNUAL AVERAGE LEAD CONCENTRATIONS AT SENSITIVE RECEPTORS (μG.M^{-3}) AS PREDICTED BY ADMS MODELLING (2004 / 2008)

	Total Lead Concentration (μg.m^{-3})			Absolute Difference 2008 w/o & w	Difference As % of AQS Objective
	2004 (Background)	2008 (Objective Year)			
Sensitive Receptors		w/o	w		2008
Rassau (NW)	0.021	0.021	0.060	0.040	15.9%
Rassau School	0.021	0.021	0.039	0.018	7.3%
Carmeltown School	0.021	0.021	0.033	0.012	4.8%
Carno Reservoir	0.021	0.021	0.049	0.029	11.5%
Glyncoed Hospital	0.021	0.021	0.027	0.007	2.7%
Glyncoed School 1	0.021	0.021	0.027	0.006	2.5%
Llangynidr Resvr (S)	0.021	0.021	0.049	0.029	11.5%
Rassau (N)	0.021	0.021	0.054	0.034	13.4%
Garnlydan (NW)	0.021	0.021	0.034	0.014	5.4%

w/o: without development
w: with development

14.3.7 Lead concentrations have been predicted for the base year (2004) by taking kerbside monitoring figures for Cardiff for 2003. It can be reasonably assumed that this approach over estimates the actual background concentrations in the relatively rural environment surrounding the subject site. The background concentration is well below the current AQS objective of 0.5 μg.m^{-3} (2003) and the 2008 objective level of 0.25 μg.m^{-3}. Table 14.8 summarises the results of the 2006 without development modelling scenario, which considers the first operational year of the Envirowales Ltd plant in combination with the currently operational Yuasa factory. The predicted background concentration is well below the current AQS objective of 0.5 μg.m^{-3} (2003) and the 2008 objective level of 0.25 μg.m^{-3}. Table 14.8 presents the results for the 2006 with development scenario. The predicted concentrations are in the range of 0.027 to 0.060 □g.m^{-3}, which well below the current AQS objective of 0.5 μg.m^{-3} (2003) and the 2008 objective level of 0.25 μg.m^{-3}.

14.3.8 Table 14.9 presents the results for the 2008 with and without development scenarios. The predicted concentrations are well below the current AQS objective of 0.5 μg.m^{-3} (2003) and the 2008 objective level of 0.25 μg.m^{-3}.

14.3.9 The absolute differences in concentrations of lead for 2006 without and with the development have been determined, and are presented in Table 14.8. The greatest difference in lead concentration was less than 8% of the AQS objective and therefore this local long-term (duration of operation) impact can be concluded to be of minor significance.

14.3.10 The absolute differences in concentrations of lead for 2008 without and with the development have been determined, and are presented in Table 14.9. Four receptors experience a difference in lead concentration of more than 10% of the AQS objective and therefore this local long-term (duration of operation) impact can be concluded to be of moderate significance.

- Rassau (NW);
- Carno Reservoir;
- Llangynidr Resvr (S); and
- Rassau (N).

14.3.11 The remaining five receptors for 2008 experience a difference in lead concentration of less than 10% of the AQS objective and therefore this local long-term impact can be concluded to be of minor significance.

14.3.12 Modelling predictions indicate that regardless of the proposed development the annual mean AQS objectives for both 2003 and 2008 will be achieved.

Nitrogen Dioxide (NO_2)

14.3.13 Results of the model predictions, including background, have been presented in Table 14.10 for all scenarios.

TABLE 14.10: ANNUAL AVERAGE NO_2 CONCENTRATIONS AT SENSITIVE RECEPTORS (µG.M^{-3}) AS PREDICTED BY ADMS MODELLING (2004 / 2006)

Sensitive Receptors	Total NO_2 Concentration (µg.m^{-3}) 2004 (Background)	2006 (Opening Year) w/o	2006 (Opening Year) w	Absolute Difference 2006 w/o & w	Difference As % of AQS Objective 2006
Nearest Resident	14.92	14.21	14.49	0.28	0.688%
Rassau School	14.92	14.21	14.33	0.12	0.288%
Carmeltown School	14.92	14.21	14.30	0.08	0.206%
Carno Reservoir	14.92	14.21	14.42	0.21	0.522%
Glyncoed Hospital	14.92	14.21	14.26	0.04	0.112%
Garnlydan School	14.92	14.21	14.24	0.03	0.069%
Glyncoed School 1	14.92	14.21	14.26	0.05	0.114%
Llangynidr Reservoir	14.92	14.21	14.35	0.14	0.350%
School/College	14.92	14.21	14.25	0.04	0.097%
Glyncoed School 2	14.92	14.21	14.25	0.04	0.102%
Rhoslan School	14.92	14.21	14.30	0.09	0.214%
Shon Sheffrey's Reservoir	14.92	14.21	14.23	0.01	0.034%
Glyncoed School 3	14.92	14.21	14.24	0.03	0.063%
Beaufort School	14.92	14.21	14.23	0.02	0.044%

w/o: without development
w: with development

14.3.14 Background NO_2 concentrations for the base year (2004), presented in Table 14.10 have been taken from the NETCEN predicted concentration for the relevant 1000 × 1000 m grid square including the subject site. These have been factored to 2006 for the base case without development.

14.3.15 Table 14.10 also presents the results for the 2006 with development scenario. The predicted concentrations are in the range of 14.23 to 14.49 µg.m^{-3}, which are well below the AQS objective.

14.3.16 The absolute differences in concentrations at existing residences for 2006 without and with the development have been determined. The greatest difference in NO_2 concentration was less than 1% of the AQS objective and therefore this impact can be concluded to be negligible.

14.3.17 A second AQS objective for NO_2 exists, which is a 1-hour mean threshold of 200 µg.m^{-3} not to be exceeded more than 18 times a year. Government guidance states that it is unlikely this short-term objective will be exceeded if the annual mean is less than 60 µg.m^{-3} [10]. It is therefore considered that the short-term NO_2 objective is likely to be achieved in the vicinity of the proposed development.

14.3.18 Modelling predictions indicate that regardless of the proposed development the annual mean AQS objective will be achieved.

Particulate Matter (PM_{10})

14.3.19 Results of the model predictions, including background, have been presented in Table 14.11 for 2004 and 2006 scenarios. Table 14.12 summarises the model predictions for the 2010 scenarios. In both cases it has been made assumed 30% of particulate matter is lead.

TABLE 14.11: PREDICTED ANNUAL AVERAGE PM_{10} CONCENTRATIONS AT SENSITIVE RECEPTORS (µG.M^{-3}) (2004 / 2006)

Sensitive Receptors	Total PM Concentration (µg.m^{-3}) 2004 (Background)	2006 (Opening Year) w/o	2006 (Opening Year) w	Absolute Difference 2006 w/o & w	Difference As % of AQS Objective 2006
Nearest Resident	16.60	16.33	16.43	0.10	0.25%
Rassau School	16.60	16.33	16.38	0.05	0.13%
Carmeltown School	16.60	16.33	16.37	0.03	0.09%
Carno Reservoir	16.60	16.33	16.43	0.10	0.25%
Glyncoed Hospital	16.60	16.33	16.35	0.02	0.05%
Garnlydan School	16.60	16.33	16.35	0.02	0.05%
Glyncoed School 1	16.60	16.33	16.35	0.02	0.05%
Llangynidr Reservoir	16.60	16.33	16.43	0.10	0.25%
School/College	16.60	16.33	16.35	0.02	0.05%
Glyncoed School 2	16.60	16.33	16.35	0.02	0.04%
Rhoslan School	16.60	16.33	16.37	0.04	0.10%
Shon Sheffrey's Reservoir	16.60	16.33	16.35	0.02	0.05%
Glyncoed School 3	16.60	16.33	16.35	0.01	0.03%
Beaufort School	16.60	16.33	16.35	0.01	0.03%

w/o: without development
w: with development

TABLE 14.12: PREDICTED ANNUAL AVERAGE PM10 CONCENTRATIONS AT SENSITIVE RECEPTORS (G.M-3) (2004 / 2010)

Sensitive Receptors	Total PM Concentration (µg.m-3)			Absolute Difference 2010 w/o & w	Difference As % of AQS Objective
	2004 (Background)	2010 (Objective Year)			
		w/o	w		2010
Nearest Resident	16.60	15.50	15.60	0.10	0.50%
Rassau School	16.60	15.50	15.55	0.05	0.25%
Carmeltown School	16.60	15.50	15.53	0.03	0.17%
Carno Reservoir	16.60	15.50	15.60	0.10	0.51%
Glyncoed Hospital	16.60	15.50	15.52	0.02	0.10%
Garnlydan School	16.60	15.50	15.52	0.02	0.10%
Glyncoed School 1	16.60	15.50	15.52	0.02	0.09%
Llangynidr Reservoir	16.60	15.50	15.60	0.10	0.50%
School/College	16.60	15.50	15.52	0.02	0.10%
Glyncoed School 2	16.60	15.50	15.52	0.02	0.09%
Rhoslan School	16.60	15.50	15.54	0.04	0.20%
Shon Sheffrey's Reservoir	16.60	15.50	15.52	0.02	0.10%
Glyncoed School 3	16.60	15.50	15.51	0.01	0.07%
Beaufort School	16.60	15.50	15.51	0.01	0.07%

w/o: without development
w: with development

14.3.20 PM_{10} concentrations for the base year (2004) have been taken from NAQIA and are presented in Table 14.11. These have been factored to provide the 2006 and 2010 base case, as before. The predicted background concentrations are well within the respective 2004 and 2010 AQS objectives.

14.3.21 Table 14.11 also presents the results for the 2006 with development scenario. The predicted concentrations are in the range of 16.35 to 16.43 g.m^{-3}, which are well within the AQS objective.

14.3.22 Table 14.12 presents the results for the 2010 with development scenario. The predicted concentrations are in the range of 15.51 to 15.60 g.m^{-3}, which is slightly lower than the predictions for 2006 and well below the current AQS objective of 40 µg.m^{-3} (2003) and the 2010 objective level of 20 µg.m^{-3}.

14.3.23 The absolute differences in concentrations of PM_{10} for 2006 and 2010 without and with the development have been determined, and are presented in Table 14.11 and Table 14.12. All receptors experience differences in PM_{10} concentration less than 1% of the AQS objective and therefore this impact can be concluded to be negligible.

14.3.24 Modelling predictions indicate that regardless of the proposed development the annual mean AQS objectives for both 2004 and 2010 will be achieved.

Benzene

14.3.25 Results of the model predictions, including background, have been presented in Table 14.13 for scenarios 2004 and 2006. Table 14.14 summarises the model predictions for the 2010 scenarios.

TABLE 14.13: PREDICTED ANNUAL AVERAGE BENZENE CONCENTRATIONS AT SENSITIVE RECEPTORS (□G.M^{-3}) (2004 / 2006)

	Total Benzene Concentration (□g/m3)			Absolute Difference 2006 w/o & w	Difference As % of AQS Objective
	2004 (Background)	2006 (Opening Year)			
Sensitive Receptors		w/o	w		2006
Nearest Resident	0.243	0.221	0.222	0.001	0.005%
Rassau School	0.243	0.221	0.221	0.000	0.002%
Carmeltown School	0.243	0.221	0.221	0.000	0.001%
Carno Reservoir	0.243	0.221	0.221	0.001	0.003%
Glyncoed Hospital	0.243	0.221	0.221	0.000	0.001%
Garnlydan School	0.243	0.221	0.221	0.000	0.000%
Glyncoed School 1	0.243	0.221	0.221	0.000	0.001%
Llangynidr Reservoir	0.243	0.221	0.221	0.000	0.002%
School/College	0.243	0.221	0.221	0.000	0.001%
Glyncoed School 2	0.243	0.221	0.221	0.000	0.001%
Rhoslan School	0.243	0.221	0.221	0.000	0.001%
Shon Sheffrey`s Reservoir	0.243	0.221	0.221	0.000	0.000%
Glyncoed School 3	0.243	0.221	0.221	0.000	0.000%
Beaufort School	0.243	0.221	0.221	0.000	0.000%

w/o: without development
w: with development

TABLE 14.14: PREDICTED ANNUAL AVERAGE BENZENE CONCENTRATIONS AT SENSITIVE RECEPTORS (G.M-3) (2004 / 2010)

Sensitive Receptors	Total Benzene Concentration (g/m3) 2004 (Background)	2010 (Objective Year) w/o	2010 (Objective Year) w	Absolute Difference 2010 w/o & w	Difference As % of AQS Objective 2010
Nearest Resident	0.243	0.215	0.216	0.001	0.015%
Rassau School	0.243	0.215	0.215	0.000	0.006%
Carmeltown School	0.243	0.215	0.215	0.000	0.004%
Carno Reservoir	0.243	0.215	0.216	0.001	0.011%
Glyncoed Hospital	0.243	0.215	0.215	0.000	0.002%
Garnlydan School	0.243	0.215	0.215	0.000	0.001%
Glyncoed School 1	0.243	0.215	0.215	0.000	0.002%
Llangynidr Reservoir	0.243	0.215	0.215	0.000	0.007%
School/College	0.243	0.215	0.215	0.000	0.002%
Glyncoed School 2	0.243	0.215	0.215	0.000	0.002%
Rhoslan School	0.243	0.215	0.215	0.000	0.005%
Shon Sheffrey`s Reservoir	0.243	0.215	0.215	0.000	0.001%
Glyncoed School 3	0.243	0.215	0.215	0.000	0.001%
Beaufort School	0.243	0.215	0.215	0.000	0.001%

w/o: without development
w: with development

14.3.26 The predicted impact on local benzene concentrations during the opening year (2006) and AQS objective year (2010) is negligible.

14.3.27 Modelling predictions indicate that regardless of the proposed development the annual mean AQS objectives for both 2003 and 2010 will be achieved.

Carbon Monoxide (CO)

14.3.28 Results of the model predictions, excluding background, have been presented in Table 14.15.

TABLE 14.15: PREDICTED RUNNING 8-HOUR AVERAGE CO CONCENTRATIONS AT SENSITIVE RECEPTORS EXCLUDING BACKGROUND ($MG.M^{-3}$)

	CO Concentration (mg/m3)
Sensitive Receptors	**(Process emission contribution only)**
Nearest Resident	0.0000052
Rassau School	0.0000021
Carmeltown School	0.0000015
Carno Reservoir	0.0000040
Glyncoed Hospital	0.0000008
Garnlydan School	0.0000005
Glyncoed School 1	0.0000008
Llangynidr Reservoir	0.0000029
School/College	0.0000007
Glyncoed School 2	0.0000007
Rhoslan School	0.0000017
Shon Sheffrey's Reservoir	0.0000003
Glyncoed School 3	0.0000005
Beaufort School	0.0000003

14.3.29 Although background data for CO are only available as an annual mean and cannot be combined directly with the model predictions, the calculated process contribution is negligible when compared with the AQS objective of 10 $mg.m^{-3}$, which is measured as a running 8-hour mean.

Road Traffic Emissions

14.3.30 Once the Envirowales Ltd plant site reaches full operation, there will be 4 shift changes during Monday to Friday and 3 during the weekend. The anticipated vehicle movements are summarised in Table 14.16.

TABLE 14.16: VEHICLE MOVEMENTS AT FULL EMPLOYMENT

Day	Time	Event	Total Vehicle Movements
Weekday	06:00	Shift Change	34
Weekday	08:00	Shift Change	47
Weekday	14:00	Shift Change	51
Weekday	22:00	Shift Change	39
Weekend	06:00	Shift Change	28
Weekend	14:00	Shift Change	28
Weekend	22:00	Shift Change	28

14.3.31 In addition to the daily staff car movements, there are expected to be 18 HGV (25 tonne loads) movements and 20 LGV (7.5 tonne loads) movements between 06:00 and 20:00 hours.

14.3.32 The main pollutants emitted from vehicle exhausts that have the potential to cause impacts on public health are carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x) and respirable particulates, including fine particulate matter (PM_{10}). These are individually described in **Error! Reference source not found.**.

14.3.33 The total expected number of vehicle movements on a weekday will be 209. This volume of traffic movement is extremely small and it is unlikely that the effect on air quality would be measurable. Consequently this impact can be concluded to be negligible.

14.4 Impact Assessment - Construction Phase

Fugitive Emissions

14.4.1 The duration of the construction period will be in two phases and is anticipated to take place over approximately 9 months:

- Phase 1 – office block, changing block, main building from grid line 23 to 11, effluent treatment, acid recovery, etc;
- Phase 2 – main building grid lines 11 to 1, battery storage building and maintenance building.

14.4.2 The major influence on air quality throughout this phase of the development is likely to be dust-generating activities such as movement of plant vehicles both on and around the site.

14.4.3 Nuisance caused by the deposition of construction dust is likely to be the most significant issue in relation to air quality impacts from the construction phase. Currently no UK statutory standards or limits appropriate for the assessment of deposited dust and its tendency for causing nuisance exist. Reference is often made to a figure of 200 $mg.m^{-2}.day^{-1}$ as a value for the threshold to serious nuisance [11]. However, this does not consider the nature of the dust may not be applicable to shorter measurement periods.

14.4.4 Whilst no further detailed construction phase information is currently available, activities that may cause fugitive dust emissions are as follows:

- site clearance;
- earthworks;
- handling and disposal of spoil;
- wind-blow from stockpiles of particulate material;
- concrete batching;
- movement of vehicles, both on and off site; and
- handling of loose construction materials.

14.4.5 The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of suppression measures. It is therefore difficult to predict emissions and conventional modelling tools are of limited use.

14.4.6 By convention, therefore, the assessment of construction dust is normally confined to an evaluation of the likelihood that emissions may give rise to some perceptible nuisance. This is defined on the basis of the distance from construction works of sensitive receptors such as residential properties. It is normally possible, by proper control, to ensure that dust deposition does not give rise to nuisance effects. It is common practice to use a distance of 100 m as the radius within which impacts may occur. Routine dust control measures would normally ensure that the risk of long-term impacts is insignificant but short-term events may occur owing to, for example, technical failure or exceptional weather conditions.

14.4.7 The main effect of any dust emissions, if not mitigated, would be nuisance due to soiling of surfaces, particularly windows, cars and laundry. Generally, site practices based on 'good housekeeping' will ensure that emissions of nuisance dusts will be minimised.

Road Traffic Emissions

14.4.8 Construction of the proposed development will have associated with it construction traffic, comprising contractors' vehicles and HGVs, diggers, and other diesel-powered vehicles. This will result in emissions of nitrogen oxides, fine particles and other combustion related pollutants. These pollutants are covered by AQS objectives. The operation of these vehicles is anticipated to be localised and construction traffic is expected to be less than operational traffic. Therefore, emissions of combustion related pollutants from the construction phase are expected to be no more than minor in terms of the effect on local air quality.

14.4.9 The potential for receptors to be impacted by an increase in road traffic emissions has been considered qualitatively. Traffic volumes during the construction period have been estimated as follows:

- 10 No. vans / cars per day;
- 2 No. tipper lorries per day during excavation works (worst case);
- 3 No. concrete mixer lorries per hour during the major concrete pours (worst case); and
- 6 No. delivery lorries per day.

14.4.10 The existing road traffic flows on the A465 has been recorded. The peak hour flows are 1596 on the A465, with 5 percent of heavy goods vehicles.

14.4.11 During the construction phase the traffic flows on A465 are therefore 1617 vehicles with 6 percent of these vehicles being HGVs.

14.4.12 The main pollutants emitted from vehicle exhausts that have the potential to cause impacts on public health are carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x) and respirable particulates, including fine particulate matter (PM_{10}). These are individually described in Appendix 14.1.

14.4.13 The total expected number of daily vehicle movements, excluding visitors to the site, will be 42. This volume of traffic movement is extremely small and it is unlikely that the effect on air quality would be measurable. Consequently this impact can be concluded to be negligible.

14.5 Mitigation

Local Mitigation Measures

14.5.1 For the construction phase of the proposed development dust control measures are well developed and are capable of eliminating or reducing emissions to a level such that nuisance is unlikely to occur. Contractors will be required to use good engineering practice to minimise dust emissions. Typical measures include:

- damping down of unsealed surfaces and stockpiles;
- minimising the height of stockpiles;
- wheel washing of mobile plant and HGVs before they leave the site;
- sheeting of loads;
- enclosure of potential point sources of dust (e.g. spoil loading areas); and
- use of solid hoardings around construction sites.

14.5.2 The impact from NO_2, PM_{10}, CO and Benzene has been concluded to be negligible and therefore no further consideration of mitigation measures is required.

14.5.3 Although the impact from lead-in-air has been concluded to be minor for all receptors in 2006 and ranging from minor to moderate in 2008, the total concentrations experienced by the receptors will, on average, be less than an order of magnitude below the new objective level, and hence no likely significant environmental impact is anticipated.

Regional Mitigation Measures

14.5.4 Emissions of lead will be minimised and controlled using Best Available Techniques in accordance with the PPC permit issued by the Environment Agency. The impacts arising from the proposed development are considered to be local in nature. Consequently there is no requirement to consider regional mitigation measures.

14.6 Residual Impacts

14.6.1 Impacts during the construction phase such as dust generation and plant vehicle emissions are predicted to be short-lived and only relevant during the construction phase. Therefore residual impacts are not expected.

14.7 Conclusions

14.7.1 Consultations with Blaenau Gwent County Borough Council have highlighted that the key pollutant of potential concern is lead. Following discussions with the Council, the atmospheric dispersion modelling assessment previously undertaken for the proposed Envirowales Ltd plant was augmented to take account of the combined lead emissions of both the Envirowales Ltd plant and existing Yuasa factory. The pollutants NO_2, PM_{10}, CO and benzene were modelled for the Envirowales Ltd site alone and have been assessed in terms of impact against AQS objectives in this Chapter. Lead has been modelled for both sites and assessed in terms of impact against AQS objectives in this Chapter.

14.7.2 Predicted concentrations of NO_2, PM_{10}, CO and benzene have been demonstrated to be very low, with associated negligible impact.

14.7.3 Although the impact from lead-in-air has been concluded to be minor for all receptors in 2006 and ranging from minor to moderate in 2008, the total concentrations experienced by the receptors will, on average, be less than an order of magnitude below the new objective level, and hence no likely significant environmental impact is anticipated. Emissions of lead will be minimised and controlled using Best Available Techniques in accordance with the PPC permit issued by the Environment Agency.

14.7.4 A qualitative assessment has also been made of the construction phase of the development. Impacts from this phase are predicted to be localised around the development site and to occur only when construction is in operation. Through established dust control measures it should be possible to reduce emissions to a level such as nuisance is unlikely to occur.

Glossary

AQMA	Air Quality Management Area
AQS	Air Quality Strategy
BGCBC	Blaenau Gwent County Borough Council
CCC	Cardiff County council
CO	Carbon Monoxide
DEFRA	Department for Environment Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
HDV	Heavy Duty Vehicle
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
MBDC	Mid Bedfordshire District Council
NAQIA	National Air Quality Information Archive
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
PAHs	Polycyclic Aromatic Hydrocarbons
PM_{10}	Fine particulate matter less than 10 μm in diameter
ppm	parts per million
ppb	parts per billion
R&A	Review and Assessment
SO_2	Sulphur Dioxide
USA	Updating and Screening Assessment
$\mu g.m^{-3}$	micrograms per cubic metre
$mg.m^{-3}$	milligrams per cubic metre

References

1. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. DETR. 2000.
2. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum. DEFRA. 2003.
3. The Air Quality (Wales) Regulations. 2000.
4. The Air Quality (Amendment) (Wales) Regulations. 2002.
5. Local Air Quality Management – Policy Guidance (PG(03)). DEFRA. 2003.
6. Atmospheric Dispersion Modelling System (ADMS) Version 3.2. Cambridge Environmental Research Consultants Ltd.

7. Local Air Quality Management – Technical Guidance (TG(03)). DEFRA. 2003.

8. Design Manual for Roads and Bridges. Volume 11. Environmental Assessment. DETR. 2000.

9. Air Assessments for Planning Applications – Technical Guidance Note. ALG Transport and Environment Committee. 2001.

10. Analysis of the Relationship Between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites. DEFRA. 2003.

11. Integrated Pollution Prevention and Control (IPPC): Environmental Assessment and Appraisal of BAT. Horizontal Guidance Note IPPC H1. Environment Agency. Version 6 July 2003.

12. Control of Dust From Construction Dust and Demolition Activities. Kuadia, Upton and Hall. 2003.

APPENDIX 14.2

ATMOSPHERIC DISPERSION MODELLING ASSESSMENT: ENVIROWALES LTD RASSAU INDUSTRIAL ESTATE PROJECT. DECEMBER 2004. ENVIRONMENTAL VISAGE LTD.

Executive Summary

Environmental Visage Ltd was commissioned by Envirowales Ltd to undertake an atmospheric dispersion modelling assessment of their proposed battery recycling plant, planned for the Rassau Industrial Estate in Ebbw Vale. This study is based on the information available to date regarding the operation of, and potential emissions to atmosphere from the proposed plant.

The processes to be undertaken at the site include battery storage and breaking, and the smelting, casting and refining of the waste lead from the batteries. Some of these activities will result in the emission to air of pollutants such as particulate, lead, and combustion gases, and the aim of this study is to determine the likely dispersion of these emissions, and their potential contribution to ground level concentrations, in order to assess the likely impact of the proposed operations on the surrounding environment.

Where appropriate, results of the modelling exercise were compared with the air quality limit values set by the Air Quality Limit Values Regulations 2003[1] (as amended). The main emission of concern from the site is that of lead, for which an air quality limit value of 0.5 µg m^{-3}, with no margin of tolerance from 1st January 2005 is set. The results of this assessment have been compared with this value. Additionally, data of emissions of particulate and combustion gases were modelled.

Predicted annual average concentrations of lead from the Envirowales site, contributing to ground level concentrations were within the air quality limit value of each model run. On inclusion of a background concentration, the total estimated ground level concentration remained within the air quality limit value, although the process contribution from the site represents 85.2 % of the air quality limit value and thus is considered to be significant.

Note: This study has been undertaken using data currently available for the proposed installation, and provided by Envirowales. It should be recognised however that until the installation is fully designed and operational, and sampling data can confirm the estimated emissions data included in this study, the accuracy of the data included cannot be guaranteed.

CONTENTS

1. Introduction

This report has been commissioned as part of an assessment of the impact of the emissions to atmosphere of a site proposed for the Rassau Industrial Estate in Ebbw Vale. The atmospheric dispersion modelling study has been undertaken to determine the dispersion of releases from proposed emission points at the Envirowales Ltd site in Ebbw Vale. The emissions considered by the assessment were lead, particulate and combustion gases.

Details of emissions and release points were supplied by Envirowales. The emissions data supplied for the process stacks represent worst case estimates, as supplied by Envirowales. Emissions from combustion stacks have been calculated based on assumed fuel usage and theoretical emission factors.

This report details the modelling work undertaken and presents the findings of the study.

2. Principal Objectives and Scope of Work

The principal aim of the work undertaken was to determine the dispersion of air borne pollutants from the proposed Envirowales site in order to predict the environmental impact of the site on the surrounding area.

The only definitive means of quantifying the impact of process emissions on air quality and the surrounding area is to undertake a comprehensive programme of environmental monitoring around the site in question, and some such monitoring is routinely undertaken at the site. As an alternative, atmospheric dispersion modelling provides a means of estimating the potential impacts of emissions with a reasonable degree of confidence, by modelling the dispersion of a plume exiting a chimney in relation to a number of key parameters. This enables the calculation of an estimated contribution to ground level pollutant concentrations arising from the release.

Environmental Visage Ltd employed the latest version of the UK Atmospheric Dispersion Modelling System (ADMS 3.2) to determine the contribution of emissions from the Envirowales site to ground level concentrations of pollutants, taking into consideration the latest three years worth of meteorological (met.) data representative of the area. The ADMS model is one of the leading atmospheric dispersion models available in the UK and can be used to assess ambient pollutant concentrations from a wide variety of emissions sources associated with an industrial installation.

3. Study Parameters

Details of the release points to be considered were supplied by Envirowales Ltd. The location of proposed emission points were taken from the current plans of the site, and information on the estimated emissions from each point has been included. Estimated emissions from the process stacks (A1 – A4) were supplied by Envirowales Ltd. Estimated emissions from the combustion stacks (C1-C5) were calculated from the given fuel throughput of the burners (3,000,000 British Thermal Units (BTUs)), with a continuous duty of 75 % assumed, and the application of data from the UK Emission Factors Database[2]. The ADMS model requires the source of emissions to be defined in terms of dimensions, location and physical characteristics of temperature and velocity. It should be noted that all of the data incorporated into the study are currently estimates as the plant is not yet operational.

One of the key factors affecting the dispersion characteristics of a plume is the height it can gain above the release point, as a result of momentum and buoyancy. The higher the plume rises, the greater the volume of the atmosphere in which it can disperse, and the lower the potential contribution to ground level concentrations of pollutants. This in turn results in a lower potential impact on the environment. Additionally, meteorological conditions affect the dispersal of a plume, and thus the ADMS model uses comprehensive met. data to determine the impact of the weather on emissions. As a minimum requirement for modelling plume dispersion, details of wind speed, direction, stability conditions and mixing height are required. Met. data for the area local to the site is limited, and thus a combination set of data has been applied within this model. The three years worth of met. data used are a combination of data from the St. Athan met. station, which is the nearest station to the site able to supply data suitable for incorporation into the ADMS model, and wind speed and direction data from Sennybridge, which is approximately 30 km to the north, north west of the site.

3.1 Emission Parameters

The characteristics of the individual release points and the pollutant parameters to be modelled are presented in Table 1. Emissions data and details of the emissions points were obtained from information supplied by Envirowales.

3.2 Nearby Buildings and Structures

Processes which have a stack or stacks located on top of a building, or adjacent to a tall building, the effect of surrounding structures may need to be taken into account. As a general guide, building downwash problems (where emissions are caught in the turbulent wake of the wind blowing around a building), may occur if the stack height is less than 2.5 times the height of the building upon which it sits. Buildings which sit adjacent to stacks may need to be considered if they are within 5 stack heights of the point of release. It was therefore deemed necessary to include into the model, details of all of the buildings at the Envirowales site, as each emission point sits on top of, or very close to process buildings. Each of the buildings proposed for the site was included, and their shapes were simplified for incorporation into the model. Elevation plans were made available in order that accurate data on the height of each building could be incorporated. The data included in the model are presented in Table 3.

Table 1 Emission Point Parameters, Envirowales Ltd

Release Point	Process Description	Volumetric Flowrate ($m^3 s^{-1}$)	Temperature (°C)	Height (m)	Diameter (m)	Grid Reference	
						X (m)	Y (m)
A1	Battery Breaking	6.67	80	15	0.7	315373	212808
A2	Rotary Furnaces	30.56	80	30	1.8	315350	212748
A3	Refining Kettles and Scrap Melting	22.78	80	20 or 30	1.5	315397	212769
A4	Slag Preparation Area	18.64	80	25	1.25	315383	212760
C1	Combustion Stack 1	1.0139	300	15	0.3	315395	212780
C2	Combustion Stack 2	1.0139	300	15	0.3	315405	212776
C3	Combustion Stack 3	1.0139	300	15	0.3	315408	212778
C4	Combustion Stack 4	1.0139	300	15	0.3	315414	212780
C5	Combustion Stack 5	1.0139	300	15	0.3	315418	212782

Note: Two sets of models were run in order to determine the dispersion characteristics of the emissions when applying the two possible heights of emission point A3. Additionally, models were run to determine the effect of higher (120 °C) and lower (70 °C) temperature discharges from the process stacks (A1 – A4).

Table 2 Estimated Emissions to Air from Envirowales Ltd

Release Point	Maximum Lead Particulate	Maximum Other (PM_{10}) Particulate	Oxides of Nitrogen (as NO_2)	Nitrous Oxide	Carbon Monoxide	Carbon Dioxide	Methane and VOCs	Benzene
A1	0.002	0.0335	-	-	-	-	-	-
A2	0.06112	0.3056	-	-	-	-	-	-
A3	0.04556	0.2278	-	-	-	-	-	-
A4	0.03726	0.1863	-	-	-	-	-	-
Gas Combustion Emissions Only								
C1	-	0.0020	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C2	-	0.0020	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C3	-	0.0020	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C4	-	0.0020	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C5	-	0.0020	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
Assumed Emissions of Particulate Relate to Combustion and Process Emissions with Lead Particulate at 30 %								
C1	0.00061	0.001423	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C2	0.00061	0.001423	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C3	0.00061	0.001423	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C4	0.00061	- 0.001423	0.0811	0.000059	0.0016	9.38	0.00475	0.00022
C5	0.00061	0.001423	0.0811	0.000059	0.0016	9.38	0.00475	0.00022

Note: Details of emissions from process stacks A1 to A4 supplied by Envirowales Ltd. Emissions from combustion stacks C1 to C5 were calculated on the assumption of 3,000,000 BTU at 75 % continuous duty, using figures from the UK Emission Factors Database[2], with the exception of NO_x (modelled as N_2O) a concentration for which was provided by the burner manufacturer.

The burner manufacturer considers that approximately 30 % of the particulate emitted from the combustion stacks could be lead. Therefore, two sets of emissions data have been modelled for the combustion stacks, one which assumes that all of the particulate (calculated for natural gas firing) is a product of the gas combustion only with no account being made for lead, and the second assuming that the calculated particulate concentration is representative of emission from gas firing and the lead kettle process, and that 30 % of the particulate is therefore lead.

Table 3 Details of Buildings and Structures, Envirowales Ltd

Factory	X (m)	Y (m)	Height (m)	Length (m)	Width (m)	Angle (°)
Main Building	315397	212794	12	156	40.8	62
Battery Store	315300	212750	12.5	28.5	65.5	62
Acid Recovery	315280	212706	21.7	15.7	6.6	62
Effluent Building	315266	212717	7.7	12.6	15.7	62
Workshops	315373	212834	8	18.7	18.7	62

3.3 Meteorological Data

The latest three years of sequential meteorological data (from 1999 – 2003) were employed to run the model. The data used was a combination of data from the St. Athan met. station, which is the nearest station to the site currently recording data suitable for inclusion into the ADMS model, and wind speed and direction data from the Sennybridge met. station, which is located approximately 30 km north, north west of the site. This data combination was used due to site concerns that previously models have not accurately reflected met. data for the local area. Discussions with the Met. Office, suggest that this combined data is the most appropriate information, available for use with ADMS, for the Ebbw Vale area.

3.4 Surface Roughness

For the purpose of running the ADMS model, it is necessary to assign a surface roughness figure to the area to be modelled. This describes the degree of ground turbulence caused by the passage of winds across surface structures. The degree of ground turbulence is much greater in urban areas than in rural areas. This is due to the presence of tall buildings in urban areas increasing the level of ground turbulence. ADMS requires the selection of a surface roughness factor to be input into the model, according to defined criteria. For the purpose of this model, a surface roughness factor of 0.5 was chosen, characteristic of parkland or open suburbia

3.5 Terrain Data

The use of terrain data was considered prior to running the model. Although the necessity of using detailed terrain data can generally be assessed using a screening model which utilises worst-case emission rates to undertake a simplified calculation, and subsequently assessing the results against the relevant air quality standards or environmental assessment levels, it was considered that due to the location of the site close to the top of a valley side, terrain data would need to be incorporated. Thus digital data in the form of Landform Panorama tiles SO00 and SO20 were employed to provide details of the terrain local to the Envirowales site.

3.6 Model Output Parameters

The ADMS 3.2 model calculates the likely contribution to ground level concentrations within a definable grid system, which is pre-determined by the user. For the purpose of this study, a Cartesian co-ordinate grid system was chosen, to cover an area of 9 km^2, with a point representing the centre of the site, identified as the centre of the grid. The Cartesian style grid has regular, pre-defined increments in both northerly and easterly directions from the specified bottom left corner of the grid, and ground level concentrations are specified at the intersections of these grid lines. Each grid modelled was based on a 31 x 31 point system, giving a total of 961 points (or intersections). The use of the grid in this way aids the generation of pollutant contours.

The chosen grid must be large enough to encompass the plume dispersion, however the smaller the grid, the more accurate the indication of pollutant contribution, as the 961 points are plotted over a smaller area. Therefore, once modelled, the output files were reviewed to ensure that the full extent of the plume had been modelled, whilst retaining a sufficient level of detail. Additionally, the output adopted specified points to identify sensitive receptors in the area. Details of the sensitive receptors considered are presented in Table 4.

Table 4 Details of Nearby Sensitive Receptors, Envirowales Ltd

Receptor Name	Central Grid Reference	Location from Envirowales
Rassau Village (nearest resident)	X: 315538 Y: 212188	550 m South, South East
Rassau School	X: 315750 Y: 211925	875 m South, South East
Carmeltown School	X: 315950 Y: 211750	1.125 km South East
Carno Reservoir	X: 316400 Y: 213050	825 m North West
Garnlydan School	X: 316750 Y: 212450	1.25 km East, South East
Llangynidr Reservoir	X: 315250 Y: 214050	1 km North

The output for the defined grid was set as long term, which provides a single concentration averaged over all of the lines of met. data, for each point, that is, providing an annual average concentration for each grid point. Pollutants were modelled over 1 hour, 8 hour or 24 hour averaging periods, in line with their respective air quality limit values, as presented in Table 5. Where no air quality limit value was applicable, a one hour averaging period was applied. Additionally, percentile concentrations were calculated to demonstrate the worst predicted contribution to ground level concentrations, minus any allowable exceedences. The 100th percentile concentration was calculated for grid points where no exceedences are allowed, in order to determine the overall worst-case concentration for each averaging period. As these results represent the worst case contribution to background concentrations over a short term (the averaging period) they are higher than the worst case annual average.

The introduction of the UK Air Quality Strategy in 2000 and its addendum in 2003 has placed a requirement on Local Authorities to manage the quality of ambient air within their jurisdiction. Air quality limit values exist for various pollutants, and those relating to the pollutants modelled in this study are presented in Table 5 below. These have been applied to the model to assess the acceptability, or otherwise, of the dispersion of emissions from Envirowales.

Table 5 Air Quality Limit Values for Pollutants Modelled

Pollutant	Objective Concentration	Averaging Period	Date Objective Should be Met
Lead	0.5 µg m^{-3}	Annual Mean	1st January 2005
Particulate (PM10)	50 µg m^{-3} not to be exceeded more than 35 times a year (90.4 percentile)	24 Hour Mean	1st January 2005
Particulate (PM10)	40 µg m^{-3}	Annual Mean	1st January 2005
Nitrogen Dioxide	200 µg m^{-3} not to be exceeded more than 18 times a year (99.79 percentile)	1 Hour Mean	1st January 2010
Nitrogen Dioxide	40 µg m^{-3}	Annual Mean	1st January 2010
Carbon Monoxide	10 mg m^{-3}	Running 8 Hour Mean	1st January 2005
Benzene	5 µg m^{-3}	Running Annual mean	1st January 2010

3.7 Modelling Assumptions

Additionally to the parameters described in the sections above, some assumptions had to be made for the modelling study and these are listed below:

Emissions are assumed to be continuous. In reality, the site will operate 24 hours, seven day per week, although operations may not necessarily be running constantly, and therefore emissions would be reduced. Additionally, the site will only operate a 48 week year, and thus the model can be seen to represent a worst case as emissions are considered to occur on a 24 hour, 7 day week basis.

Emissions concentrations for lead and particulate from the process stacks A1 – A4 were provided as maximum figures, with the actual emissions of the proposed plant thought to be less than the estimates given. As these estimates are the only information available at this time, this data has been assumed to represent the emission concentrations, and thus the model can again be seen to represent a worst case.

All emissions of lead are assumed to be particulate. In reality, the total emission concentration is likely to be made up of both particulate and vapour phase lead.

Emissions of combustion gases and particulate have been calculated using theoretical emission factors from the UK Emission Factors Database[(2)], with the exception of NO_x (modelled as N_2O) a concentration for which was provided by the burner manufacturer. For the purpose of this model the burners of the combustion units are considered to have a maximum capacity of 880 kWhrs (3,000,000 BTUs). A continuous duty of 75% has been applied, resulting in a continuous operation capacity of 660 kWhrs, 24 hour, 7 days per week.

Of the particulate emissions calculated as being discharged from the combustion process, two scenarios were considered. The first scenario assumes that none of the particulate contains lead, however as the combustion processes are connected to the lead kettles at the site, the second scenario assumes that up to 30 % of the particulate is lead, to account for the process contribution.

4. Results and Discussion

The results of the modelling work are presented in Tables 6 to 16 and Figures 1 to 5. The maximum predicted annual average contributions to ground level concentrations, and the location of these concentrations are reported, as are the maximum predicted contributions to ground level concentrations (worst case) and details of the number of times each year that pollutant concentrations are predicted to exceed any relevant air quality limit values.

Table 6 Predicted Maximum Contributions to Ground Level Concentrations, Modelled with Meteorological Data from 2001 and A3 at 20 m High, on a 9 km^2 Grid

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Grid Reference X	Grid Reference Y
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead		
Lead (as particulate)	Annual average	0.329 µg m^{-3}	0.367 µg m^{-3}	315525	212875
Lead (as particulate)	Maximum hourly contribution in the year	3.49 µg m^{-3}	3.72 µg m^{-3}	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	1950 Exceedences	2025 Exceedences	315625 315535	212975 212875
Particulate Matter	Annual average	1.90 µg m^{-3}	1.86 µg m^{-3}	315525	212875
Particulate Matter	Maximum hourly contribution in the year	18.5 µg m^{-3}	18.26 µg m^{-3}	315425	212775
Particulate Matter	24 hourly average	1.94 µg m^{-3}	1.90 µg m^{-3}	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	8.85 µg m^{-3}	8.71 µg m^{-3}	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	5.60 µg m^{-3}	5.50 µg m^{-3}	315525	212875
Oxides of Nitrogen (as NO_2)	Annual average	6.41 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	43.6 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Nitrous Oxide	Annual average	0.00469 µg m^{-3}		315425	212775
Nitrous Oxide	Maximum hourly contribution in the year	0.0382 µg m^{-3}		315425	212875
Carbon Monoxide	8 hour rolling average	0.000124 µg m^{-3}		315425	212775
Carbon Monoxide	Maximum 8 hour contribution in the year	0.000778 µg m^{-3}		315425	212775
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Carbon Dioxide	Annual average	0.741 mg m^{-3}		315425	212775
Carbon Dioxide	Maximum hourly contribution in the year	6.03 mg m^{-3}		315425	212875
Methane and non-methane VOCs	Annual average	0.375 µg m^{-3}		315425	212775
Methane and non-methane VOCs	Maximum hourly contribution in the year	3.06 µg m^{-3}		315425	212875
Benzene	Annual average	0.0171 µg m^{-3}		315425	212775
Benzene	Maximum hourly contribution in the year	0.139 µg m^{-3}		315425	212875
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-

Table 7 Predicted Maximum Contributions to Ground Level Concentrations, Modelled with Meteorological Data from 2002 and A3 at 20 m High, on a 9 km^2 Grid

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Grid Reference X	Grid Reference Y
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead		
Lead (as particulate)	Annual average	0.335 µg m^{-3}	0.371 µg m^{-3}	315525	212875
Lead (as particulate)	Maximum hourly contribution in the year	3.72 µg m^{-3}	3.96 µg m^{-3}	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	2005 Exceedences	2049 Exceedences	315525	212975
Particulate Matter	Annual average	1.90 µg m^{-3}	1.87 µg m^{-3}	315525	212875
Particulate Matter	Maximum hourly contribution in the year	20.1 µg m^{-3}	19.86 µg m^{-3}	315425	212775
Particulate Matter	24 hourly average	1.90 µg m^{-3}	1.86 µg m^{-3}	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	9.29 µg m^{-3}	9.14 µg m^{-3}	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	5.40 µg m^{-3}	5.30 µg m^{-3}	315525	212875
Oxides of Nitrogen (as NO_2)	Annual average	5.71 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	40.7 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Nitrous Oxide	Annual average	0.00418 µg m^{-3}		315425	212775
Nitrous Oxide	Maximum hourly contribution in the year	0.0382 µg m^{-3}		315425	212875
Carbon Monoxide	8 hour rolling average	0.000111 µg m^{-3}		315425	212775
Carbon Monoxide	Maximum 8 hour contribution in the year	0.000877 µg m^{-3}		315425	212775
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Carbon Dioxide	Annual average	0.661 mg m^{-3}		315425	212775
Carbon Dioxide	Maximum hourly contribution in the year	6.03 mg m^{-3}		315425	212875
Methane and non-methane VOCs	Annual average	0.335 µg m^{-3}		315425	212775
Methane and non-methane VOCs	Maximum hourly contribution in the year	3.06 µg m^{-3}		315425	212875
Benzene	Annual average	0.0152 µg m^{-3}		315425	212775
Benzene	Maximum hourly contribution in the year	0.139 µg m^{-3}		315425	212875
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-

Table 6 Predicted Maximum Contributions to Ground Level Concentrations, Modelled with Meteorological Data from 2003 and A3 at 20 m High, on a 9 km^2 Grid

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Grid Reference X	Grid Reference Y
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead		
Lead (as particulate)	Annual average	0.387 µg m^{-3}	0.426 µg m^{-3}	315525	212875
Lead (as particulate)	Maximum hourly contribution in the year	3.56 µg m^{-3}	3.76 µg m^{-3}	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	2135 Exceedences	2205 Exceedences	315525	212875
Particulate Matter	Annual average	2.18 µg m^{-3}	2.14 µg m^{-3}	315525	212875
Particulate Matter	Maximum hourly contribution in the year	19.2 µg m^{-3}	19.01 µg m^{-3}	315425	212775
Particulate Matter	24 hourly average	2.32 µg m^{-3}	2.28 µg m^{-3}	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	9.85 µg m^{-3}	9.73 µg m^{-3}	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	6.62 µg m^{-3}	6.52 µg m^{-3}	315525	212875
Oxides of Nitrogen (as NO_2)	Annual average	6.26 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	41.8 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Nitrous Oxide	Annual average	0.00458 µg m^{-3}		315425	212775
Nitrous Oxide	Maximum hourly contribution in the year	0.0403 µg m^{-3}		315425	212875
Carbon Monoxide	8 hour rolling average	0.000121 µg m^{-3}		315425	212775
Carbon Monoxide	Maximum 8 hour contribution in the year	0.00078 µg m^{-3}		315425	212775
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Carbon Dioxide	Annual average	0.724 mg m^{-3}		315425	212775
Carbon Dioxide	Maximum hourly contribution in the year	6.36 mg m^{-3}		315425	212875
Methane and non-methane VOCs	Annual average	0.367 µg m^{-3}		315425	212775
Methane and non-methane VOCs	Maximum hourly contribution in the year	3.22 µg m^{-3}		315425	212875
Benzene	Annual average	0.0167 µg m^{-3}		315425	212775
Benzene	Maximum hourly contribution in the year	0.146 µg m^{-3}		315425	212875
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-

Table 9 Predicted Maximum Contributions to Ground Level Concentrations, Modelled with Meteorological Data from 2001 and A3 at 30 m High, on a 9 km^2 Grid

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Grid Reference X	Grid Reference Y
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead		
Lead (as particulate)	Annual average	0.227 µg m^{-3}	0.244 µg m^{-3}	315625 315525	212975 212875
Lead (as particulate)	Maximum hourly contribution in the year	3.10 µg m^{-3}	3.34 µg m^{-3}	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	1815 Exceedences	1867 Exceedences	315625	212975
Particulate Matter	Annual average	1.28 µg m^{-3}	1.25 µg m^{-3}	315525 315625	212875 212975
Particulate Matter	Maximum hourly contribution in the year	16.6 µg m^{-3}	16.37 µg m^{-3}	315425	212775
Particulate Matter	24 hourly average	1.31 µg m^{-3}	1.295 µg m^{-3}	315525	212975
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	6.20 µg m^{-3}	6.15 µg m^{-3}	315525	212975
Particulate Matter	90.41 percentile of the 24 hourly average	3.75 µg m^{-3}	3.71 µg m^{-3}	315525	212975
Oxides of Nitrogen (as NO_2)	Annual average	6.41 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	43.6 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Nitrous Oxide	Annual average	0.00469 µg m^{-3}		315425	212775
Nitrous Oxide	Maximum hourly contribution in the year	0.0382 µg m^{-3}		315425	212875
Carbon Monoxide	8 hour rolling average	0.000124 µg m^{-3}		315425	212775
Carbon Monoxide	Maximum 8 hour contribution in the year	0.000778 µg m^{-3}		315425	212775
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Carbon Dioxide	Annual average	0.741 mg m^{-3}		315425	212775
Carbon Dioxide	Maximum hourly contribution in the year	6.03 mg m^{-3}		315425	212875
Methane and non-methane VOCs	Annual average	0.375 µg m^{-3}		315425	212775
Methane and non-methane VOCs	Maximum hourly contribution in the year	3.06 µg m^{-3}		315425	212875
Benzene	Annual average	0.0171 µg m^{-3}		315425	212775
Benzene	Maximum hourly contribution in the year	0.139 µg m^{-3}		315425	212875
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-

Table 10 Predicted Maximum Contributions to Ground Level Concentrations, Modelled with Meteorological Data from 2002 and A3 at 30 m High, on a 9 km^2 Grid

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Grid Reference X	Grid Reference Y
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead		
Lead (as particulate)	Annual average	0.234 $\mu g\ m^{-3}$	0.254 $\mu g\ m^{-3}$	315525	212975
Lead (as particulate)	Maximum hourly contribution in the year	3.49 $\mu g\ m^{-3}$	3.70 $\mu g\ m^{-3}$	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	1807 Exceedences	1896 Exceedences	315625 315525	212975 212975
Particulate Matter	Annual average	1.37 $\mu g\ m^{-3}$	1.35 $\mu g\ m^{-3}$	315525	212975
Particulate Matter	Maximum hourly contribution in the year	18.9 $\mu g\ m^{-3}$	18.71 $\mu g\ m^{-3}$	315425	212775
Particulate Matter	24 hourly average	1.41 $\mu g\ m^{-3}$	1.39 $\mu g\ m^{-3}$	315525	212975
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	6.07 $\mu g\ m^{-3}$	5.95 $\mu g\ m^{-3}$	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	3.94 $\mu g\ m^{-3}$	3.89 $\mu g\ m^{-3}$	315525	212975
Oxides of Nitrogen (as NO_2)	Annual average	5.71 $\mu g\ m^{-3}$		315425	212775
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	40.7 $\mu g\ m^{-3}$		315425	212775
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Nitrous Oxide	Annual average	0.00418 $\mu g\ m^{-3}$		315425	212775
Nitrous Oxide	Maximum hourly contribution in the year	0.0382 $\mu g\ m^{-3}$		315425	212875
Carbon Monoxide	8 hour rolling average	0.000111 $\mu g\ m^{-3}$		315425	212775
Carbon Monoxide	Maximum 8 hour contribution in the year	0.000877 $\mu g\ m^{-3}$		315425	212775
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Carbon Dioxide	Annual average	0.661 mg m^{-3}		315425	212775
Carbon Dioxide	Maximum hourly contribution in the year	6.03 mg m^{-3}		315425	212875
Methane and non-methane VOCs	Annual average	0.335 $\mu g\ m^{-3}$		315425	212775
Methane and non-methane VOCs	Maximum hourly contribution in the year	3.06 $\mu g\ m^{-3}$		315425	212875
Benzene	Annual average	0.0152 $\mu g\ m^{-3}$		315425	212775
Benzene	Maximum hourly contribution in the year	0.139 $\mu g\ m^{-3}$		315425	212875
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-

Table 11 Predicted Maximum Contributions to Ground Level Concentrations, Modelled with Meteorological Data from 2003 and A3 at 30 m High, on a 9 km^2 Grid

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Grid Reference X	Grid Reference Y
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead		
Lead (as particulate)	Annual average	0.25 µg m^{-3}	0.283 µg m^{-3}	315625	212975
Lead (as particulate)	Maximum hourly contribution in the year	3.33 µg m^{-3}	3.53 µg m^{-3}	315525 315425	212875 212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	2024 Exceedences	2054 Exceedences	315625	212975
Particulate Matter	Annual average	1.47 µg m^{-3}	1.43 µg m^{-3}	315525	212875
Particulate Matter	Maximum hourly contribution in the year	18.09 µg m^{-3}	17.89 µg m^{-3}	315425	212775
Particulate Matter	24 hourly average	1.55 µg m^{-3}	1.51 µg m^{-3}	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	6.72 µg m^{-3}	6.60 µg m^{-3}	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	4.38 µg m^{-3}	4.32 µg m^{-3}	315525 315525	212875 212975
Oxides of Nitrogen (as NO_2)	Annual average	6.26 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	41.8 µg m^{-3}		315425	212775
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Nitrous Oxide	Annual average	0.00458 µg m^{-3}		315425	212775
Nitrous Oxide	Maximum hourly contribution in the year	0.0403 µg m^{-3}		315425	212875
Carbon Monoxide	8 hour rolling average	0.000121 µg m^{-3}		315425	212775
Carbon Monoxide	Maximum 8 hour contribution in the year	0.00078 µg m^{-3}		315425	212775
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-
Carbon Dioxide	Annual average	0.724 mg m^{-3}		315425	212775
Carbon Dioxide	Maximum hourly contribution in the year	6.36 mg m^{-3}		315425	212875
Methane and non-methane VOCs	Annual average	0.367 µg m^{-3}		315425	212775
Methane and non-methane VOCs	Maximum hourly contribution in the year	3.22 µg m^{-3}		315425	212875
Benzene	Annual average	0.0167 µg m^{-3}		315425	212775
Benzene	Maximum hourly contribution in the year	0.146 µg m^{-3}		315425	212875
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-	-

Table 12 Predicted Maximum Contributions to Ground Level Concentrations at Receptors, Modelled with Meteorological Data from 2001 and A3 at 20 m High

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Receptor
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead	
Lead (as particulate)	Annual average	0.024 $\mu g\ m^{-3}$	0.026 $\mu g\ m^{-3}$	Nearest Resident
Lead (as particulate)	Maximum hourly contribution in the year	0.76 $\mu g\ m^{-3}$	0.78 $\mu g\ m^{-3}$	Nearest Resident
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	114 Exceedences	124 Exceedences	Nearest Resident
Particulate Matter	Annual average	0.132 $\mu g\ m^{-3}$	0.13 $\mu g\ m^{-3}$	Nearest Resident
Particulate Matter	Maximum hourly contribution in the year	4.0 $\mu g\ m^{-3}$	3.99 $\mu g\ m^{-3}$	Nearest Resident
Particulate Matter	24 hourly average	0.131 $\mu g\ m^{-3}$	0.129 $\mu g\ m^{-3}$	Carno Reservoir
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-
Particulate Matter	98.08 percentile of the 24 hourly average	1.16 $\mu g\ m^{-3}$	1.15 $\mu g\ m^{-3}$	Nearest Resident
Particulate Matter	90.41 percentile of the 24 hourly average	0.43 $\mu g\ m^{-3}$	0.426 $\mu g\ m^{-3}$	Nearest Resident
Oxides of Nitrogen (as NO_2)	Annual average	0.28 $\mu g\ m^{-3}$		Nearest Resident
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	9.47 $\mu g\ m^{-3}$		Nearest Resident
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-
Nitrous Oxide	Annual average	0.0002 $\mu g\ m^{-3}$		Nearest Resident
Nitrous Oxide	Maximum hourly contribution in the year	0.0094 $\mu g\ m^{-3}$		Nearest Resident
Carbon Monoxide	8 hour rolling average	0.000005 $\mu g\ m^{-3}$		Nearest Resident
Carbon Monoxide	Maximum 8 hour contribution in the year	0.00011 $\mu g\ m^{-3}$		Nearest Resident
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-
Carbon Dioxide	Annual average	0.032 $mg\ m^{-3}$		Nearest Resident
Carbon Dioxide	Maximum hourly contribution in the year	1.48 $mg\ m^{-3}$		Nearest Resident
Methane and non-methane VOCs	Annual average	0.016 $\mu g\ m^{-3}$		Nearest Resident
Methane and non-methane VOCs	Maximum hourly contribution in the year	0.75 $\mu g\ m^{-3}$		Nearest Resident
Benzene	Annual average	0.0007 $\mu g\ m^{-3}$		Nearest Resident
Benzene	Maximum hourly contribution in the year	0.034 $\mu g\ m^{-3}$		Nearest Resident
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-

Table 13 Predicted Maximum Contributions to Ground Level Concentrations at Receptors, Modelled with Meteorological Data from 2002 and A3 at 20 m High

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Receptor
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead	
Lead (as particulate)	Annual average	0.019 µg m^{-3}	0.0199 µg m^{-3}	Llangynidr Reservoir
Lead (as particulate)	Maximum hourly contribution in the year	0.73 µg m^{-3}	0.75 µg m^{-3}	Nearest Resident
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	69 Exceedences	78 Exceedences	Nearest Resident
Particulate Matter	Annual average	0.10 µg m^{-3}	0.10 µg m^{-3}	Llangynidr Reservoir
Particulate Matter	Maximum hourly contribution in the year	3.88 µg m^{-3}	3.86 µg m^{-3}	Nearest Resident
Particulate Matter	24 hourly average	0.10 µg m^{-3}	0.099 µg m^{-3}	Llangynidr Reservoir
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-
Particulate Matter	98.08 percentile of the 24 hourly average	0.68 µg m^{-3}	0.67 µg m^{-3}	Nearest Resident
Particulate Matter	90.41 percentile of the 24 hourly average	0.32 µg m^{-3}	0.32 µg m^{-3}	Carno Reservoir
Oxides of Nitrogen (as NO_2)	Annual average	0.185 µg m^{-3}		Nearest Resident
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	9.3 µg m^{-3}		Nearest Resident
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-
Nitrous Oxide	Annual average	0.0001 µg m^{-3}		Nearest Resident
Nitrous Oxide	Maximum hourly contribution in the year	0.01 µg m^{-3}		Nearest Resident
Carbon Monoxide	8 hour rolling average	0.000004 µg m^{-3}		Nearest Resident
Carbon Monoxide	Maximum 8 hour contribution in the year	0.00011 µg m^{-3}		Nearest Resident
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-
Carbon Dioxide	Annual average	0.021 mg m^{-3}		Nearest Resident
Carbon Dioxide	Maximum hourly contribution in the year	1.60 mg m^{-3}		Nearest Resident
Methane and non-methane VOCs	Annual average	0.011 µg m^{-3}		Nearest Resident
Methane and non-methane VOCs	Maximum hourly contribution in the year	0.81 µg m^{-3}		Nearest Resident
Benzene	Annual average	0.0005 µg m^{-3}		Nearest Resident
Benzene	Maximum hourly contribution in the year	0.037 µg m^{-3}		Nearest Resident
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-

Table 14 Predicted Maximum Contributions to Ground Level Concentrations at Receptors, Modelled with Meteorological Data from 2003 and A3 at 20 m High

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration		Receptor
		Particulate from C1-C5 is from Combustion Only	Particulate from Combustion is 30 % Lead	
Lead (as particulate)	Annual average	0.0199 $\mu g\ m^{-3}$	0.021 $\mu g\ m^{-3}$	Carno Reservoir
Lead (as particulate)	Maximum hourly contribution in the year	0.767 $\mu g\ m^{-3}$	0.785	Nearest Resident
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	97 Exceedences	111 Exceedences	Nearest Resident
Particulate Matter	Annual average	0.108 $\mu g\ m^{-3}$	0.107 $\mu g\ m^{-3}$	Llangynidr Reservoir
Particulate Matter	Maximum hourly contribution in the year	4.03 $\mu g\ m^{-3}$	4.01 $\mu g\ m^{-3}$	Nearest Resident
Particulate Matter	24 hourly average	0.113 $\mu g\ m^{-3}$	0.112 $\mu g\ m^{-3}$	Carno Reservoir
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	No Exceedences	-
Particulate Matter	98.08 percentile of the 24 hourly average	0.96 $\mu g\ m^{-3}$	0.957 $\mu g\ m^{-3}$	Nearest Resident
Particulate Matter	90.41 percentile of the 24 hourly average	0.336 $\mu g\ m^{-3}$	0.33 $\mu g\ m^{-3}$	Carno Reservoir
Oxides of Nitrogen (as NO_2)	Annual average	0.192 $\mu g\ m^{-3}$		Nearest Resident
Oxides of Nitrogen (as NO_2)	99.79 percentile of the hourly average	9.23 $\mu g\ m^{-3}$		Nearest Resident
Oxides of Nitrogen (as NO_2)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-
Nitrous Oxide	Annual average	0.00014 $\mu g\ m^{-3}$		Nearest Resident
Nitrous Oxide	Maximum hourly contribution in the year	0.0098 $\mu g\ m^{-3}$		Nearest Resident
Carbon Monoxide	8 hour rolling average	0.000004 $\mu g\ m^{-3}$		Nearest Resident
Carbon Monoxide	Maximum 8 hour contribution in the year	0.00013 $\mu g\ m^{-3}$		Nearest Resident
Carbon Monoxide	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-
Carbon Dioxide	Annual average	0.022 $mg\ m^{-3}$		Nearest Resident
Carbon Dioxide	Maximum hourly contribution in the year	1.54 $mg\ m^{-3}$		Nearest Resident
Methane and non-methane VOCs	Annual average	0.011 $\mu g\ m^{-3}$		Nearest Resident
Methane and non-methane VOCs	Maximum hourly contribution in the year	0.78 $\mu g\ m^{-3}$		Nearest Resident
Benzene	Annual average	0.00051 $\mu g\ m^{-3}$		Nearest Resident
Benzene	Maximum hourly contribution in the year	0.036 $\mu g\ m^{-3}$		Nearest Resident
Benzene	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	No Exceedences		-

Table 15 Predicted Maximum Contributions to Ground Level Concentrations Modelling Varying Discharge Temperatures, A3 at 30 m High, and Assuming All Particulate from Combustion Stacks is a Product of Gas Combustion, Containing No Lead Particulate

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration (Year of Meteorological Data)	Grid Reference X	Grid Reference Y
Temperature of Process Stacks Reduced to 70 °C at Discharge				
Lead (as particulate)	Annual average	0.4 µg m^{-3} (2003)	315525	212875
Lead (as particulate)	Maximum hourly contribution in the year	3.73 µg m^{-3} (2003)	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	2172 Exceedences (2003)	315525	212875
Particulate Matter	Annual average	2.26 µg m^{-3} (2003)	315525	212875
Particulate Matter	Maximum hourly contribution in the year	21.14 µg m^{-3} (2002)	315425	212775
Particulate Matter	24 hourly average	2.4 µg m^{-3} (2003)	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	10.02 µg m^{-3} (2003)	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	6.88 µg m^{-3} (2003)	315525	212875
Temperature of Process Stacks Increased to 120 °C at Discharge				
Lead (as particulate)	Annual average	0.226 µg m^{-3} (2003)	315625	212975
Lead (as particulate)	Maximum hourly contribution in the year	3.00 µg m^{-3} (2002)	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	1951 Exceedences (2003)	315625	212975
Particulate Matter	Annual average	1.31 µg m^{-3} (2003)	315525	212875
Particulate Matter	Maximum hourly contribution in the year	16.4 µg m^{-3} (2002)	315425	212775
Particulate Matter	24 hourly average	1.4 µg m^{-3} (2003)	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	6.34 µg m^{-3} (2003)	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	3.98 µg m^{-3} (2003)	315525	212975

Table 16 Predicted Maximum Contributions to Ground Level Concentrations Modelling Varying Discharge Temperatures, A3 at 30 m High, and Assuming 30 % of the Particulate from Combustion Stacks is Lead Particulate

Pollutant	Reporting Basis	Maximum Contribution to Ground Level Concentration (Year of Meteorological Data)	Grid Reference X	Grid Reference Y
Temperature of Process Stacks Reduced to 70 °C at Discharge				
Lead (as particulate)	Annual average	0.44 µg m^{-3} (2003)	315525	212875
Lead (as particulate)	Maximum hourly contribution in the year	3.95 µg m^{-3} (2003)	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	2223 Exceedences (2003)	315525	212875
Particulate Matter	Annual average	2.22 µg m^{-3} (2003)	315525	212875
Particulate Matter	Maximum hourly contribution in the year	20.88 µg m^{-3} (2002)	315425	212775
Particulate Matter	24 hourly average	2.36 µg m^{-3} (2003)	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	9.69 µg m^{-3} (2003)	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	6.77 µg m^{-3} (2003)	315525	212875
Temperature of Process Stacks Increased to 120 °C at Discharge				
Lead (as particulate)	Annual average	0.25 µg m^{-3} (2003)	315525	212875
Lead (as particulate)	Maximum hourly contribution in the year	3.21 µg m^{-3} (2002)	315425	212775
Lead (as particulate)	Location experiencing the highest number of exceedences of the Air Quality Standard in the year	1993 Exceedences (2003)	315625	212975
Particulate Matter	Annual average	1.28 µg m^{-3} (2003)	315525	212975
Particulate Matter	Maximum hourly contribution in the year	16.19 µg m^{-3} (2002)	315425	212775
Particulate Matter	24 hourly average	1.35 µg m^{-3} (2003)	315525	212875
Particulate Matter	Location experiencing the highest number of exceedences of the 24 hourly Air Quality Standard in the year	No Exceedences	-	-
Particulate Matter	98.08 percentile of the 24 hourly average	6.22 µg m^{-3} (2003)	315525	212875
Particulate Matter	90.41 percentile of the 24 hourly average	3.94 µg m^{-3} (2003)	315525	212975

From the results presented in Tables 6 to 16 and Figures 1 to 9, it is apparent that for each of the pollutants modelled, the average concentrations are predicted to be within the requirements of the air quality limit values. The maximum predicted contribution to ground level concentrations of combustion gases are well below any Air Quality Limit, as is the predicted particulate concentration.

Models Run Assuming Process Stack A3 is 20 m High:

The highest annual average concentration of lead particulate was calculated using meteorological data from the year 2003, and assuming that 30 % of the particulate from combustion was lead. This resulted in an annual average concentration of 0.426 µg m^{-3}, which represents 85.2 % of the annual (long term) air quality limit value. Assuming that combustion gases contained no lead predicted a concentration of 0.387 µg m^{-3}, which represents 77.4 % of the annual (long term) air quality limit value. As the percentage contribution of pollutants is more than 1 % of the limit value, the contribution of the Envirowales process to air quality in the local area can be considered significant.

Lead particulate was the only pollutant predicted to exceed the air quality limit during any one hourly average. The maximum hourly concentration of lead pollution from the Envirowales site was calculated to occur in 2002, with a concentration of 3.96 µg m^{-3} (30 % lead in the combustion gases) or 3.72 µg m^{-3} (lead from process stacks only). These represent the worst case contribution to ground level concentrations predicted by the models runs, and can be considered to represent the worst case short term contribution. There is no short term air quality limit value for lead. Hourly averaged contributions of lead to ground level concentrations were predicted to exceed the annual average limit value of 0.5 µg m^{-3}, and the most exceedences occurred at a location just outside of the site boundary, whilst modelling 2003 met. data. The hourly average exceeded 0.5 µg m^{-3} 2135 - 2205 times at this point (grid reference 3155425 212875) when omitting lead from combustion gases, and including it as 30 % respectively.

Models Run Assuming Process Stack A3 is 30 m High:

Due to the process stacks being modelled for emissions of lead and particulate only, only the results of these two pollutants were affected by the increase in height of stack A3. As would be expected, an increase in the height of the stack leads to more effective dispersion and thus the results in Tables 9 – 11 present lower particulate and lead concentrations than those in Tables 6 – 8, however the pattern of dispersion is similar between the two scenarios, with met. data from 2003 giving higher average contributions of the pollutants to ground level concentrations, and data from 2002 resulting in the highest maximum contributions of lead and PM_{10} particulate.

Sensitive Receptors:

Of the sensitive receptors modelled, the nearest resident located at grid reference 315538 212188, experienced the highest concentrations of pollutant contributions from the site on most occasions. It should be noted however, that all of the predicted results were well below any relevant air quality limit value, and the hourly average concentration of lead only exceeded the annual average limit value of 0.5 µg m^{-3} a maximum of 124 times (2001 meteorological data, assuming A3 is 20 m and particulate from combustion gases consist of 30 % lead). The results from modelling the contribution to ground level concentrations at the sensitive receptors assumes emission point A3 has a stack height of 20 m. Increasing the stack height will lead to more effective dispersion, reducing the pollutant concentrations contributed from the process to any one point.

Modelling Variations in Temperature:

Variations in stack gas temperature affect the momentum and buoyancy of the plume. The process stacks proposed for the Envirowales site are estimated to have a discharge temperature of 80 °C, however it is considered that this temperature may be as low as 70 °C or as high as 120 °C. Therefore, a model was run to determine the effects of temperature variation. As would be expected, lowering the discharge temperature reduces the efficiency of dispersion, leading to higher pollutant concentrations reaching ground level. Hotter stack gases however result in lower pollutant concentrations due to more efficient dispersion. Despite the temperature variations, concentrations of pollutants were still with the air quality limit values where applicable.

Figures 1 - 9 present contour plots of the contribution to ground level concentrations of the pollutants modelled. Averaging periods are consistent with the requirements of the air quality limit values, or are annual where no air quality limit value exists.

Background concentrations of lead in air are measured through a National Air Quality Monitoring Network (the National Network). Additional ambient monitoring may also be undertaken by Local Authorities in specific locations of concern within their area. The current results of the National Network monitoring of lead were published on the Air Quality Archive website[6] in October 2004. The annual average lead concentrations at the sites monitored in 2003 ranged from 0.003 µg m^{-3} to 0.103 µg m^{-3}. Based on this data and assuming a worst case scenario, the overall predicted ground level concentration in the locality of the Envirowales site could total 0.426 µg m^{-3} + 0.103 µg m^{-3} = 0.529 µg m^{-3}. This concentration is higher than the air quality limit value of 0.5 µg m^{-3}. It should however be remembered that the emissions included assume a maximum and worst case scenario, and it is thought that the actual emissions from the site are likely to be much lower than the data included in this model. Additionally, the assumptions on site operation times assume a worst case.

Monitoring work undertaken in Cardiff by Cardiff City Council in 1999 through to 2003, demonstrate much lower background concentrations than the maximum considered above, with results ranging from 0.01 to 0.02 µg m^{-3}. There is no background monitoring work undertaken by the Local Authority close to the Envirowales site in Ebbw Vale, thus if these figures are applied to the worst case predicted results from the modelling exercise, the overall predicted ground level concentration in the locality of the Envirowales site could total 0.426 µg m^{-3} + 0.02 µg m^{-3} = 0.446 µg m^{-3}. These figures do not take account for any other potential contributions to ground level lead concentrations in the area.

5. Conclusions

Environmental Visage Limited was requested by Envirowales Ltd to undertake a modelling exercise to predict the contribution of their proposed process emissions to ground level concentrations of pollution. Details of the emission points to be modelled were supplied by Envirowales, as were the estimated emissions concentrations from the process stacks. Emissions of combustion gases from the combustion stacks were calculated using the UK Emission Factors Database[2], with the exception of NO_x (modelled as N_2O) a concentration for which was provided by the burner manufacturer.

The emissions from the process stacks were considered to consist of lead and particulate only. The combustion stacks (C1 – C5) were considered to emit combustion gases and particulate. For some modelling scenarios, up to 30 % of the particulate from combustion was considered to be lead. All models were run taking into account the site buildings, local terrain data and meteorological data considered representative of conditions at the site, for years 2001 through to 2003.

Where appropriate, the results of the modelling were compared with air quality limit values, and all pollutants were within the limits for each model run. The highest annual average contribution to ground level concentrations of lead predicted was 0.426 µg m^{-3}, occurring in 2003, which is below the air quality limit value of 0.5 µg m^{-3} as an annual average. Additionally, a background concentration of 0.103 µg m^{-3} was included with this figure to represent the highest background concentration measured in 2003 by the National Network. The result of this addition exceeds the air quality limit value, equalling 0.529 µg m^{-3}. Considering the National Network undertakes a wide variety of monitoring, ranging from rural locations to the contribution of lead in air from the lead in petrol, it is suggested that the background concentration (that is, not including the process contribution from industrial sites in the vicinity) of lead in ambient air in the Rassau area is likely to be lower than this. Additionally, it is believed that the emissions data from the site is representative of a worst case and it is considered that emissions should in actual fact be much lower than the data incorporated into this model.

The worst case short term, hourly average contribution to ground level concentrations of lead was calculated to occur in 2002, with a concentration of 3.96 µg m^{-3}.

Dispersion of all other pollutants resulted in contributions to ground level concentrations which were well within the air quality limit values.

6. References

1. Air Quality Limit Values Regulations. Statutory instrument 2003 Number 2121. HMSO. ISBN 0 1104 7448 1

2. UK Emission Factors Database www.naei.co.uk

3. www.airquality.co.uk Lead Trace Elements and Industrial Metals Data. Updated 27/10/2003.

4. Occupational Exposure Limits 2002, Supplement 2003. Environmental Hygiene 40/2002 (EH40), Health and Safety Executive. HMOS. ISBN 0 7176 2172 3.

FIGURES

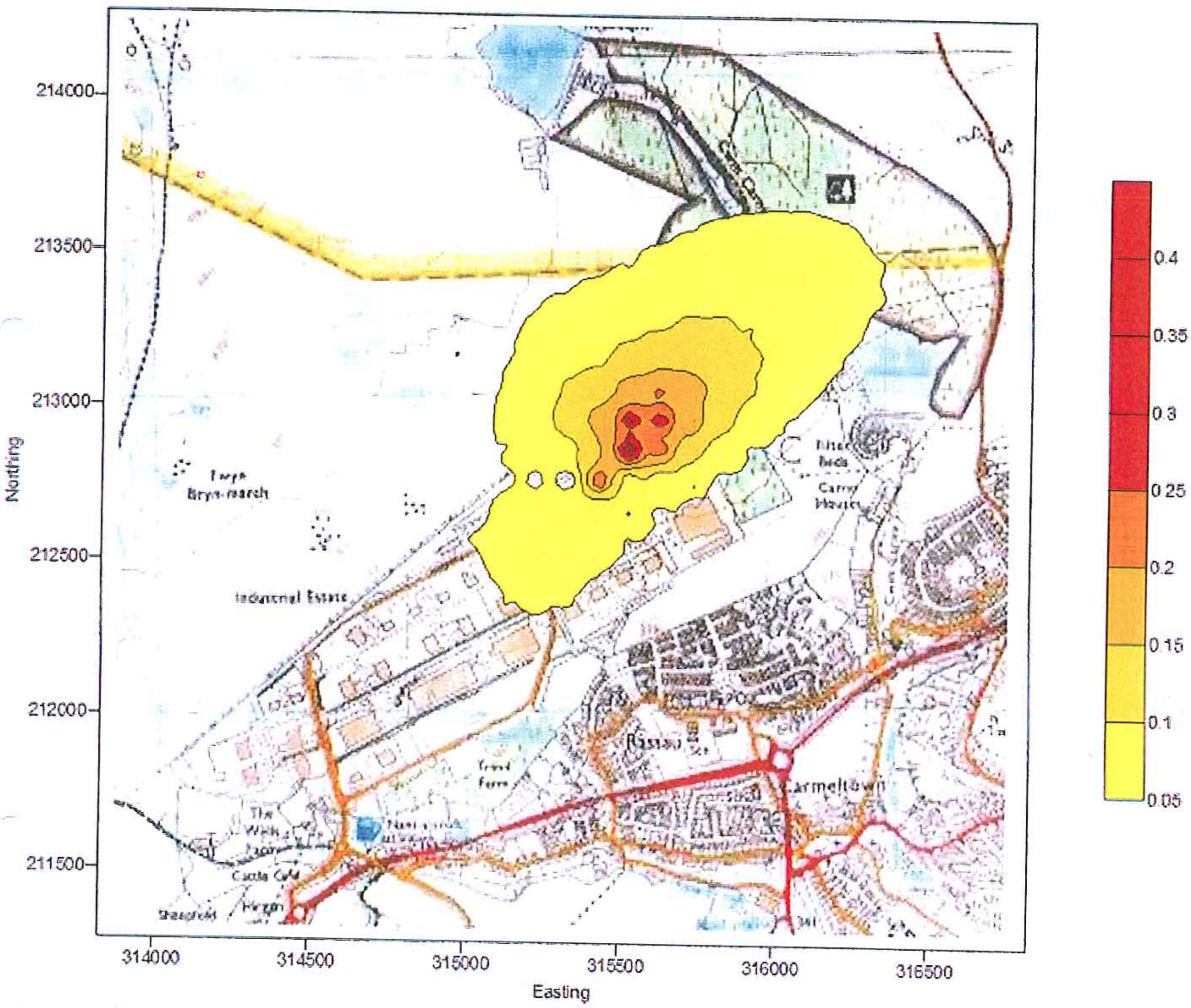


Figure 1 Maximum Predicted Annual Average Contribution to Ground Level Concentrations of Lead (ug/m3) from the Proposed Envirowales Site. Assumes 30% of the Particulate from Combustion Processes is Lead, Process Stack A3 is 20 m and Applies Meteorological Data from 2003.

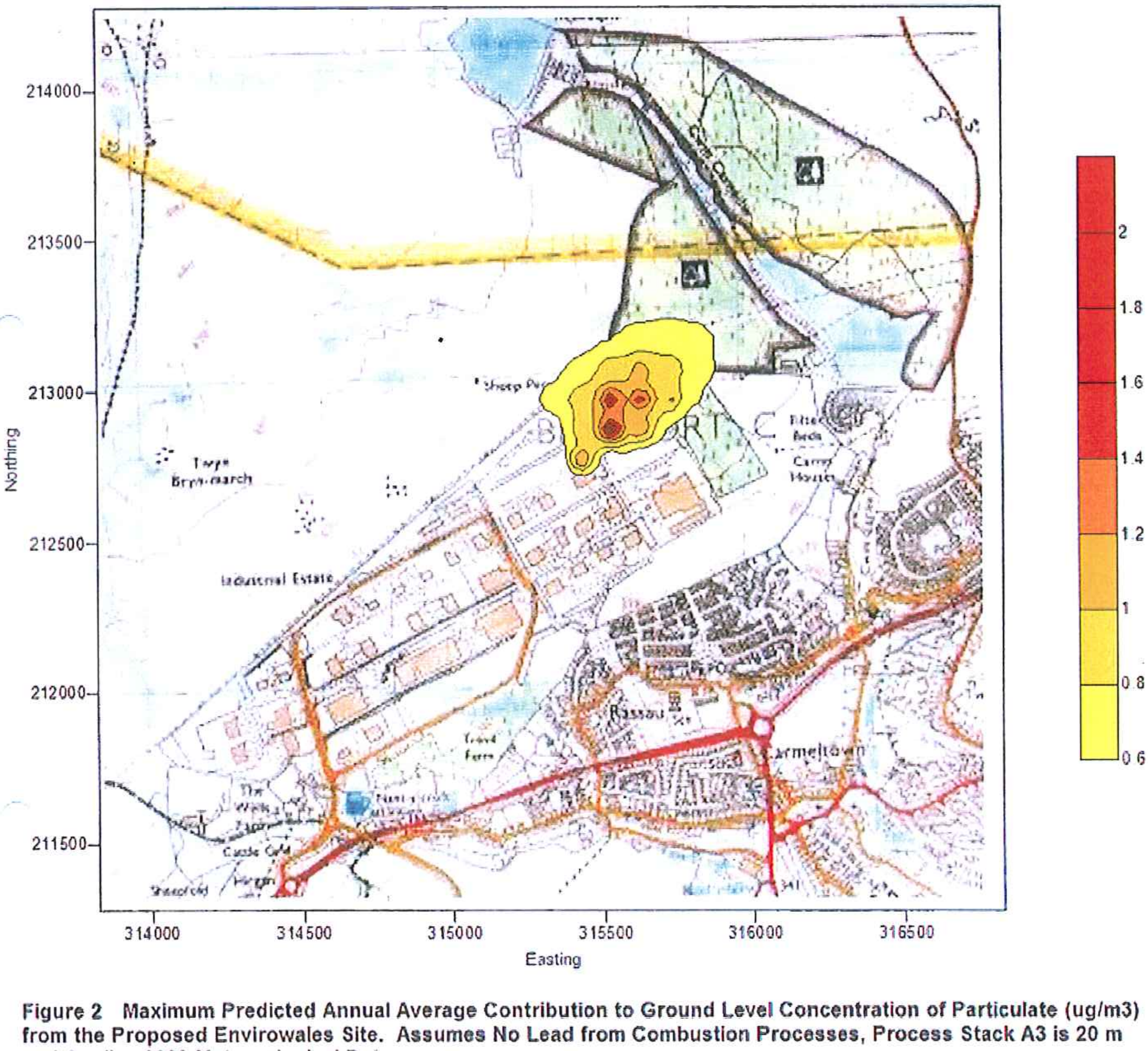


Figure 2 Maximum Predicted Annual Average Contribution to Ground Level Concentration of Particulate (ug/m3) from the Proposed Envirowales Site. Assumes No Lead from Combustion Processes, Process Stack A3 is 20 m and Applies 2003 Meteorological Data.

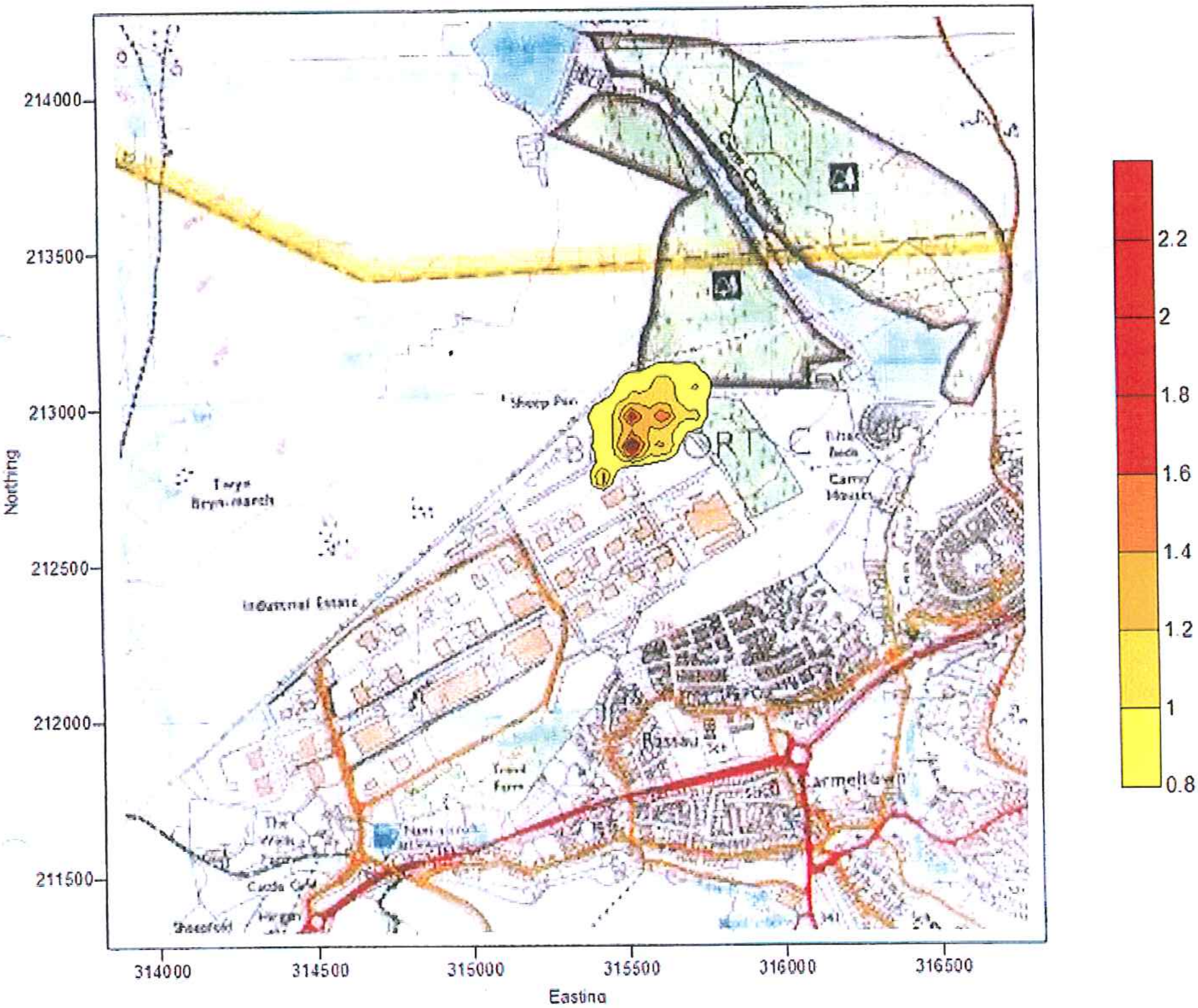


Figure 3 Maximum Predicted 24 Hourly Average Contribution to Ground Level Concentrations of Particulate (ug/m3) from the Proposed Envirowales Site. Assumes No Lead from Combustion Processes, Process Stack A3 is 20 m and Applies 2003 Meteorological Data.

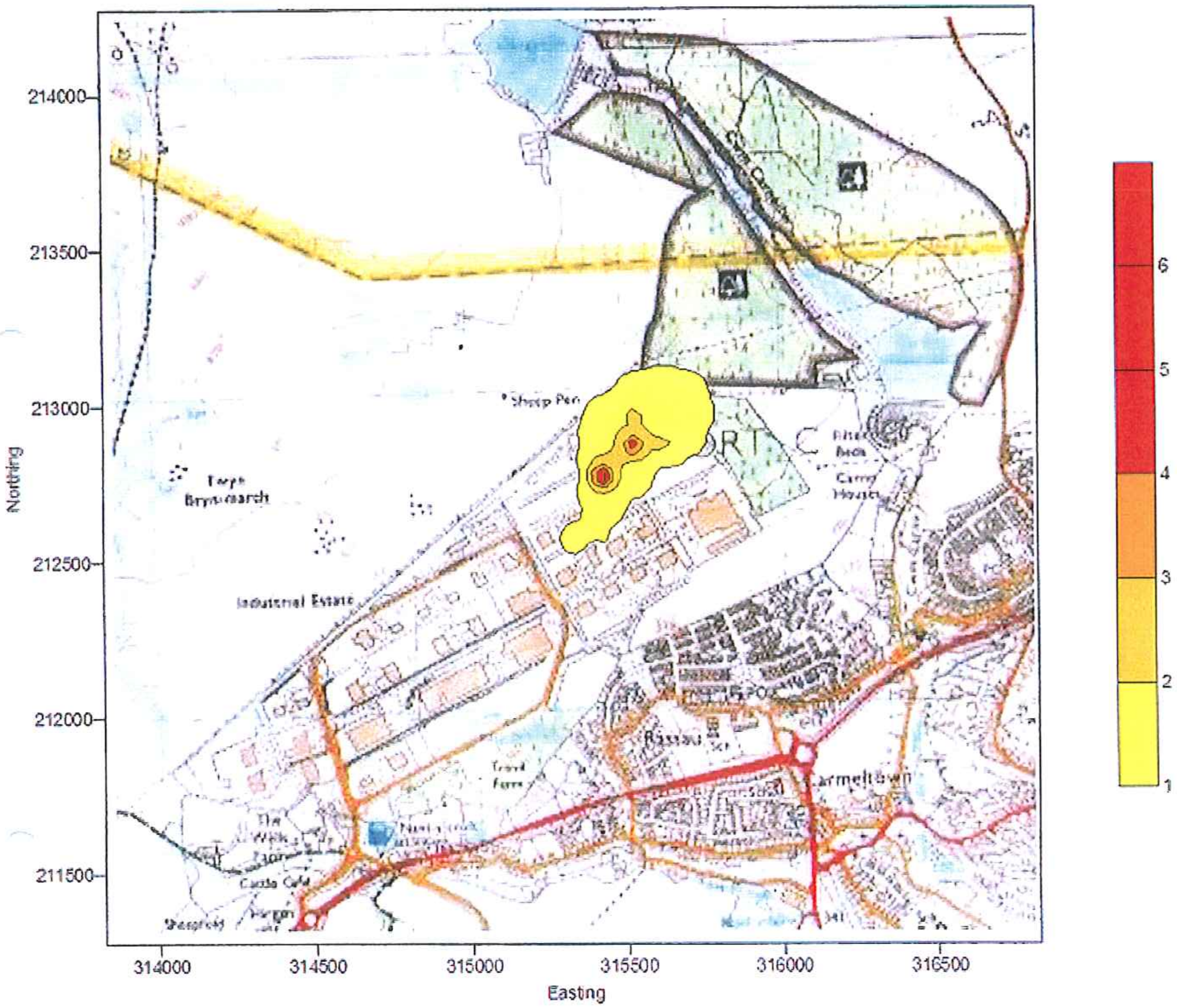


Figure 4 Maximum Predicted Annual Average Contribution to Ground Level Concentrations of Oxides of Nitrogen (as Nitrogen Dioxide) (ug/m3) from the Proposed Envirowales Site Using 2001 Meteorological Data.

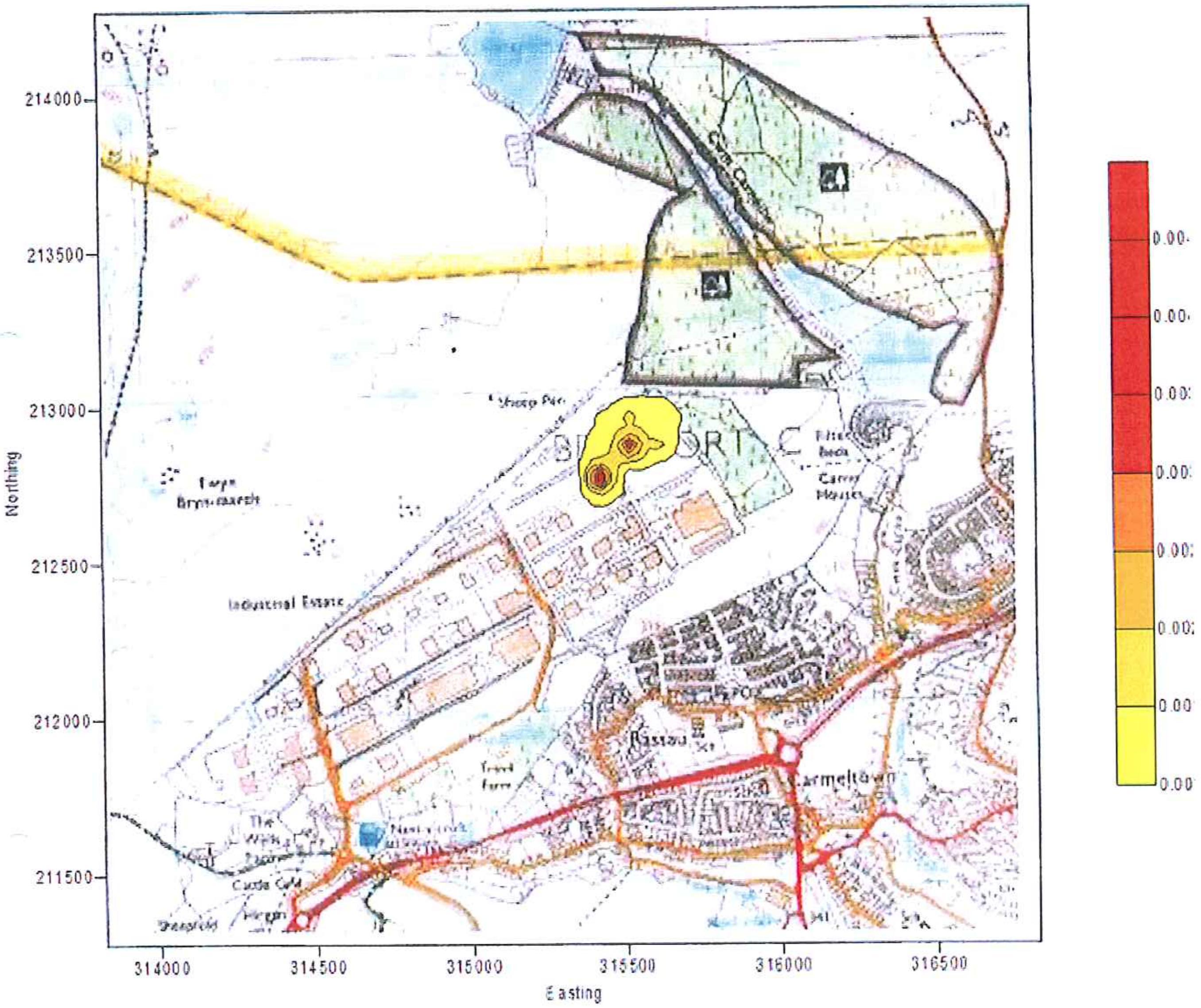


Figure 5 Maximum Predicted Annual Average Contribution to Ground Level Concentrations of Nitrogen Dioxide (ug/m3) from teh Proposed Envirowales Site Using 2001 Meteorological Data.

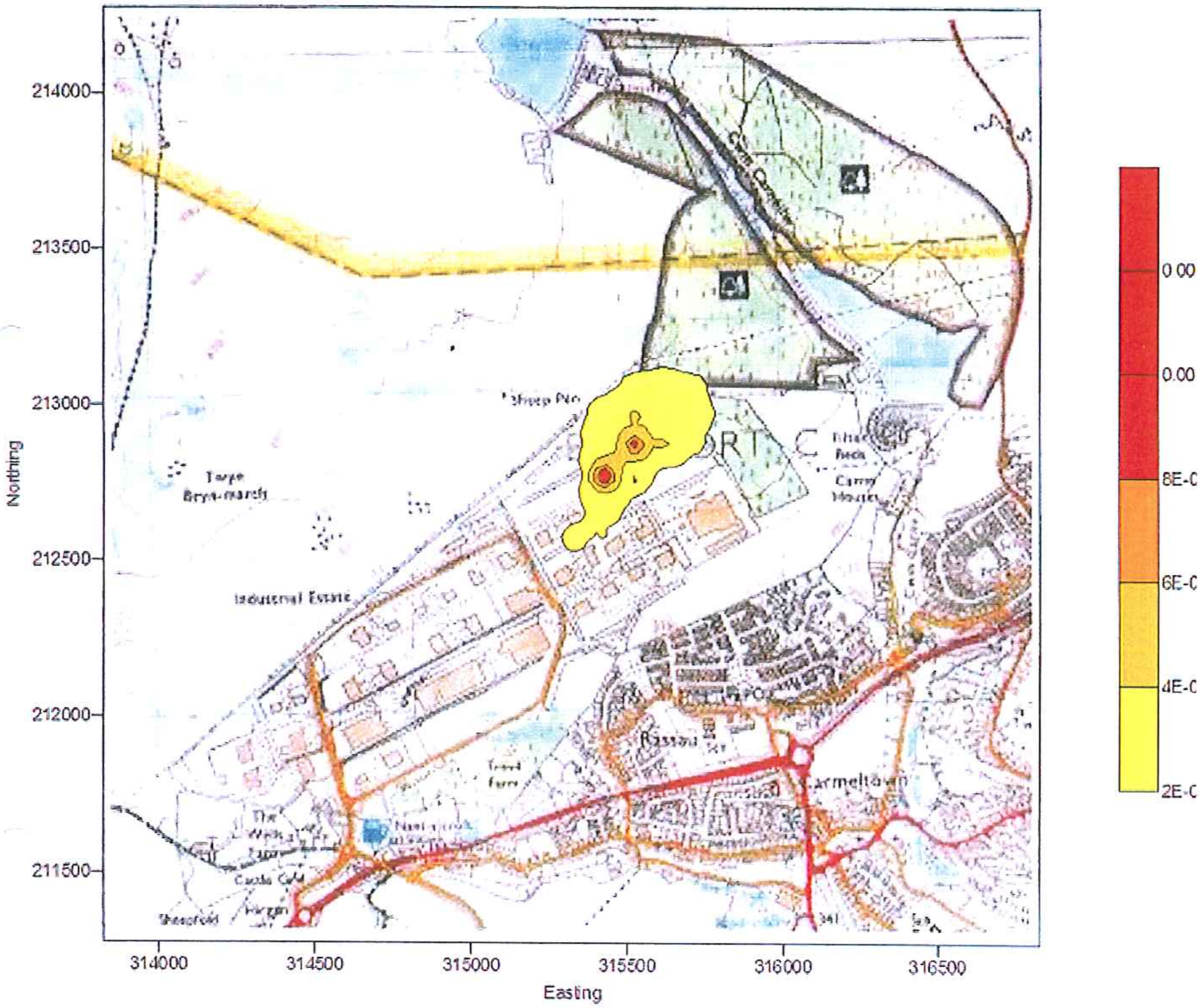


Figure 6 Maximum Predicted 8 Hourly Average Contribution to Ground level Concentrations of Carbon Monoxide (ug/m3) from the Proposed Envirowales Site Using 2001 Meteorological Data.

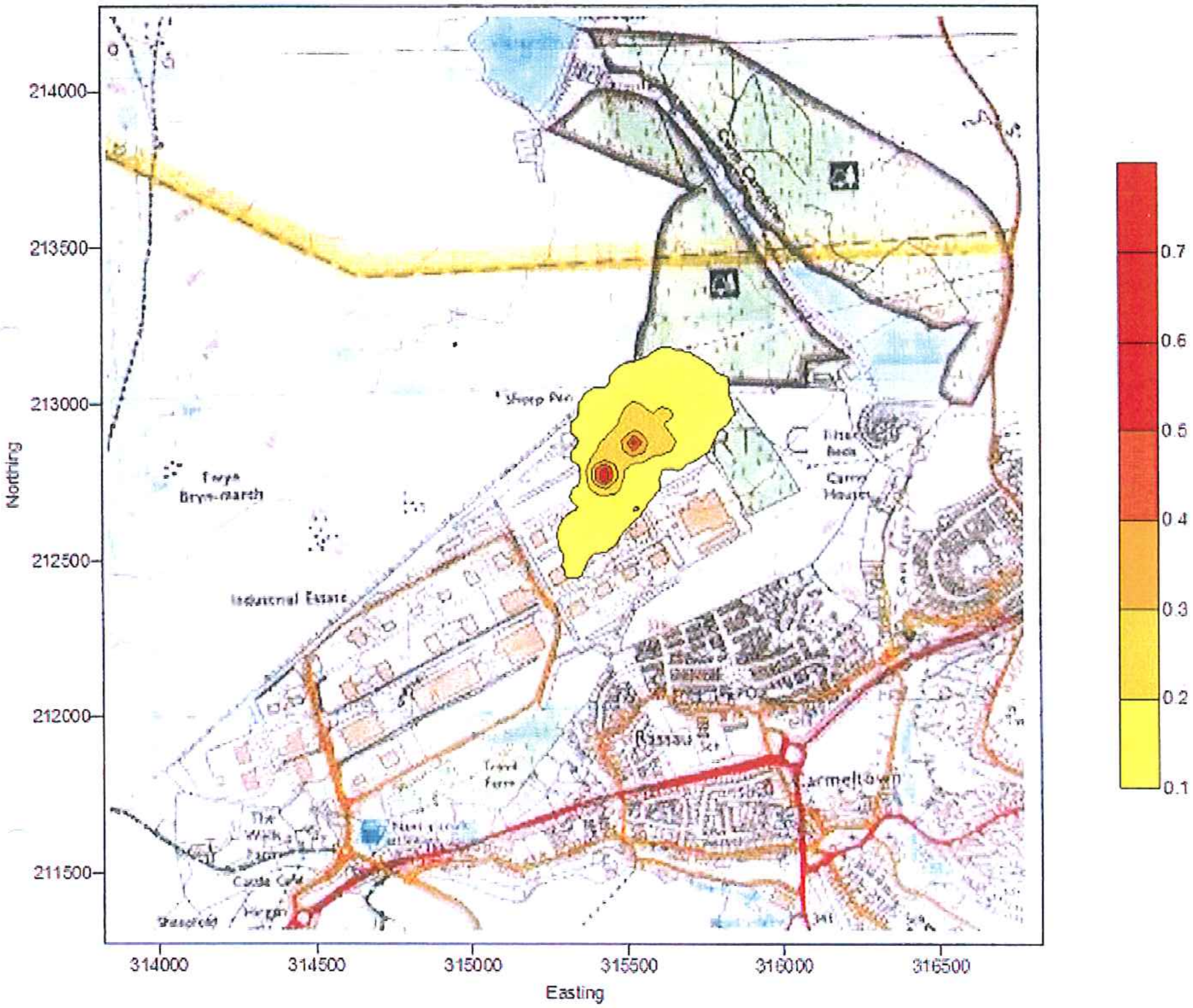


Figure 7 Maximum Predicted Annual Average Contribution to Ground Level Concentrations of Carbon Monoxide (mg/m3) from the Propsed Envirowales Site Using 2001 Meteorological Data.

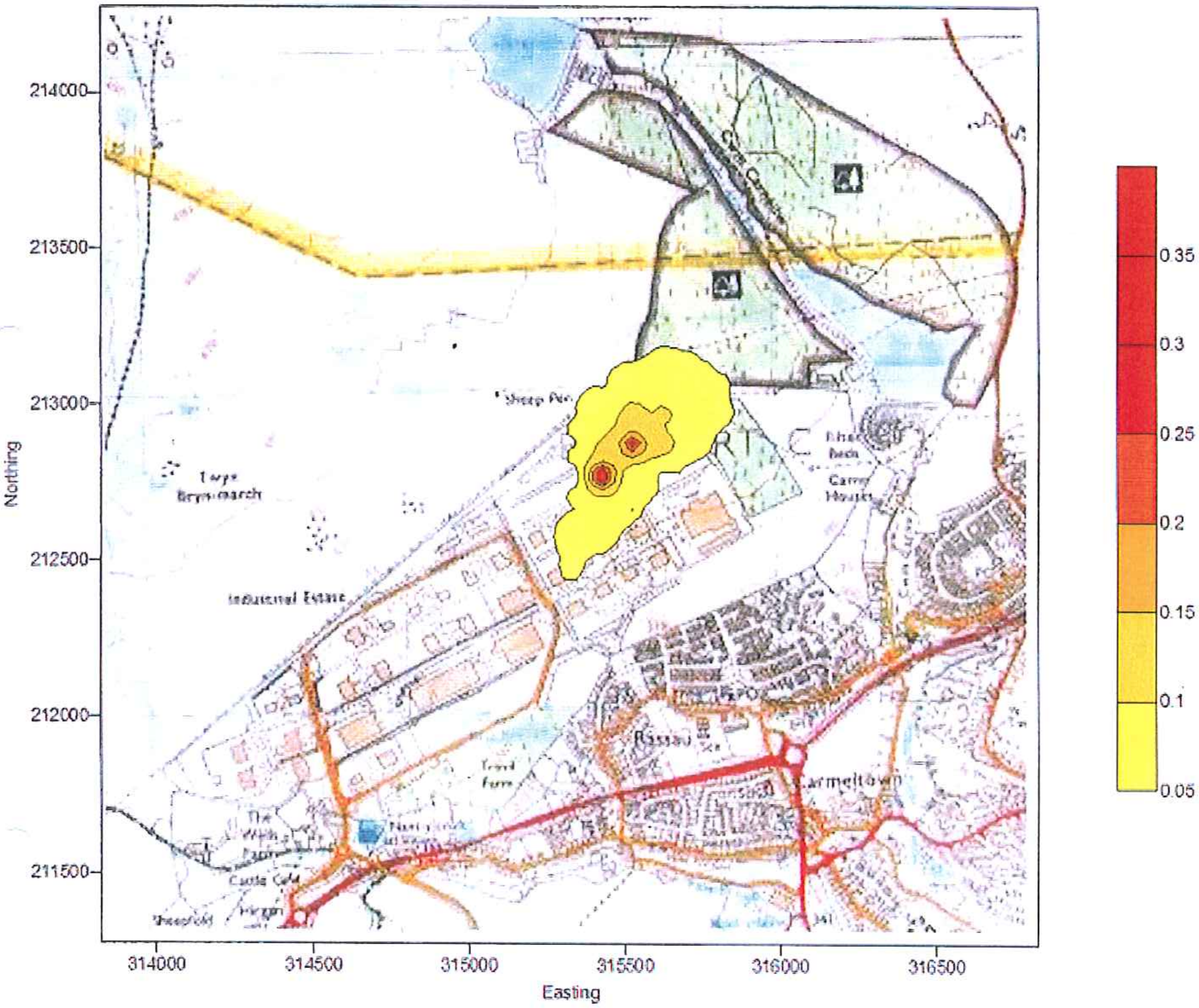


Figure 8 Maximum Predicted Annual Average Contribution to Ground Level Concentration of Methane and Non-Methane Volatile Organic Compounds (ug/m3) from the Proposed Envirowales Site Using 2001 Meteorological Data.

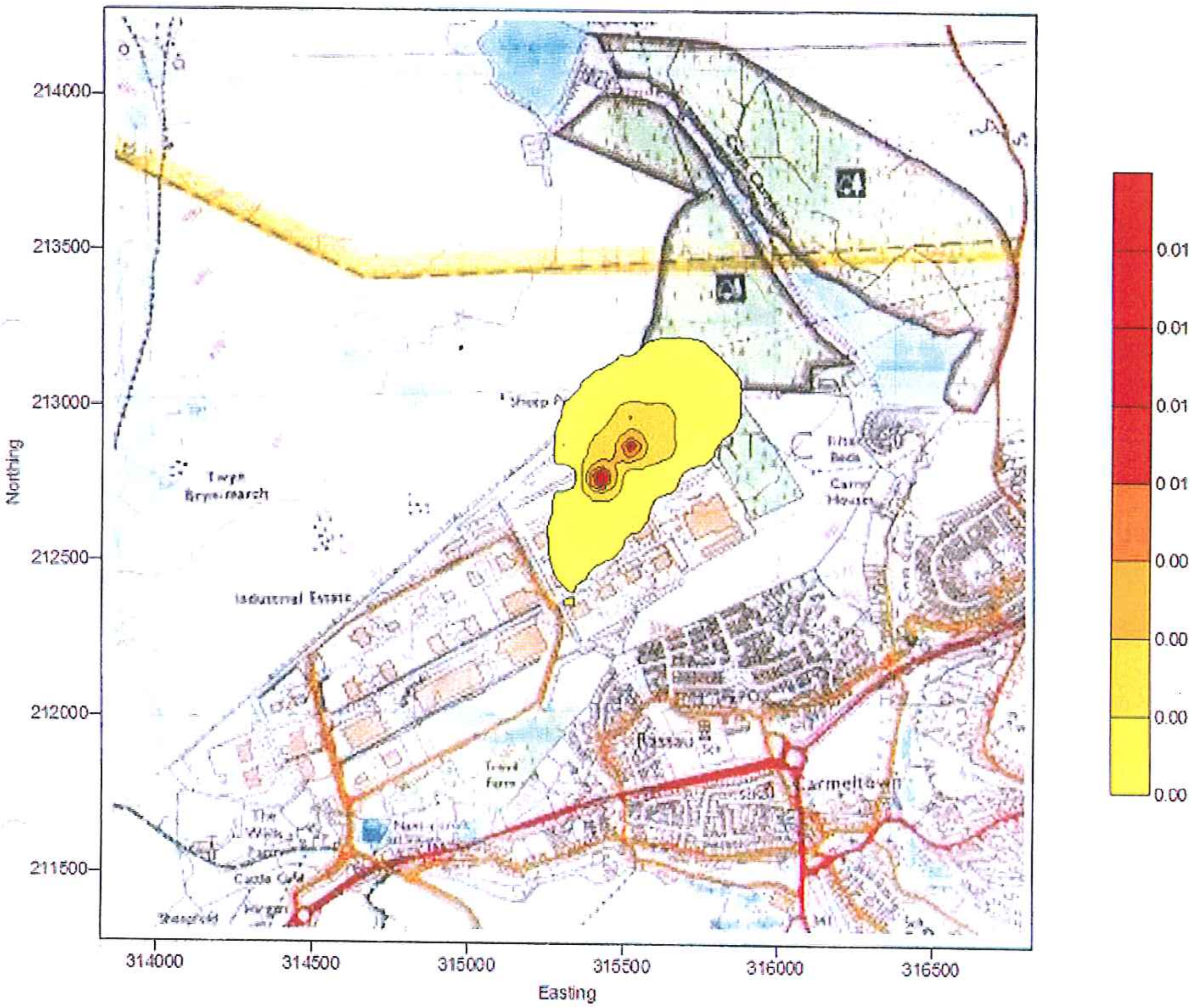


Figure 9 Maximum Predicted Annual Average Contribution to Ground Level Concentrations of Benzene (ug/m3) from the Proposed Envirowales Site Using 2001 Meteorological Data

APPENDIX 14.3

ATMOSPHERIC DISPERSION MODELLING ASSESSMENT: ENVIROWALES LTD RASSAU INDUSTRIAL ESTATE PROJECT. MARCH 2005. ENVIRONMENTAL VISAGE LTD.

Atmospheric Dispersion Modelling Assessment

Study of the Combined Impact of Emissions from Yuasa Battery (UK) and the Proposed Envirowales Site; Rassau Industrial Estate, Ebbw Vale

March 2005

Executive Summary

Environmental Visage Ltd (Envisage) was commissioned by Envirowales Ltd to undertake an atmospheric dispersion modelling assessment of the combined impact of lead emissions from their proposed battery recycling plant, planned for the Rassau Industrial Estate in Ebbw Vale, and the nearby Yuasa Battery (UK) site. This study is based on information from previous dispersion modelling studies[1,2] of both sites, and includes actual test data from the Yuasa site, and estimated data, believed to be worst case, for the operations at the Envirowales site.

Yuasa Battery manufacture lead acid batteries and activities at the site include, among others, lead melting and lead oxide production. As a result, the site has many lead emission discharge points to atmosphere, serving process and local exhaust ventilation systems and these are fitted with abatement systems, to reduce the concentration of emissions from the site.

The processes to be undertaken at the proposed Envirowales site include battery storage and breaking, and the smelting, casting and refining of the waste lead from the batteries. Some of these activities will result in the emission to air of lead, and although these emissions will be abated, the operation of the new site will undoubtedly increase the current levels of lead pollution in the local environment. The purpose of this study is to determine the combined potential of the two sites to contribute to ground level concentrations of lead, in order to assess the likely impact of the proposed operations on the surrounding environment.

Where appropriate, results of the modelling exercise were compared with the air quality limit values set by the Air Quality Limit Values Regulations 2003[3] (as amended). The main emission of concern from the two sites, and that which the Local Authority has requested be considered specifically is lead, which has an air quality limit value of 0.5 µg m^{-3}, with no margin of tolerance from 1st January 2005. The results of this assessment have been compared with this value. No other potential emissions have been considered by this combined study.

Predicted annual average concentrations of lead from the two sites, contributing to ground level concentrations were within the air quality limit value of each model run. On inclusion of a background concentration, the total estimated ground level concentration remained within the air quality limit value, although the process contribution from the sites represent 70 % of the air quality limit value and thus are considered to be significant.

Note: This study has been undertaken using data currently available for the proposed Envirowales site. It should be recognised however that until the installation is fully designed and operational, and sampling data can confirm the estimated emissions data included in this study, the accuracy of the data included cannot be guaranteed.

CONTENTS

1. Introduction

This report has been commissioned as part of an assessment of the combined impact of the emissions to atmosphere of two sites, one current and one proposed on the Rassau Industrial Estate in Ebbw Vale. The atmospheric dispersion modelling study has been undertaken to determine the dispersion of actual emissions from the Yuasa Battery (UK) Ltd site and the estimated releases from proposed emission points at the Envirowales Ltd site in Ebbw Vale. The assessment considers emissions of lead to atmosphere only.

Details of emissions and release points were provided by the sites for previous dispersion modelling studies[1,2] and this data has been applied to the combined model. The emissions data supplied from Yuasa was taken from the results of regular monitoring surveys, and the emissions data supplied for the proposed Envirowales site process stacks are believed to represent worst case estimates. As it is considered that up to 30 % of particulate emission from the combustion stacks at the Envirowales site might consist of lead, calculations as to the potential lead emissions from these stacks have been performed based on assumed fuel usage and theoretical emission factors. Two models were therefore run, one considering process release points from both sites only, and one considering process stacks plus a lead emission from each of the combustion stacks at the Envirowales site. This report details the modelling work undertaken and presents the findings of the study.

2. Principal Objectives and Scope of Work

The principal aim of the work undertaken was to determine the dispersion of lead pollutants from two sites situated locally to one another in order to predict the combined environmental impact of the sites on the surrounding area.

The only definitive means of quantifying the impact of process emissions on air quality and the surrounding area is to undertake a comprehensive programme of environmental monitoring around the sites in question. However, in order to predict the likely impact of a proposed site, atmospheric dispersion modelling provides a means of estimating the potential impacts of emissions with a reasonable degree of confidence, by modelling the dispersion of a plume exiting a chimney in relation to a number of key parameters. This enables the calculation of an estimated contribution to ground level pollutant concentrations arising from the release.

Environmental Visage Ltd employed the latest version of the UK Atmospheric Dispersion Modelling System (ADMS 3.2) to determine the contribution of emissions from the two sites to ground level concentrations of pollutants, taking into consideration the latest three years worth of meteorological (met.) data representative of the area. The ADMS model is one of the leading atmospheric dispersion models available in the UK and can be used to assess ambient pollutant concentrations from a wide variety of emissions sources associated with an industrial installation.

3. Study Parameters

Details of the release points to be considered were taken from recent dispersion modelling studies from both sites, with the original information having been supplied directly from the operators. It should be borne in mind that the Yuasa site is considering a reduced operating schedule for 2005, and as such, assuming continued maintenance and repair of abatement systems, overall emissions from the site should be reducing in the short term.

The location of proposed emission points for the Envirowales site were taken from the current plans of the site, and information on the estimated emissions from each point has been included. Estimated emissions from the process stacks (EnvA1 – EnvA4) were supplied by Envirowales Ltd. Estimated particulate emissions from the combustion stacks (EnvC1 - EnvC5) were calculated from the given fuel throughput of the burners (3,000,000 British Thermal Units (BTUs)), with a continuous duty of 75 % assumed, and the application of data from the UK Emission Factors Database[4]. A lead emission equivalent to 30 % of the calculated theoretical particulate emission from these stacks was included into an additional modelling run. The ADMS model requires the source of emissions to be defined in terms of dimensions, location and physical characteristics of temperature and velocity. It should be noted that all of the data incorporated into the study which represent the Envirowales site, are currently estimates as the plant is not yet operational.

One of the key factors affecting the dispersion characteristics of a plume is the height it can gain above the release point, as a result of momentum and buoyancy. The higher the plume rises, the greater the volume of the atmosphere in which it can disperse, and the lower the potential contribution to ground level concentrations of pollutants. This in turn results in a lower potential impact on the environment. Additionally, meteorological conditions affect the dispersal of a plume, and thus the ADMS model uses comprehensive met. data to determine the impact of the weather on emissions. As a minimum requirement for modelling plume dispersion, details of wind speed, direction, stability conditions and mixing height are required. Met. data for the area local to the site is limited, and thus a combination set of data has been applied within this model. The three years worth of met. data used are a combination of data from the St. Athan met. station, which is the nearest station to the site able to supply data suitable for incorporation into the ADMS model, and wind speed and direction data from Sennybridge, which is approximately 30 km to the north, north west of the site.

3.1 Emission Parameters

The characteristics of the individual release points from both sites and the pollutant parameters to be modelled are presented in Tables 1 and 2.

3.2 Nearby Buildings and Structures

When modelling processes which have a stack or stacks located on top of a building, or adjacent to a tall building, the effect of surrounding structures may need to be taken into account. As a general guide, building downwash problems (where emissions are caught in the turbulent wake of the wind blowing around a building), may occur if the stack height is less than 2.5 times the height of the building upon which it sits. Buildings which sit adjacent to stacks may need to be considered if they are within 5 stack heights of the point of release. It was therefore deemed necessary to include into the model, details of all of the buildings at both sites, as each emission point sits on top of, or very close to process buildings. Building shapes were simplified for incorporation into the model and elevation plans were provided where available, in order that accurate data on the height of each building could be incorporated. The building data included in the model are presented in Table 3.

Table 1 Details of the Site Emission Points

Operator	Emission Point Number	Process Served	Input Data at Actual Conditions or STP*
Yuasa Battery	A4	Oxide Mill	STP
Yuasa Battery	A5	Oxide Mill	STP
Yuasa Battery	A6	Casting Moulds	STP
Yuasa Battery	A7	Casting Pots	STP
Yuasa Battery	A8	Strip Bar Casting	STP
Yuasa Battery	A9	Pasting Mixers	STP
Yuasa Battery	A10	Expanded Grid Line	STP
Yuasa Battery	A14	Pellet Casters	STP
Yuasa Battery	A16	Cutting Extraction	STP
Yuasa Battery	A19	Extraction	STP
Yuasa Battery	A20	Extraction	STP
Yuasa Battery	A22	Vacuum	STP
Yuasa Battery	A24	Vacuum	STP
Yuasa Battery	A25	Vacuum	STP
Yuasa Battery	A26	Vacuum	STP
Yuasa Battery	A26A	Vacuum	STP
Yuasa Battery	A29	Dross Bin	STP
Yuasa Battery	A30	Cutting Extraction	STP
Yuasa Battery	A31	Oxide Mill	STP
Yuasa Battery	A33	Vacuum	STP
Yuasa Battery	A34	Oxide Mill	STP
Yuasa Battery	A35	Extraction	STP
Yuasa Battery	A36	Vacuum	STP
Yuasa Battery	A37	Casting Pots	STP
Envirowales	EnvA1	Battery Breaking	Actual
Envirowales	EnvA2	Rotary Furnaces	Actual
Envirowales	EnvA3	Refining Kettles and Scrap Melting	Actual
Envirowales	EnvA4	Slag Preparation Area	Actual
Envirowales	EnvC1	Combustion Stack 1	Actual
Envirowales	EnvC2	Combustion Stack 2	Actual
Envirowales	EnvC3	Combustion Stack 3	Actual
Envirowales	EnvC4	Combustion Stack 4	Actual
Envirowales	EnvC5	Combustion Stack 5	Actual

*Input data corrected to standard temperature and pressure (STP); 273K and 101.3 KPa

Table 2 Emission Point Parameters

Release Point	Emission Rate (lead g s^{-1})	Volumetric Flowrate (m^3 s^{-1})	Temperature (°C)	Height (m)	Diameter (m)	Grid Reference	
						X (m)	Y (m)
A4	2.84E-05	0.13	86.0	12.5	0.147	314910	212091
A5	1.74E-06	0.04	21.0	12.5	0.147	314915	212088
A6	2.23E-04	0.72	25.4	10.0	0.464	314875	212088
A7	6.90E-05	0.19	33.0	12.0	0.19	314890	212095
A8	6.98E-05	0.37	20.2	9.1	0.38	314890	212090
A9	3.23E-03	3.33	31.3	12.0	0.89	314870	212084
A10	6.24E-03	3.54	31.7	10.0	0.89	314835	212055
A14	5.02E-04	0.91	49	9.0	0.482	314900	212060
A16	2.07E-05	0.41	6.0	11.6	0.55	314853	212065
A19	2.18E-03	5.88	27.8	10.0	1.145	314930	212110
A20	2.34E-03	7.30	31.3	9.6	0.864	314970	212130
A22	1.00E-04	0.21	37.3	11.6	0.15	314935	212112
A24	1.03E-04	0.30	89.0	11.5	0.15	314916	212103
A25	3.91E-05	0.24	76.0	11.5	0.1	314925	212115
A26	2.83E-05	0.09	31.0	11.5	0.1	315180	212250
A26A	4.36E-06	0.07	31.0	10.0	0.1	315182	212247
A29	5.76E-04	1.69	28.8	7.3	0.51	314895	212093
A30	7.92E-03	12.98	19.0	12.2	1.1	314845	212060
A31	1.53E-04	0.28	102	12.5	0.147	314920	212085
A33	3.56E-05	0.27	21.0	11.0	0.15	315184	212244
A34	1.96E-03	1.32	89.3	12.4	0.4	314925	212075
A35	1.64E-03	4.57	33.0	11.5	0.6	314980	212134
A36	9.17E-05	0.32	46.7	9.0	0.15	314975	212132
A37	8.87E-04	1.18	42.0	7.0	0.5	314880	212093
EnvA1	2.00E-03	6.67	80	15	0.7	315373	212808
EnvA2	61012E-02	30.56	80	30	1.8	315350	212748
EnvA3	4.556E-02	22.78	80	30	1.5	315397	212769
EnvA4	3.726E-02	18.64	80	25	1.25	315383	212760
EnvC1	6.10E-04	1.0139	300	15	0.3	315395	212780
EnvC2	6.10E-04	1.0139	300	15	0.3	315405	212776
EnvC3	6.10E-04	1.0139	300	15	0.3	315408	212778
EnvC4	6.10E-04	1.0139	300	15	0.3	315414	212780
EnvC5	6.10E-04	1.0139	300	15	0.3	315418	212782

Table 3 Details of Buildings and Structures

Factory	X (m)	Y (m)	Height (m)	Length (m)	Width (m)	Angle (°)
Yuasa Battery						
Factory 1	314870	212035	9	110	70	61.5
Factory 2	314970	212095	11	135	75	61.5
Factories 3-5	315175	212200	9	110	80	61.5
Envirowales						
Main Building	315397	212794	12	156	40.8	61.5
Battery Store	315300	212750	12.5	28.5	65.5	61.5
Acid Recovery	315280	212706	21.7	15.7	6.6	61.5
Effluent Building	315266	212717	7.7	12.6	15.7	61.5
Workshops	315373	212834	8	18.7	18.7	61.5

Note: A minor discrepancy in the angle of the buildings has been modified for the purpose of this modelling exercise. In the original models run for each site, the angle of the buildings at the Yuasa site was considered 61° from north, whilst those from the Envirowales site were considered 62° from north. The view of the industrial estate on the Ordnance Survey Map used for the purpose of this study suggest that each of the units on the estate will likely be situated on the same angle. Thus the angle was re-measured and a new angle of 61.5° applied to both sites. The angle was the only alteration to the input data of the original models.

3.3 Meteorological Data

The latest three years of hourly sequential meteorological data (from 2001 – 2003) were employed to run the model. The data used was a combination of data from the St. Athan met. station, which is the nearest station to the sites currently recording data suitable for inclusion into the ADMS model, and wind speed and direction data from the Sennybridge met. station, which is located approximately 30 km north, north west of the sites. This data combination was used due to concerns of local weather patterns not being accurately reflected in met. data from a wider area. Discussions with the Met. Office, suggest that this combined data is the most appropriate information, available for use with ADMS, for the Ebbw Vale area.

3.4 Surface Roughness

For the purpose of running the ADMS model, it is necessary to assign a surface roughness figure to the area to be modelled. This describes the degree of ground turbulence caused by the passage of winds across surface structures. The degree of ground turbulence is much greater in urban areas than in rural areas. This is due to the presence of tall buildings in urban areas increasing the level of ground turbulence. ADMS requires the selection of a surface roughness factor to be input into the model, according to defined criteria. For the purpose of this model, a surface roughness factor of 0.5 was chosen, characteristic of parkland or open suburbia.

3.5 Terrain Data

The use of terrain data was considered prior to running the model. Although the necessity of using detailed terrain data can generally be assessed using a screening model which utilises worst-case emission rates to undertake a simplified calculation, and subsequently assessing the results against the relevant air quality standards or environmental assessment levels, it was considered that due to the location of the site close to the top of a valley side, terrain data would need to be incorporated. Thus digital data in the form of Landform Panorama tiles SO00 and SO20 were employed to provide details of the terrain local to the Rassau Industrial Estate.

3.6 Model Output Parameters

The ADMS 3.2 model calculates the likely contribution to ground level concentrations within a definable grid system, which is pre-determined by the user. For the purpose of this study, a Cartesian co-ordinate grid system was chosen, to cover an area of 9 km^2, with the two sites situated close to the centre of the grid. The Cartesian style grid has regular, pre-defined increments in both northerly and easterly directions from the specified bottom left corner of the grid, and ground level concentrations are specified at the intersections of these grid lines. Each grid modelled was based on a 31 x 31 point system, giving a total of 961 points (or intersections). The use of the grid in this way aids the generation of pollutant contours. Additionally, the output adopted specified points to identify sensitive receptors in the area. Details of the sensitive receptors considered are presented in Table 4.

Table 4 Details of Nearby Sensitive Receptors

Receptor Name	Grid Reference
Rassau Village (north west)	X: 315450 Y: 212075
Rassau Village (north)	X: 315750 Y: 212275
Garnlydan (north west)	X: 316425 Y: 212475
Rassau School	X: 315750 Y: 211925
Carno Reservoir	X: 316400 Y: 213050
Carmeltown School	X: 315950 Y: 211750
Glyncoed School 1	X: 316450 Y: 211225
Glyncoed Hospital	X: 316175 Y: 211050
Llangynidr Reservoir	X: 315250 Y: 214050

The output for the defined grid was set as long term, which provides a single concentration averaged over all of the lines of met. data, for each point, thereby providing an annual average concentration for each grid point. The 100^{th} percentile concentration of lead was also calculated in order to determine the overall worst-case concentration of lead modelled to arrive at ground level at any point. As these results represent the worst case contribution to background concentrations over a short term (the averaging period which for lead is 1 hour) they are higher than the worst case annual average.

The introduction of the UK Air Quality Strategy in 2000 and its addendum in 2003 has placed a requirement on Local Authorities to manage the quality of ambient air within their jurisdiction. Air quality limit values exist for various pollutants including lead, which has an objective concentration of 0.5 $\mu g\ m^{-3}$ as an annual mean value. This limit has been applied to the model to assess the acceptability, or otherwise, of the dispersion of lead emissions from the Yuasa and Envirowales sites.

3.7 Modelling Assumptions

Additionally to the parameters described in the sections above, some assumptions had to be made for the modelling study and these are listed below:

Emissions are assumed to be continuous. In reality, the Yuasa site operates a 236 day year, with weekends and shutdown periods resulting in no emissions to atmosphere, and the Envirowales site will operate 24 hours, seven day per week, although operations may not necessarily be running constantly, and therefore emissions would be reduced. Additionally, Envirowales will only operate a 48 week year, and thus the model can be seen to represent a worst case as emissions are considered to occur on a 24 hour, 7 day week basis.

Emissions concentrations for lead from the process stacks EnvA1 – EnvA4 were provided as maximum figures, with the actual emissions of the proposed plant thought to be less than the estimates given. As these estimates are the only information available at this time, this data has been assumed to represent the emission concentrations, and thus the model can again be seen to represent a worst case.

All emissions of lead are assumed to be particulate. In reality, the total emission concentration is likely to be made up of both particulate and vapour phase lead.

Emissions of lead from combustion processes are assumed to represent 30 % of the particulate emission. Particulate emissions from these processes were calculated using theoretical emission factors from the UK Emission Factors Database[(4)]. For the purpose of this model the burners of the combustion units are considered to have a maximum capacity of 880 kWhrs (3,000,000 BTUs). A continuous duty of 75% has been applied, resulting in a continuous operation capacity of 660 kWhrs, 24 hour, 7 days per week.

4. Results and Discussion

The results of the modelling work are presented in Tables 5 to 10 and Figures 1 and 2. Tables 5 – 7 present details of the results from the model which considered process stacks only. Tables 8 – 10 show the results from the models which included an emission of lead from the combustion stacks. The maximum predicted annual average contributions to ground level concentrations, and the location of these concentrations are reported, as are the maximum predicted contributions to ground level concentrations (worst case) and details of the number of times each year that pollutant concentrations are predicted to exceed any relevant air quality limit values.

Table 5 **Maximum Predicted Combined Contributions to Ground Level Concentrations of Pollutants from Yuasa Battery (UK) and Envirowales Process Stacks; Rassau Industrial Estate, Ebbw Vale, Applying Meteorological Data from 2001**

Pollutant Modelled	Averaging Period or Percentile Calculated	Grid Reference		Maximum Contribution to Ground Level Concentrations (µg m^{-3})	Local Receptor Experiencing Highest Contribution	Maximum Contribution to Ground Level Concentrations (µg m^{-3})
		X	Y			
Lead	Annual Average	314900	212100	0.335	Rassau (NW)	0.0314
Lead	100^{th} Percentile (worst case)	314700	212200	4.19	Rassau (N)	0.974
Lead	Location experiencing the highest number of exceedences	314900	212100	2524 Exceedences	Rassau (NW)	113 Exceedences

Table 6 **Maximum Predicted Combined Contributions to Ground Level Concentrations of Pollutants from Yuasa Battery (UK) and Envirowales Process Stacks; Rassau Industrial Estate, Ebbw Vale, Applying Meteorological Data from 2002**

Pollutant Modelled	Averaging Period or Percentile Calculated	Grid Reference		Maximum Contribution to Ground Level Concentrations (µg m^{-3})	Local Receptor Experiencing Highest Contribution	Maximum Contribution to Ground Level Concentrations (µg m^{-3})
		X	Y			
Lead	Annual Average	314900	212100	0.334	Rassau (NW)	0.0457
Lead	100^{th} Percentile (worst case)	314700	212200	4.43	Rassau (NW)	0.957
Lead	Location experiencing the highest number of exceedences	314900	212100	2645 Exceedences	Rassau (N)	178 Exceedences

Table 7 **Maximum Predicted Combined Contributions to Ground Level Concentrations of Pollutants from Yuasa Battery (UK) and Envirowales Process Stacks; Rassau Industrial Estate, Ebbw Vale, Applying Meteorological Data from 2003**

Pollutant Modelled	Averaging Period or Percentile Calculated	Grid Reference		Maximum Contribution to Ground Level Concentrations (µg m^{-3})	Local Receptor Experiencing Highest Contribution	Maximum Contribution to Ground Level Concentrations (µg m^{-3})
		X	Y			
Lead	Annual Average	314900	212100	0.349	Rassau (NW)	0.0381
Lead	100^{th} Percentile (worst case)	315100	212200	4.79	Rassau (N)	0.971
Lead	Location experiencing the highest number of exceedences	314900	212100	2788 Exceedences	Rassau (NW)	132 Exceedences

Table 8 **Maximum Predicted Combined Contributions to Ground Level Concentrations of Pollutants from Yuasa Battery (UK) and Envirowales Process and Combustion Stacks; Rassau Industrial Estate, Ebbw Vale, Applying Meteorological Data from 2001**

Pollutant Modelled	Averaging Period or Percentile Calculated	Grid Reference		Maximum Contribution to Ground Level Concentrations (µg m^{-3})	Local Receptor Experiencing Highest Contribution	Maximum Contribution to Ground Level Concentrations (µg m^{-3})
		X	Y			
Lead	Annual Average	314900	212100	0.337	Rassau (NW)	0.0334
Lead	100th Percentile (worst case)	314700	212200	4.19	Rassau (N)	0.974
Lead	Location experiencing the highest number of exceedences	314900	212100	2564 Exceedences	Rassau (NW)	124 Exceedences

Table 9 **Maximum Predicted Combined Contributions to Ground Level Concentrations of Pollutants from Yuasa Battery (UK) and Envirowales; Process and Combustion Stacks; Rassau Industrial Estate, Ebbw Vale, Applying Meteorological Data from 2002**

Pollutant Modelled	Averaging Period or Percentile Calculated	Grid Reference		Maximum Contribution to Ground Level Concentrations (µg m^{-3})	Local Receptor Experiencing Highest Contribution	Maximum Contribution to Ground Level Concentrations (µg m^{-3})
		X	Y			
Lead	Annual Average	314900	212100	0.335	Rassau (NW)	0.0482
Lead	100th Percentile (worst case)	314700	212200	4.43	Rassau (NW)	0.957
Lead	Location experiencing the highest number of exceedences	314900	212100	2664 Exceedences	Rassau (N)	197 Exceedences

Table 10 **Maximum Predicted Combined Contributions to Ground Level Concentrations of Pollutants from Yuasa Battery (UK) and Envirowales; Process and Combustion Stacks; Rassau Industrial Estate, Ebbw Vale, Applying Meteorological Data from 2003**

Pollutant Modelled	Averaging Period or Percentile Calculated	Grid Reference		Maximum Contribution to Ground Level Concentrations (µg m^{-3})	Local Receptor Experiencing Highest Contribution	Maximum Contribution to Ground Level Concentrations (µg m^{-3})
		X	Y			
Lead	Annual Average	314900	212100	0.35	Rassau (NW)	0.0397
Lead	100th Percentile (worst case)	315100	212200	4.79	Rassau (N)	0.971
Lead	Location experiencing the highest number of exceedences	314900	212100	2809 Exceedences	Rassau (NW)	138 Exceedences

From the results presented in Tables 5 to 10 and Figures 1 and 2, it is apparent that the average contribution to ground level concentrations of lead are predicted to be within the requirements of the air quality limit value.

Of the sensitive receptors modelled, the north and north western edge of Rassau experienced the highest concentrations of lead contributions from the sites. It should be noted however, that all of the predicted results were well below any relevant air quality limit value, and the hourly average concentration of lead only exceeded the annual average limit value of 0.5 µg m^{-3} a maximum of 197 times at the receptors (modelling 2002 meteorological data and when including a lead emission from the combustion stacks of Envirowales).

Background concentrations of lead in air are measured through a National Air Quality Monitoring Network (the National Network). Additional ambient monitoring may also be undertaken by Local Authorities in specific locations of concern within their area. The current results of the National Network monitoring of lead were published on the Air Quality Archive website[5] in October 2004. The annual average lead concentrations at the sites monitored in 2003 ranged from 0.003 µg m^{-3} to 0.103 µg m^{-3}. Based on this data and assuming a worst case scenario (results from modelling 2003 meteorological data and when including a lead emission from the combustion stacks of Envirowales), the overall predicted ground level concentration in the locality of the Rassau Industrial Estate site could total 0.35 µg m^{-3} + 0.103 µg m^{-3} = 0.453 µg m^{-3}. This concentration is still within the air quality limit value of 0.5 µg m^{-3} and it should be remembered that the emissions included within the model are thought to represent a worst case scenario. It is possible that the future emissions from the sites could be much lower, either through a reduction in the processing lines operated at the Yuasa site, or through effective control by abatement systems. Additionally, the assumptions on site operation times assume a worst case.

Monitoring work undertaken in Cardiff by Cardiff City Council in 1999 through to 2003, demonstrate much lower background concentrations than the maximum considered above, with results ranging from 0.01 to 0.02 µg m^{-3}. There is no background monitoring work currently undertaken by the Local Authority around the Rassau Industrial Estate in Ebbw Vale, however, if the figures from Cardiff are applied to the worst case predicted results from the modelling exercise, the overall predicted ground level concentration in the locality of the industrial estate could total 0.35 µg m^{-3} + 0.02 µg m^{-3} = 0.37 µg m^{-3}. The model has only included data from the Yuasa and Envirowales sites and thus these figures do not take account for any other potential contributions to ground level lead concentrations in the area.

5. Conclusions

Environmental Visage Limited was requested by Envirowales Ltd to undertake a modelling exercise to predict the combined contribution of their proposed process emissions and emissions of lead from the near-by Yuasa Battery (UK) Ltd site, to ground level concentrations. Details of the emission points to be modelled were taken from previous modelling exercises run for both Yuasa Battery and Envirowales.

Emissions of lead only were modelled, as agreed with the Local Authority. The Envirowales site also plans to operate five combustion stacks, and it is considered that these could also emit a proportion of lead. Thus two scenarios were modelled, one considering process stacks only, and one considering an emission of lead from the combustion stacks at Envirowales. All models were run taking into account the site buildings, local terrain data and meteorological data considered representative of conditions at the site, for years 2001 through to 2003.

The results of the modelling were compared with the air quality limit value for lead, and the annual average concentrations predicted were within the limits for each model run. The highest annual average contribution to ground level concentrations of lead predicted was 0.35 $\mu g\ m^{-3}$, occurring in 2003, which is below the air quality limit value of 0.5 $\mu g\ m^{-3}$. Inclusion of a background concentration of 0.103 $\mu g\ m^{-3}$ (representing the highest background concentration measured in 2003 by the National Network) was still within the air quality limit value, equalling 0.453 $\mu g\ m^{-3}$. Considering the National Network undertakes a wide variety of monitoring, ranging from rural locations to the contribution of lead in air from the lead in petrol, it is suggested that the background concentration (that is, not including the process contribution from industrial sites in the vicinity) of lead in ambient air in the Rassau area is likely to be lower than this. Additionally, it is believed that the emissions data from the site is representative of a worst case and it is considered that emissions should in actual fact be much lower than the data incorporated into this model.

The worst case short term, hourly average contribution to ground level concentrations of lead was calculated to occur in 2003, with a concentration of 4.79 $\mu g\ m^{-3}$.

6. References

1. Atmospheric Dispersion Modelling Assessment. Yuasa Battery (UK) Ltd, Ebbw Vale. November 2004.
2. Atmospheric Dispersion Modelling Assessment. Envirowales Ltd, Rassau Industrial Estate Project. December 2004.
3. Air Quality Limit Values Regulations. Statutory instrument 2003 Number 2121. HMSO. ISBN 0 1104 7448 1
4. UK Emission Factors Database www.naei.co.uk
5. www.airquality.co.uk Lead Trace Elements and Industrial Metals Data. Updated 27/10/2003.

FIGURES

Figure 1: Dispersion of Combined Emissions of Yuasa Battery and Envirowales.

Maximum Predicted Contribution to Ground Level Concentrations of Lead

Maximum Annual Average from Process Stacks Only. 2003 Meteorological Data.

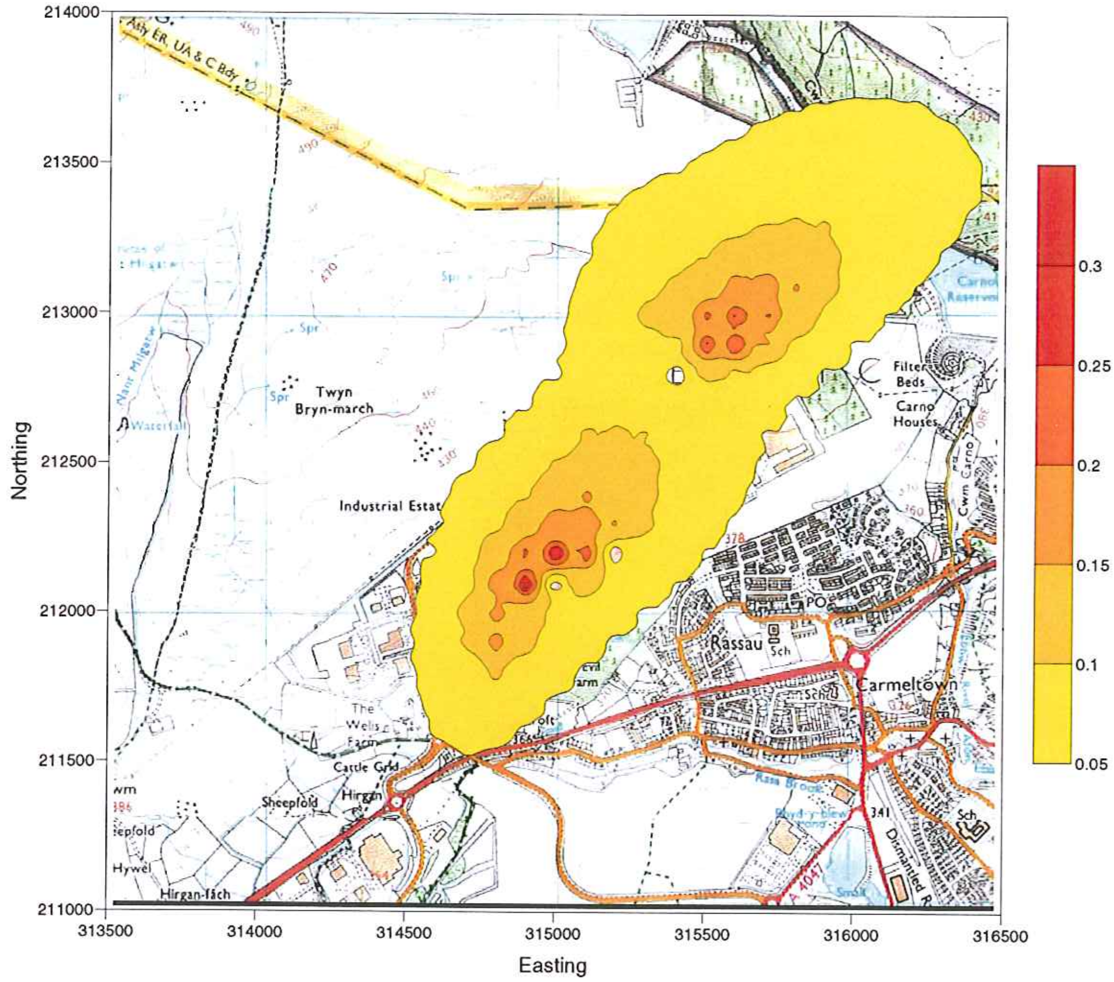


Figure 2: Dispersion of Combined Emissions of Yuasa Battery and Envirowales.

Maximum Predicted Contribution to Ground Level Concentrations of Lead

Maximum Annual Average. Lead from Process and Combustion Stacks. 2003 Meteorological Data.