Environment

Air Quality Action Plan for the Taibach Margam Air Quality Management Area PM_{10}

Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council Cyngor Bwrdeistref Sirol

Making a difference Gwahaniaeth er gwell

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AIR QUALITY

Part IV Environment Act 1995

Air Quality Action Plan for the Taibach Margam Air Quality Management Area PM_{10}

January 2003

Approved by EECS 12/12/02

NEATH PORT TALBOT COUNTY BOROUGH COUNCIL
CYNGOR BWRDEISTREF SRIOL CASTELL-NEDD PORT TALBOT

AIR QUALITY

Air Quality Action Plan for the Taibach Margam Air Quality Management Area PM_{10} (adopted by Council December 2002)

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APPENDICES

Neath Port Talbot C.B.C.
Taibach/Margam Air Quality Management Area (PM_{10})

AIR QUALITY ACTION PLAN
(Ref. Section 84(2)(b) Environment Act 1995)

The purpose of this plan is to detail actions to be taken in pursuit of the achievement of the Air Quality Objective for PM_{10} as laid down in the Air Quality (Wales) Regulations 2000. This plan relates to both actions by this Authority and the actions the Authority will rely on from others who have contributed to the preparation of this plan.

1.0 Introduction:
This plan has been produced in accordance with section 84(2)(b) Environment Act 1995 following the Authorities Review and Assessment of Air Quality, designation of the Taibach/Margam area as an Air Quality Management area for PM_{10} and following a further assessment report of air quality in the Air Quality Management Area which is attached as appendix 1 to this plan [The plan also includes the Council's aspirations in relation to the reduction of nuisance dust fallout in the area which is complementary to the section 84(2)(b) plan)]. The further assessment report confirmed the PM_{10} stage III review and assessment which had shown by means of pollution roses and source apportionment that blast furnace fume was a significant local contributor to PM_{10} air quality objective exceedances. This was done by the modelling of fugitive industrial PM_{10} as part of the further assessment. In parallel to this it has been found in the initial review and assessment exercise that M4 derived PM_{10} is not a significant factor in relation to local exceedances of the PM_{10} objective.

The area to which the plan refers is shown on the map which is attached as appendix 2 and will be subsequently referred to as the "Action Plan Area".

2.0 Production of Plan and Consultation:
The plan has been produced by means of working with stakeholders to generate initially a list of options by means of an Action Plan workshop at which over 50 stakeholders and officers took part. Prior to this a community newsletter had been distributed to approximately 3,000 premises in the Air Quality Management Area providing news about the proposed workshop and giving information about air quality and initiatives to improve it in the area. The details of the draft plan have then been worked on by Corporate group of officers who make up the Air

Quality Action Plan Team (formerly the Air Quality Management Action Plan (internal) Working group) and also the Corus Tripartite Working Group made up of representatives from Corus Strip Products, the Environment Agency and the Authority. It is intended that the Air Quality Action Plan Team will monitor the implementation of the Action Plan and ensure that other parties on which the plan relies stay involved in the process. It is the intention for the indicators developed in the plan to be compiled by the Air Quality Action Plan Team and reported at appropriate times to the Economic, Environment and Consumer Services Cabinet Committee.

Formal consultation on the draft plan has then been undertaken between 9th October to 2nd December 2002 with the original stakeholders who attended the workshop together with additional stakeholders who did not attend the workshop. A full list of both organisations and individuals represented at the Action Plan Workshop in March 2002 together with the remainder of the stakeholders consulted are listed in appendix 3.

3.0 Prioritisation of Actions including cost benefit analysis:

The initial list of actions generated by the workshop process together with consensus views from the workshop as a whole in relation to the relative importance of each action, the air quality and non air quality benefits, disadvantages, cost and practicability are shown in appendix 4.

An assessment of each action by means of a matrix similar to that used at the workshop has then been carried out by the Air Quality Action Plan Team, the actions then being ranked in priority order. The results of the ranking are shown in appendix 5. The Action Plan has then been derived by the Team having regard to appendices 4 and 5 and is shown in section 4. The actions making up the plan have been categorised as either industrial, land use planning, transport, domestic or general environmental.

4.0 Action Plan:

Ref. A1

Category: Industrial **Time scale:** - within 1 year

Action: Rebuilding of number 5 blast furnace with complete cast house fume arrestment at the Corus Steel Works, to meet the Best Available Techniques standard as indicated in the Best Available Techniques

Reference Document on the production of Iron and Steel (European IPPC Bureau 2000).

Responsible Bodies: Corus plc and Environment Agency Wales

Implementation Method: Through the IPPC permitting process, Corus Strip Products Port Talbot Works IPPC application currently under determination by the Environment Agency Wales and reference should be made to the sector guidance note (i.e. IPPC s2.01 - Technical Guidance for the Coke, Iron and Steel sector -version 1 -April 2001). At the same time blast furnace number 5 is being rebuilt. Projected completion date for blast furnace rebuilding project is early January 2003.

Environmental consequences:

(i) **Air Quality (PM_{10}) -** Predicted improvement in the range 10% - 80% of Environmental Quality Standard i.e. 5 - 40μg/m^3

(ii) **Air Quality (Non PM_{10}) -** Better visibility, less dust fallout

Economic consequences: The cost of rebuilding blast furnace number 5 is approximately £75million of which £10million is for fume arrestment, i.e. the bag filter plant to the cast house.

Social consequences: Positive perception of scheme by stakeholders at workshop

Cost benefit analysis: High - Distinct beneficial impact on health of vulnerable anticipated however difficult to quantify on small population numbers.

Allocated priority: 1

Indicator: Effect on the number of days exceedance of the Air Quality Objective Level for PM_{10} compared with base line year of 1999 as this source was identified as the most significant local contribution to 24hour average PM_{10} exceedances. Effects should become clear after two years of monitoring following the blast furnace rebuilding, to allow for any masking effects due to climatic variations.

Ref. A2

Category: Industrial **Time Scale:** 1 to 5 years

Action: Dust reduction programme/improvement at the Corus site. This is an on-going programme aimed at identifying and quantifying sources of dust and assessing the significance of the impact. The IPPC permit applications from Corus, Cambrian Stone and Short Brothers are currently being determined and this includes an evaluation of techniques used throughout the site to reduce emissions from release points and fugitive sources.

Responsible Bodies/Partners: Corus plc, Cambrian Stone Ltd., Short Brothers Ltd. and the Environment Agency Wales.
[Neath Port Talbot CBC in relation to the monitoring and assessment of PM_{10} and the fallout of nuisance dusts including fingerprinting in the urban area].
Implementation: Through the IPPC permitting process, identifying possible improvements and set implementation timetables.

Environmental consequences:
(i) **Air Quality (PM_{10}) -** Impossible to quantify at this stage.
(ii) **Air Quality (non PM_{10}) -** Better visibility, less dust fallout.

Economic consequences: Investment will depend upon the assessment of the impact of the sources. It is envisaged that much work can be accomplished by reviewing operational techniques at low cost. Justification for higher expenditure will depend upon impact.

Social consequences: Positive perception of scheme by stakeholders at workshop.

Cost benefit analysis: Medium

Allocated Priority: 1

Indicator: Annual releases of particulate from the whole site compared to the record (2001).
[Annual average fallout of iron rich dust in deposit gauges in the three deposit gauges in the urban area surrounding the works].

Ref. A3

Category: Planning Policy **Time Scale:** 1 to 15 years

Action: The planning strategy as set out in the Deposited Draft of the UDP is based on the following:-

1) Proposals for new or expanded activities or developments which

would be likely to create additional PM_{10}'s within the Air Quality Management Area (AQMA), or cause adjacent areas to exceed National Standards, will be likely to be resisted. Amounts of PM_{10} less than 0.2% of the National Air Quality Objective (AQO) will be likely to be considered as insignificant. Amounts of PM_{10} greater than 2% of the AQO will be regarded as significant and potentially creating unacceptable impacts, whilst developments contributing between 0.2% and 2% will be considered on their merits.

Where existing businesses or organisations put forward a proposal which would result in a net improvement in emissions and this would not prejudice the likelihood of emissions in the whole of the AQMA area breaching the national targets, the proposal would be likely to be considered favourably in terms of air pollution considerations.

2) **The Authority will assess proposals for new sensitive uses (such as housing) within the area on air quality grounds. The development of land for housing or other sensitive uses will not be permitted where the proximity of an existing use or installation or exposure to pollutants would unacceptably affect amenity, safety, health or environmental quality.**

It is likely that the level of PM_{10} within the AQMA is likely to fall below the current national standard by the end of 2004 as a result of the Council's multi-agency Action Plan a major part of which is the investment by Corus in rebuilding blast furnace number 5. The complete Planning Policy statement in relation to the Air Quality (Policy ENV15 - Air Quality) is given in full in appendix 6 .

Responsible Body: Neath Port Talbot CBC as Local Planning Authority.

Implementation method: Through the Development Control Section of the Planning Services Division processing and making recommendations concerning applications in accordance with planning policy. In addition the use of planning conditions and section 106 agreements where appropriate.

Environmental consequences:
(i) **Air Quality (PM_{10}) -** Medium
(ii) **Non Air Quality** - Often secures general environmental

improvements to the natural, urban and built environment (e.g. visual, noise etc.)

Economic consequences: The policy would constrain developments which would cause significant levels of particles.

Social consequences: Positive perception by stakeholders at workshop.

Cost benefit analysis: Medium

Allocated priority: 1

Indicator: Monitoring of Planning Approvals to ensure the policy is being applied.

Ref. A4

Category: Transport - Infrastructure (PDR) **Time Scale:** 1 to 5 years

Action: Provision of an alternative route for traffic bypassing the A48. This may enable re-classification of the length of the A48 in Port Talbot enabling traffic calming and environmental landscaping, thus greatly improving the environment and quality of life for residents affected by the A48.

Responsible Bodies/Partners: Neath Port Talbot, Welsh Assembly Government and the European Union.

Implementation method: Work on Stage 1C is scheduled for commencement in 2004-2005 as indicated in the Transport Grant Settlement from the Welsh Assembly Government with funds having been made available for the design of Stage 2 with the hope of commencement in 2005. The PDR is the subject of an Objective 1 bid to hopefully bring forward the programme for the scheme.

Environmental consequences:

(i) **Air Quality (PM_{10}) -** Small
(NO_2) - Medium

(ii) Noise - Potential reduction in traffic noise in Port Talbot

Economic consequences: The PDR is an essential element in the economic development and prosperity of the area and will open up opportunities for re-development.

Social consequences: Generation of greater prosperity in the area giving rise to the possibility of a health gain.

Cost benefit analysis: Medium

Allocated priority: 2

Indicator: Reduction of traffic flow through the Air Quality Management Area (i.e. on A48).

Ref. A5

Category: Transport - Green Transport Plans (Travel Plans) **Time Scale:** 1 to 5 years

Action: Through the development control process the Authority as the local planning authority takes impacts by way of traffic generation associated with an application into account. Where significant levels of traffic are likely to be generated, developers are required to prepare Transport Assessments to appraise travel demand and related impacts. Travel plans are normally requested in such cases explaining how they propose to minimise traffic and emission generation and how it is proposed to promote the use of public transport , cycling and walking in place of the car. Travel plans are normally required for organisations with 50 or more persons employed.

Responsible Bodies/Partners: Neath Port Talbot as Local Planning Authority, developers, Companies and Organisations and the regional Green Travel Plan Co-ordinator.

Implementation method: Through the development control process and through the work of the South West Wales Integrated Transport Consortium (SWWITCH) Green Travel Plan Co-ordinator for the region.

Environmental consequences:
Air Quality (PM_{10}) - Small

Economic consequences: Small

Social consequences: Change in travel patterns and increased used of public transport, cycling and walking and decreased car use to access work.

Cost benefit analysis: Medium

Allocated priority: 2

Indicator: Number of travel plans implemented in the AQMA.

Ref. A6

Category: Transport - School Travel Plans **Time Scale:** 1 to 5 years

Action: Through the Council's School Travel Plan Co-ordinator to promote with schools and to support Head Teachers and Governors who are interested in preparing a School Travel Strategy and implementing individual School Travel Plan for their school, in order to reduce the impact of the school journey within the AQMA.

Responsible Bodies/Partners: Neath Port Talbot, the Head Teachers and Governors of the schools within the AQMA and the children and parents of the schools in the area.

Implementation method: As part of the overall work of promoting and supporting schools across the whole borough, the School Travel Plan Co-ordinator to promote and support schools in the AQMA in implementing School Travel Plans.

Environmental consequences:
Air Quality PM_{10} - Small

Economic consequences: Small

Social consequences: Providing an environment which enables and encourages children to walk or cycle to school safely, leading parents away from the perception that the safest way to take their children to school is via the car. In addition it will help with lifestyle improvements such as increased exercise for children leading to better health as well as increasing the "interaction" and "wisdom" for each age group.

Cost benefit analysis: Medium

Allocated priority: 2

Indicator: The number of schools within the AQMA implementing school travel plans.
Ref. A7 **Category:** Domestic - Bonfires **Time Scale:** 1 year **Action:** Discourage bonfires in the area by a combination of promotion and also diversion of green waste for composting. **Responsible Body/Partners:** Neath Port Talbot and the Community **Implementation method:** Promotion of disposal of green waste at civic amenities sites [and possible collection service for green waste] for subsequent composting at the Materials Recycling Centre. Promotion of recycling in general and home composting where appropriate. Targeted campaigns with specific groups e.g. allotment holders and community groups against bonfires. **Environmental consequences:** **(i)** **Air Quality (PM_{10}) -** Small **(ii)** **Other Pollutants -** Beneficial reduction of potentially toxic compounds as well as smoke, smut and soiling prevention. **Economic consequences:** Additional cost if a separate green waste collection was started, otherwise infrastructure for green waste recycling e.g. composting already in place. **Social consequences:** The principles of recycling and sustainability are reinforced with the community and quality of life is improved by removal of bonfire nuisances such as smutting and low level smoke inhalation. **Cost benefit analysis:** Medium **Allocated priority:** 3 **Indicator:** Quantity of green waste recycled from the area and the number of promotions undertaken.
Ref. A8 **Category:** General Environmental - Tree Planting **Time Scale:** 1 to 15 year.

Action: One of the Community Plan's targets is to increase the amount of broadleaf tree cover within the County Borough. Within the Air Quality Management Area this will be particularly relevant with in addition suitably selected evergreen species as appropriate. It will help screen industry and derelict land and enhance the landscape and street scene, making a small contribution to address global warming and helping to trap air-borne particles.

A working party comprising County Borough officers and representatives of partner bodies and organisations will co-ordinate and promote tree planting programmes throughout the County Borough and with a particular focus on the AQMA. Community and volunteer input and support will be welcomed.

Responsible Bodies/Partners: Neath Port Talbot CBC, Ground Work Trust Neath Port Talbot, Forest Enterprise, Coed Cymru, Industrial and Commercial partners, Schools, Cardiff University, the Community etc.

Implementation method: Through a working party comprising County Borough officers and representatives of partner bodies and organisations who will co-ordinate and promote tree planting with a particular focus on the AQMA (Neath Port Talbot Trees & Woodland Group). The aim will be to identify suitable planting areas including the street scene, to seek funds and to promote projects to plant suitable tree species including after care and with community input wherever appropriate.

Environmental consequences:

(i) **Air Quality (PM_{10}) -** Small

(ii) **Non PM_{10} consequences -** Adsorption of a percentage of gaseous pollutants, visual impact, ecological benefits, recreation, reduction in nuisance dust.

Economic consequences: Medium - involving planting and maintenance of trees on our own land as appropriate. Other costs would be picked up by partners or through sponsorship.

Social consequences: Positive perception by stakeholders at the workshop, including the amenity and aesthetic aspects of such a scheme.

Cost benefit analysis: Medium

Allocated priority: 3

Indicator: Number, site and species of trees planted.

Ref. A9

Category: Transport - Fleet vehicle emissions **Time Scale:** 1 to 5 years

Action: To set an example by moving towards the use of low emission vehicles within the Council fleet of Large Goods Vehicles (LGVs) and to encourage the use of low and zero emission vehicles by private operators of fleet and commercial vehicles.

Responsible Bodies/Partners: Neath Port Talbot, Freight Transport Association, First Cymru and other bus operators, private fleet operators, taxi operators etc.

Implementation method: Where appropriate and practical the Council will seek to move towards specifying LGV's meeting EURO IV emission standards for acquired new vehicles. To encourage low emission vehicles by means of Freight Quality Partnerships, Bus Quality Partnerships and contracts and by promotion e.g. encouragement of taxi operators to change over to low emission vehicles.

Environmental consequences:

(i) Air Quality (PM_{10}) - Small

Economic consequences: Increased operator costs in purchasing modern fleets e.g. of buses. Increased costs in relation to school transport for school contracts.

Social consequences: Possibly discriminatory against small operators but offset by improved health and safety standards say in relation to school contracts etc.

Cost benefit analysis: Medium

Allocated priority: 3

Indicator: Percentage of Council newly acquired LGVs meeting EURO 1V standards and number of quality partnerships entered into that include emission standards.

Ref. A10

Category: Transport - Road side Emission Testing **Time Scale:** 1 to 5 years.

Action: The carrying out of a limited programme of vehicle emission testing in the AQMA and or its approaches in accordance with the powers proposed in the regulations to be implemented at the end of the year. Such testing could be on the basis of a collaborative arrangement with other authorities in the Welsh Air Quality Forum who have Air Quality Management Areas.

Responsible Body/Partner: Neath Port Talbot with Police assistance and in addition possible partnership with other Authorities through the Welsh Air Quality Forum.

Implementation method: Adoption of the proposed stop and test powers to be made available by the Welsh Assembly Government at the end of the year. Training of two staff who will carry out a limited testing programme within the AQMA with police assistance for stopping vehicles. It is envisaged that the test equipment necessary will be hired through the Welsh Air Quality Forum from Authorities already equipped for testing purposes (currently one Authority).

Environmental consequences:

(i) **Air Quality (PM_{10}) -** Small

(ii) **Air Quality (NO_2) -** Reduction of other pollutants as cars better maintained and MOT tested as a result of deterrent of monitoring campaign and publicity.

Economic consequences: May impose greater economic burden on low income groups.

Social consequences: May be a disproportionate effect on low income groups as older vehicles may receive greater targeting, hence social exclusion is possible.

Cost benefit analysis: Low

Allocated priority: 4

Indicator: The number of vehicles that were tested and failed, the number of fixed penalty notices issued and number of vehicle passing re-test after being tuned or modified.

Ref. A11

Category: Transport - Transport in the Community **Time Scale:** 1 to 15 years

Action: Transport in the Community is about filling gaps in transport needs for all the community that conventional public transport simply does not or cannot cater for, for whatever reasons be it economical, geographical or social exclusion.

Transport in the Community is an umbrella under which the communities transport demands are recognised, administered and suitably resourced. It covers all aspects of the communities transport expectations whether it be for reasons of health, education business, shopping or recreational.

Responsible Bodies/ Partners: Neath Port Talbot CBC, all transport providers both public, ambulance service, social transport, taxis etc.

Implementation method: The community demand for transport is resourced efficiently by drawing on all transport available, whether that be school transport, ambulances, social club minibuses and taxis as well as the more conventional forms of public transport.

The whole concept is run on a more business like standing with proper and accountable administration backed up with appropriate funding and run using suitably qualified and paid staff. Resources are managed on a regional basis to provide a better and more co-ordinated and efficient service to the public.

Environmental consequences:

(i) Air Quality (PM_{10}) - Small

Economic Consequences: Medium cost to set up infrastructure to run the system.

Social Consequences: Highly desirable as the communities transport demands are more fully met.

Cost benefit analysis: Low

Allocated priority: 4

Indicator: Setting up of the necessary infrastructure to run Transport in the Community.

Ref. A12

Category: General Environmental - Street sweeping **Time Scale:** 1 year

Action: Taibach Margam falls in to Zone 3 for the purposes of street cleaning (wet sweeping). Street sweeping is currently carried out monthly. The standards are assessed by the Area Supervisor who can change the specification if he feels it is needed, to a more frequent sweep.

Responsible Body: Neath Port Talbot CBC.

Implementation method: More frequent sweeping can be instituted by the Area Supervisor of the Technical Services Cleansing Section as required.

Environmental consequences:

- **(i) Air Quality (PM_{10}) -** Small
- **(ii) Nuisance dust -** Medium

Economic consequences: An increase in cleansing costs.

Social consequences: A more positive impression of the area and the Council as cleanliness of the street scene improves.

Cost benefit analysis: Low

Allocated priority: 4

Indicator: Cleanliness of the street scene.

APPENDIX 1

Neath Port Talbot County Borough Council

AIR QUALITY

FURTHER ASSESSMENT OF AIR QUALITY IN THE TAIBACH/MARGAM AIR QUALITY MANAGEMENT AREA (PM_{10})

SEPTEMBER 2001

NEATH PORT TALBOT COUNTY BOROUGH COUNCIL
CYNGOR BWRDEISTREF SIROL CASTELL-NEDD PORT TALBOT

AIR QUALITY

Further Review and Assessment of Air Quality in the Taibach/Margam Air Quality Management Area (PM_{10})
September (2001)

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APPENDICES

AIR QUALITY

Further assessment of air quality in the Taibach/Margam Air Quality Management Area (PM_{10}) Section 84 Environment Act 1995

Introduction.
The Environment Act 1995 Part IV established a statutory framework for local air quality management in the UK. The legislation placed a duty upon local authorities to undertake an air quality review and assessment which resulted in Neath and Port Talbot County Borough Council making the Taibach/Margam Air Quality Management Area (PM_{10}) Order 2000. This designated an area of Taibach/Margam as an AQMA on 13th June 2000, operative on 1st July 2000. The legislation requires that a further assessment be made prior to the production of an Action Plan. According to government guidance, consideration must be given to a number of matters as part of the assessment, these are dealt with in turn below.

Confirmation of the original air quality assessment.
It is recommended that local authorities confirm the assessment of air quality against the prescribed objectives, in order to ensure that it was correct to designate the Air Quality Management Area (AQMA) in the first place.

The AQMA was designated following a Stage III review and assessment in which the levels of fine particles (PM_{10}) were assessed to be unlikely to meet the Welsh Assembly Air Quality Objective by the relevant deadline (31st December 2004). The six other prescribed pollutants were found to meet the current objectives. Pollution monitoring continues to show exceedences of the PM_{10} Objective level with no predicted reduction. The Stage III assessment therefore remains unchanged.

Refinement of knowledge of pollution sources to target Action Plans.

The Stage III Review and Assessment of PM_{10}

The Stage III assessment included several source apportionment studies.

Analysis of the PM_{10} pollution rose showed that the average concentration was heavily biased toward the west/south-west of the Groeswen monitoring station. This suggested that the M4 motorway, which runs from west to east, north of the monitoring station, was not likely to be the source of the problems. The nearby steel works and the sea are the only features located along the west/south-westerly direction.

The exceedences of the Government Objective arose not from elevated mean PM_{10} concentrations, rather from a series of pollution incidents. These incidents were isolated to the Margam area, but did not extend as far as Aberafan where the Objective was not likely to be exceeded. This shows that the problem is relatively localised and is less likely to be due to long-distance transportation of pollution.

The PM_{10} particles were collected and analysed using techniques such as electron microscopy, inductively coupled plasma, ion chromatography etc. Samples from different wind directions were separately collected and analysed. The results appeared to show that soluble substances comprised the majority of the samples, but spherical particles of iron oxide consistent with blast furnace emissions were also an important component. The soluble substances, whilst peaking in the west/south-westerly direction, did not vary in concentration by as large a factor as the iron particles which were as much as eight times as common from the west/south-west.

Further studies since the Stage III Review and Assessment

Since the Stage III assessment was carried out, a further source apportionment monitoring study has been carried out. The study comprised the simultaneous operation of the Groeswen Hospital Advanced Urban Network TEOM, together with another identical instrument belonging to Corus and located on the coastal side of the steel works. It was hoped that further information could be obtained by studying the pollution rose of the Corus TEOM, together with analysis of the PM_{10} particles at Cardiff University as carried out previously.

In addition, all major PM_{10} sources on the steel works site have been modelled by Corus. The Environment Agency has also modelled the PM_{10} emissions from the No. 5 blast furnace. The Corus report, which forms part of the public register is attached as Appendix 1, whilst the report from Environment Agency Wales (EAW) is attached as Appendix 2.

Summary and comparison of Corus and Environment Agency Wales Modelling.

The EAW modelling was restricted to the blast furnace emissions whilst the Corus work examined all significant PM_{10} sources on site. Different assumptions were made by the modellers in some respects, one of the most significant being the plume rise factor used in relation to blast furnace No. 5. According to Corus' figures blast furnace No. 5 contributes between 60-70% of the steel works PM_{10} emissions and approximately 10% of the Environmental Quality Standard (EQS) at the Groeswen monitoring station (i.e. $5\mu g/m^3$). By comparison, the Environment Agency Wales (EAW) predicted the contribution to be 80% of the EQS (i.e. approx. $40\mu g/m^3$). Therefore, because of the differing modelling assumptions by Corus and EAW the estimates for the contribution of blast furnace No. 5 as a percentage of the EQS varied between 10-80%. The true figure is likely to lie between these two figures, however the contribution is considered as significant and to require action to reduce it. It is estimated that the reduction of this locally significant source will make a major contribution to moving towards compliance with the PM_{10} Objective.

Take account of national policy developments arising since the AQMA declaration.

The Welsh Assembly Air Quality Objective's have not changed since the AQMA was declared. Neither have there been any locally relevant changes to pollution emission factors or transport plans. The Council will consider whether to adopt road side emission testing of vehicles when the legislative provisions are made available to Authorities with Air Quality Management Areas. However, transport has not been identified as a significant cause of the PM_{10} problems in the AQMA. For this reason the adoption of cleaner transport fuels, end of pipe transport solutions such as diesel vehicle recuperative particle traps or transport management related solutions are not expected to make a sufficient improvement in PM_{10} levels.

Take account of local policy developments, transport schemes, housing and industrial developments etc.

The Unitary Development Plan is currently in preparation and policy issues concerning the Air Quality Management Area are being addressed. There has been a significant development in terms of the Baglan Bay gas fired power station. This plant however will reduce many of the emissions previously produced by boiler plant on site including PM_{10}. Modelling does not show that any air quality problems will arise as a result of the development. Existing industrial processes have not changed significantly enough as to affect the current status of air quality. There are plans for a peripheral distributor road in the vicinity of the steel works. Since traffic has not been identified as a major contributor to the PM_{10} problems, the re-direction of local traffic onto this new road is not considered likely to be a major air quality issue.

Any polluting proposed new development is assessed as to whether it will give rise to a significant contribution to the PM_{10} Environmental Quality Standard (EQS). Any developments likely to exceed a threshold of 0.2% of the EQS and likely to effect the Air Quality Management Area are more likely to be subject to refusal or require amendment. Contributions less than 0.2% of the EQS have been classed as insignificant. Other industrial development in progress such as the recycling and waste to energy plant at Crymlyn Burrows has been assessed and will not cause any significant contributions to PM_{10} in the Air Quality Management Area.

Further monitoring

Monitoring will continue as discussed in Section 2 above. This work will form part of the Action Plan to assess compliance with the Air Quality Objective.

Corroborating other assumptions

The Air Quality Management Area (AQMA) was declared based upon monitoring information, rather than modelling data. The monitoring continues to show a trend towards non-compliance. The boundaries of the AQMA were therefore estimated, based upon the available monitoring data. Three real time monitors were used to make assessments of air quality in three different locations. No further information has arisen to suggest that the re-drawing of the AQMA boundary would be appropriate.

Comments of consultees

A wide range of consultees were contacted during the assessment process. Consultations were received and evaluated but no comments were received that obviated the need for the AQMA or that gave reasons for changes to the boundary.

Costs, Benefits and Feasibility

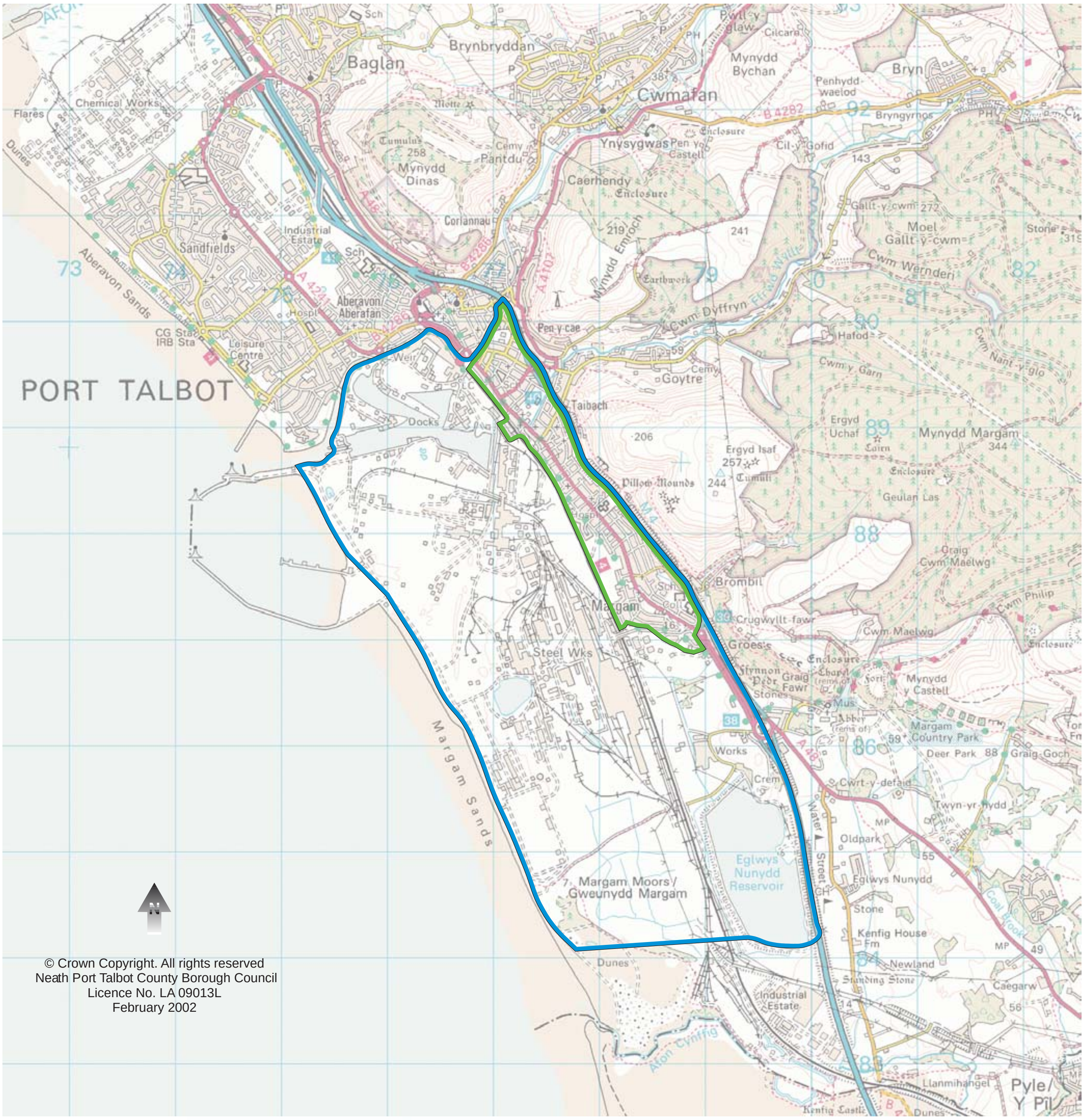
The improvements required to resolve the air quality issues are in part under control of the Environment Agency, since the steel works is subject to an IPC authorisation. In future an IPPC permit will apply to the steel works and the Environment Agency will decide what constitutes Best Available Techniques. Air quality issues will be dealt with in the Action Plan and the IPPC permit will be a vital factor. The permit is anticipated to require Best Available Techniques (BAT) to deal with reduction of PM_{10} from the Corus site of which cast house fume particulates from blast furnace No. 5 have been identified as a significant local contributor to the PM_{10} exceedence problem.

It is anticipated that the reduction of blast furnace cast-house fume emissions will result in less visible fume and possibly less precipitation of fine dust. There are few environmental disadvantages associated with the possible installation of a bag filter plant to reduce the emission. An exception relates to increased power consumption for operation of the bag filter plant, resulting in higher CO_2 emissions.

The Action Plan will also include other proposals to reduce PM_{10} in the AQMA. Proposals for vehicle-related initiatives such as: reduction of Council fleet emissions; safe routes to school; traffic reduction strategies etc. The Unitary Development Plan will also guide decisions on new development. These are all considered to be beneficial, feasible and cost effective approaches.

Airwise

Taibach / Margam Air Quality Management Area (PM_{10}) Action Plan Area



Air Quality Management Area

Action Plan Area

APPENDIX 3 - CONSULTEES

Action Plan Workshop Delegates

ACKERY, H.I. (Mrs) - Church Warden, St Theodore Church.
AMOS, C. J. (FATHER) - Vicar , Parish of St. Theodore Church.
BAGSHAW, R - Development Control Officer, N.P.T.C.B.C.
BOLCHOVER, S. - Head of Environmental Health & Trading Standards, N.P.T.C.B.C.
BRITTON, N. - Welsh Assembly Government - Air Quality Branch
CORK, R. - Swansea Bay Port Health Authority
DAVID, N. -Post Office & British Telecom Pensioners Port Talbot Branch
DAVIES, B. (Mrs) - Resident, Margam
DAVIES, K. - Carnaud Metalbox plc
DAVIES, R.W. - Friends of the Earth
EDE, C. - P.O. Regeneration, Neath Port Talbot C.B.C.
EVANS, P. E. - (Cllr.) Neath Port Talbot C.B.C.
GIBBONS, B. (Dr) - AM, Welsh Assembly Government
GIDDINGS, A. - Farmers Union of Wales
GREANEY, M. (Mrs.) - Head Teacher, Eastern Primary
HARRIS, W.J. (Cllr.) - Neath Port Talbot C.B.C.
HARTSHORN, R., P.O. - Pollution Control Cardiff County Council
HAYES, S. (Dr.) - CCDC, Dept. of Public Health & Medicine
HOARE, S. (Ms) - School Travel Plan Coordinator
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JONES, P.C. (Mrs.) - St Theodore Church/Soroptimist Int.
KYTE, L. (Ms) - Arena Network.
LEONARD, R. - Corus plc
LEWIS, D. - Economic Environment & Consumer Services, Cabinet spokes person, Neath Port Talbot CBC
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Annex 1
Corus Modelling Report

corus

Your Ref:
Our Ref: M188.LWP/RAL/LHD
Date: 30 March 2001

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Mr J Stephens
Environment Agency Wales
Glan Tawe
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SA1 4DF

Dear Mr Stephens

Authorisation Number AR0357/BH1212
Improvement Condition 8.81

Please find enclosed three copies of a report in response to the first part of the above Improvement Condition.

Yours sincerely

R H Leonard

RICHARD LEONARD
Manager - Environment

Encl.

PIR/RSR - South West Wales	
File Ref:	AR0357 Imp Cond
Received:	30 MAR 2001
Pub Reg	YES / ~~NO~~

Summary

Dispersion modelling has been undertaken to estimate the impact of emissions of SO_2, PM10 and NO_x from the Corus integrated steelworks at Port Talbot on ambient air quality in the surrounding area. Twenty-two pollutant sources have been included in the modelling exercise; most were emissions from stacks, but estimated fugitive emissions from roof vents and stockyards were also included.

The ADMS dispersion model was used for the study, and the effects of complex terrain and atmospheric NO_x chemistry were included in the model. Individual buildings were not included, but the overall effect of many widely-spaced buildings, large and small, was modelled by varying the surface roughness over the area of interest.

The modelling results the contribution of emissions from the Corus site, and the overall pollutant levels will be the sum of this contribution and the contributions from road transport, other industry, domestic sources and natural sources. Objectives for ambient levels of SO_2, PM10 and NO_2 are included in recent legislation, and the averaging times specified in those regulations have been used for the output from the dispersion model. For SO_2 and PM10, Corus' contributions were more significant for short-term concentrations than for long-term levels. The peak modelled 99.9th percentile of 15-minute average SO_2 concentrations was around 23 µg/m^3, compared to the objective of 266 µg/m^3. For PM10, the highest off-site daily average concentration (allowing for 35 exceedences) was about 14 µg/m^3, compared to the objective of 50 µg/m^3, but this result is subject to more uncertainty than that for SO_2 as it is very sensitive to the emission rate of fugitive fume from No. 5 Blast Furnace casthouse roof. For NO_2, the long-term concentration was more significant than the short-term levels - the modelled annual average contribution was 4 µg/m^3, compared to the objective of 40 µg/m^3, but this result is sensitive to the assumed background levels of pollutants. Adding the Corus contribution to ambient background levels from NETCEN gives a peak 99.9th percentile of 15-minute average SO_2 concentrations of 61 µg/m^3, a highest off-site 90.4th percentile of daily mean PM10 concentrations of 62 µg/m^3 and a peak annual average NO_2 concentration of 17 µg/m^3. Variation in pollutant concentrations from year to year is small in relation to the uncertainty expected in the results.

The sensitivity of the modelling results to some of the assumptions in the model has been tested by varying those assumptions. Variations in assumed surface roughness (within realistic limits) were found to have a negligible effect on the results. The levels of PM10 were very sensitive to the estimated emission rates from fugitive sources, which are not as well defined as those from stack sources, though short-term variations in emission rate had little effect. The exclusion of individual buildings resulted in up to a 30% reduction in the PM10 concentrations at the boundary of the Corus site, but this difference decreased further from the site. Treating stockyard emissions as a single point source, rather than an area source, affected predicted PM10 concentrations within the stockyard areas, but had a negligible effect in populated areas. Ambient NO_2 concentrations were sensitive to the background levels of total NO_x, NO_2 and especially ozone.

1 Introduction

This report describes dispersion modelling undertaken to estimate the impact of emissions of SO_2, PM10 and NO_x from the Corus integrated steelworks at Port Talbot on ambient air quality in the surrounding area. The modelling results reflect the contribution of emissions from the Corus site, and the overall pollutant levels will be the sum of this contribution and the contributions from road transport, other industry, domestic sources and natural sources. Background pollutant concentrations and predicted overall levels (including contributions from both Corus and background sources) have also been estimated.

2 Dispersion Modelling

2.1 Software

The model used for this study was the commercially available Atmospheric Dispersion Modelling System (ADMS), version 3.0, released in February 1999 and further upgraded in November 1999 (interface version 1.12). ADMS 3 is a "new-generation" model based on a detailed understanding of the structure of the atmospheric boundary layer and represents an up-to-date approach to dispersion modelling. There are still many sources of possible error, and a report commissioned by Her Majesty's Inspectorate of Pollution and published in 1996[(1)] concluded that :

> "The ADMS results ... indicated that, on average, the difference between predicted and observed maximum ground level concentrations in conditions similar to those investigated is unlikely to be more than a factor of two. This is acceptable for most practical purposes and is unlikely to be bettered by other modelling methods"

These conclusions related to a previous version of ADMS (version 1.35), but the current version is based on the same algorithms and would be expected to have similar accuracy. Further validation studies[(2)] of ADMS 3 have been undertaken against several different data sets and a comparison[(3)] of the performance of ADMS against wind tunnel data in complex terrain has also been made. A further comparison[(4)] of the performance of ADMS and two models developed by the United States Environmental Protection Agency (AERMOD, another "new-generation" model, and the older ISC3 model) against five different sets of field observations has been undertaken by the American Petroleum Institute, and concluded that :

> "... ISC3 typically overpredicts, has a scatter of about a factor of three, and has about 33% of its predictions within a factor of two of observations. The ADMS performance is slightly better than the AERMOD performance and both perform better than ISC3. On average, ADMS underpredicts by about 20% and AERMOD underpredicts by about 40%, and both have a scatter of about a factor of two. ADMS and AERMOD have about 53% and 46% of their predictions within a factor of two of observations, respectively. Considering only the highest predicted and observed concentrations, ISC3 overpredicts by a factor of about seven, on average, while ADMS and AERMOD underpredict by about 20%, on average."

Hence ADMS represents a state-of-the-art tool for dispersion modelling. It should be noted that the inclusion of additional factors in the modelling reported here, such as complex terrain and atmospheric chemistry for NO_x, is likely to increase the uncertainty of the modelling results.

2.2 Modelling Set-Up

There are a variety of optional modules available within ADMS, for instance to model the effect of complex terrain, buildings and coastlines, and the modules and other options used in this exercise are discussed in Appendix 1. Following the initial modelling exercise, some of these options were altered to determine the sensitivity of the results to assumptions made in the set-up. The sensitivity analysis is further discussed in Section 5.

3 Input to the Dispersion Model

3.1 Emissions Data

The emissions data input to the model was obtained from the Works' Environmental Department at Port Talbot. A total of 22 sources was included, covering the following areas:

- Combustion processes - four Boilers, two Coke Oven Underfiring stacks, two sets of Blast Furnace Stoves, Reheating Furnace and Annealing Furnace
- Other stack emissions - Main Stack and Dedust Stack at the Sinter Plant, No. 4 Blast Furnace Casthouse Extraction, Primary and Secondary Extraction and Hot Metal Pour at the BOS Plant, Ammonia Incinerator
- Estimated fugitive emissions - No. 4 and No. 5 Blast Furnace casthouse roofs, BOS Plant roof, ore stockyards and coal stockyards

Details of these emissions are included in Appendix 2.

3.2 Topographical Data

The Port Talbot site is at approximately 51.5 °N, 4 °W. Spot height data from the Ordnance Survey were used to generate the terrain file illustrated in Figure A1.2, and surface roughness data over the same area were estimated from the Ordnance Survey 1:50,000 scale map as described in Appendix 1.

3.3 Meteorological Data

The nearest Meteorological Office station where the data required for the ADMS model have been collected was at Cardiff Rhoose airport, 35 km ESE of the Corus site. This site ceased operation at the end of 1997, and so the five years' data input to the model were for the period 1993 to 1997. For each year, hourly sequential data were obtained from the Meteorological Office covering wind speed and direction, cloud cover, surface temperature, precipitation and relative humidity. The surface roughness at the Meteorological Office station is 0.1 metres, whilst the surface roughness around the Port Talbot site is variable. The option within ADMS to specify the surface roughness at the meteorological site was used to allow the software to make allowance for the different roughness.

4 Dispersion Modelling Results

The following results reflect only the contribution of emissions from the sources listed in Appendix 2. Overall pollutant levels will be the sum of this contribution and the contributions from road transport, other industry, domestic sources and natural sources. Output concentrations have been expressed in the averaging times specified in the Air Quality (Wales) Regulations 2000[5], that set objectives for future ambient air quality (see also Table A1.3.

4.1 SO_2

Figure 1 illustrates the variation in the 99.9th percentile of fifteen-minute average SO_2 concentrations attributable to emissions from the Corus site, using the 1993 meteorological data. The peak value is 22.5 µg/m^3 in Margam and the most significant contributors to this peak are the coke ovens (underfiring stacks at Grange and Morfa, plus the ammonia incinerator). The peak on the hillside north-east of the Corus site (20.7 µg/m^3) is largely attributable to emissions from the sinter plant. Table 1 summarises the peak contributions for different averaging times and different sets of meteorological data. The variation from year to year is small in relation to the uncertainty expected in the results.

4.2 PM10

Figure 2 illustrates the variation in the 90.4th percentile of 24-hour average PM10 concentrations attributable to emissions from the Corus site, using the 1997 meteorological data. The peak value occurs on the Corus site, within the coal stockyards (estimated to be a significant source of PM10, see Appendix 2, with emissions at ground level rather than dispersed by a tall stack). The peak contribution beyond the Corus boundary is to the west of the coal stockyards, in Swansea Bay, and the highest level in a populated area is 11.6 µg/m^3 to the east of the blast furnaces. The most significant contributor to this peak is the estimated emissions from No. 5 Blast Furnace casthouse roof. The other area where PM10 levels are high, in the north-west of the Corus site, is within the ore stockyards. Table 2 summarises the peak contributions for different averaging times and different sets of meteorological data.

The dispersion results for PM10 emissions have additional errors on top of the modelling uncertainty in that the most significant contributors are sources for which the emissions cannot easily be quantified (coal and ore stockyards and casthouse roof). This is further discussed in Section 5.

4.3 NO_2

The NO_2 concentrations calculated from the ADMS dispersion model include the background concentrations input to the NO_x Chemistry module, but the principal aim of the modelling work was to reflect only the additional contribution from Corus. Accordingly, the background levels were subtracted from the calculated results to leave the Corus contribution. Figure 3 illustrates the variation in the 99.8th percentile of hourly average NO_2 concentrations attributable to emissions from the Corus site, using the 1995 meteorological data. The highest values are found at some distance from the Corus site as the reactions of NO_x to form NO_2 do not occur instantaneously; the peak additional contribution is 12.8 µg/m^3. Table 3 summarises the peak contributions for different averaging times and different sets of meteorological data.

5 Sensitivity Analysis

In Section 2.1 it was stated that the results of dispersion modelling are subject to considerable uncertainty, and that the necessity of including the effects of complex terrain and atmospheric chemistry was likely to increase the potential error. The results for the PM10 modelling have additional uncertainty because the emission rates of the sources that are expected to have the greatest impacts are themselves difficult to quantify. Other assumptions made in the development of this model, such as the ambient total NO_x, NO_2 and ozone levels, the roughness lengths to be used for the different types of terrain and the exclusion of building effects will also affect the final results.

To examine the sensitivity of the results to some of these parameters, further modelling runs have been undertaken. To reduce the computer run-time required, only one year's meteorological data has been used in each run, since the results in Tables 1 to 3 indicate that the variation from year to year is relatively small.

5.1 SO_2

Most of the SO_2 is emitted from tall stacks, with minimal influence from buildings, and so it would not be expected that the exclusion of buildings effects would be significant - building effects are considered in more detail in section 5.2. The parameters most likely to affect the final SO_2 results are the assumed roughness lengths in Table A1.1. To test the sensitivity, five different sets of roughness data were used, and Table 4 lists these, along with the corresponding SO_2 modelling results using the 1993 meteorological data. The first three runs demonstrate that the modelling results are not sensitive to the roughness length, within the range of values used. The final runs, one using a constant roughness length over the whole area and one using unrealistic roughness lengths, were undertaken to demonstrate that large enough changes could affect the results, but the overall conclusion is that the results are not sensitive to the assumed surface roughness values.

5.2 PM10

The dispersion modelling results for PM10 are likely to be significantly affected by uncertainties and variations in the estimated emission rates from fugitive sources, and possibly by the exclusion of buildings effects, as many of the principal PM10 sources are not tall stacks. In addition, stockyard emissions have been assumed to come from a single point source at the centre of the stockyard area (area sources can be included in ADMS, but cannot be combined with complex terrain), and this is likely to overestimate the impact close to the source.

Ambient concentrations downwind of a single source are directly proportional to the emission rate of the pollutant if other parameters remain constant, and in this instance the peak modelled PM10 concentrations are largely attributable to single sources. The sources concerned are fugitive sources (stockyards and casthouse roof vents) that are difficult to quantify, and so the emission rate estimates are subject to considerable uncertainty. Emission rates from these fugitive sources are also likely to be more variable than those from stacks, and so the use of a single average emission rate in the model will introduce further errors; however the fact that ambient PM10 concentrations are averaged over twenty-four hours or a year will reduce the impact of short-term variations in emission rate. To illustrate the effect of the emission rate, three different emission scenarios for No. 5 Blast Furnace casthouse roof have been examined - one with a constant emission rate of 13.25 g/s (as in Appendix 2), one with double that emission rate, and one with hourly average emission rates varying from 2.8 g/s to 60 g/s through the day, but averaging 13.25 g/s.

Table 5 details the PM10 modelling results for each of the above scenarios using the 1997 meteorological data; these results are for a single source, rather than for the whole site. Varying the emission rate during each day makes less than 10% difference to both the annual average concentration and the 90.4th percentile of 24-hour averages compared to using a constant emission rate of 13.25 g/s. Doubling the emission rate results in double the ambient concentration, which would be expected. Hence the value of the average emission rate is of more significance than short-term variations in the rate.

As discussed in Appendix 1, buildings in the vicinity of pollutant sources may affect dispersion, particularly at locations within the wake of a large building, but ADMS can only include the effect of a single structure. The exclusion of buildings will be more significant for low-level sources than for emissions from tall stacks. To investigate the effect that buildings might have, the three emission scenarios previously examined for No. 5 Blast Furnace casthouse roof have been re-examined including the effects of the casthouse building, and these modelling results are also included in Table 5.

At the NETCEN station, one kilometre from No. 5 Blast Furnace, including the casthouse building in the model increases the results by less than 10%. Closer to the source, the effect of the building becomes more significant, and at the boundary of the Corus site, the increase in concentrations when the building is included is around 30%. This represents a worst case for a single source on the Port Talbot site, as the emission concerned is from vents at roof level, rather than from a stack, and the source is close to the Works boundary. For the model of emissions from the whole site, the off-site effect of excluding buildings will be less than a 30% difference in the predicted PM10 concentrations.

To examine the effect of using a single point source for emissions from stockyards, the whole-site model has also been run with the stockyard areas divided into either four or nine equal areas, and the emission divided between point sources at the centre of each area. Table 6 summarises the results obtained using the 1997 meteorological data and demonstrates that the choice of single or multiple sources for the stockyard emissions does not significantly affect the results obtained beyond the Works boundary, although it does have a marked effect on predicted concentrations within the stockyards themselves.

5.3 NO_2

The NO_2 concentrations attributable to emissions from the Corus site will be affected by the assumed background ambient concentrations of total NO_x, NO_2 and ozone which determine the rate of conversion of NO to NO_2. Table 7 summarises the results of modelling using different values for these parameters and the 1995 meteorological data. The NO_2 concentrations are very sensitive to the assumed background levels, particularly to the ozone level.

6 Background Pollutant Levels

About a kilometre from the Corus site is a local authority air quality monitoring station, operated as part of the Automatic Urban Network by the National Environmental Technology Centre (NETCEN). Monitoring at this site commenced in January 1997 and the results are posted on the NETCEN Internet site[6]. Some of the data for the year 2000 are still provisional, but the data recorded in the three previous years since the station commenced operation are summarised in Table 8. The PM10 measurements were undertaken using a TEOM monitor, and a report from the Airborne Particles Expert Group[7] concludes that at PM10 levels around 50 µg/m³, this instrument under-reads compared to gravimetric sampling by between 15 and 30%. For the purposes of air quality assessments, guidance published by DETR[8] suggests that TEOM results should be multiplied by a factor of 1.3 (paragraph 8.72) to account for this discrepancy, though further work to examine the relationship between TEOM and gravimetric results has been commissioned by DETR. Both the original TEOM results and the estimated gravimetric results are included in the Table.

For the three pollutants considered in this dispersion modelling report, only short-term PM10 concentrations (daily average concentration, allowing for 35 exceedences) do not currently meet the objectives for future ambient air quality specified in the legislation (dependent on the factor used to correct the TEOM results). In July 2000, Neath Port Talbot Borough Council declared an air quality management area for PM10 over an area between the Corus site and the M4 motorway. Exercises to improve understanding of the nature of the particulates collected at the Port Talbot NETCEN station and to determine the contributions from different sources are in progress.

7 Combined Effect of Corus Contribution and Background Concentration

For comparison with long-term (e.g. annual average) objectives, it is valid to simply add the annual average contribution from the Corus emissions to the annual average background level from other sources. For comparison with short-term objectives, however, this is not a valid approach, since the meteorological conditions giving rise to the greatest contributions from stack emissions are generally not the same as those giving rise to the highest background levels from other sources. In these circumstances, guidance published by DETR[8] suggests a methodology for adoption by Local Authorities for their second stage reviews and assessments, and the same method will be employed here.

7.1 SO_2

The DETR guidance (paragraph 7.37) suggests adding the predicted short-term SO_2 concentrations attributable to emissions from an industrial source to a multiple of the annual mean background concentrations. The annual mean SO_2 measured at the NETCEN station ranged from 13 to 19 µg/m³ (see Table 8), though this will include some contribution from the emissions from the Corus site. NETCEN have also published active maps[9] of pollution concentrations interpolated for the whole of the UK; excluding the 1 km square within which there is an oil refinery, the highest estimated annual mean SO_2 level in the Neath Port Talbot area is 17 µg/m³. Hence as a worst case, an annual average of 19 µg/m³ will be assumed across the whole of the area under consideration. The DETR guidance then suggests the following:

- for assessment of the fifteen-minute mean objective add the predicted 99.9th percentile of fifteen-minute means from the stack to twice the estimated annual mean background concentration
  Peak Corus contribution = 23 µg/m^3
  Peak Corus plus background = 23 + (2 x 19) = 61 µg/m^3
- for assessment of the one-hour mean objective add the predicted 99.7th percentile of one-hour mean concentrations from the stack to twice the estimated annual mean background concentration
  Peak Corus contribution = 16 µg/m^3
  Peak Corus plus background = 16 + (2 x 19) = 54 µg/m^3
- for assessment of the 24-hour mean objective add the predicted 99th percentile of 24-hour mean concentrations from the stack to the estimated annual mean background concentration
  Peak Corus contribution = 8 µg/m^3
  Peak Corus plus background = 8 + 19 = 27 µg/m^3

The short-term SO_2 values measured at the NETCEN station are considerably greater than the predictions, and the discrepancy is greater than could be accounted for by the expected uncertainty in the modelling exercise. It is likely that the difference between the predicted and the measured results is attributable to emissions from sources not included within this model, for instance from other (non-Corus) industrial sources. SO_2 concentrations measured at the Port Talbot NETCEN site are well within the objectives specified in the Air Quality (Wales) Regulations 2000[5], and from the limited amount of data available seem to be falling still further.

7.2 PM10

Table 8 indicates that the annual mean PM10 concentration measured using a TEOM at the NETCEN station in Port Talbot ranged from 26 to 27 µg/m^3. As discussed in section 6, DETR guidance[8] suggests that TEOM results should be multiplied by a factor of 1.3 to correct to a gravimetric basis, though there is some uncertainty over this factor and further work to examine the relationship between TEOM and gravimetric results has been commissioned. Using the suggested factor, the annual mean PM10 concentration ranged from 34 to 35 µg/m^3, gravimetric. Table 8 also indicates that the annual average contribution from the Corus site was 2 to 3 µg/m^3 and since annual average contributions from different sources are additive, it is estimated that the annual mean background concentration excluding the contribution from the Corus site is around 32 µg/m^3.

For assessment against the short-term PM10 objective, the DETR guidance (paragraph 8.59) suggests adding the predicted short-term PM10 concentrations attributable to emissions from industrial sources to short-term background levels. The 90.4th percentile of daily mean PM10 concentrations measured at the NETCEN station, after applying the factor to correct the TEOM results, ranged from 59 to 62 µg/m^3, gravimetric, but these values are not true background levels, as they will include some contribution from the emissions from the Corus site. The DETR guidance (paragraph 8.11) suggests that the 90.4th percentile of daily mean PM10 concentrations is approximately 1.68 times the annual mean, i.e. 1.68 x 32 = 54 µg/m^3, and this value will be used in the following assessment. The DETR guidance then suggests the following:

- if the 90.4th percentile of daily mean PM10 concentrations attributable to stack emissions exceeds that for the background, add the predicted stack contribution to 0.6 times the background level
  Peak Corus contribution beyond Boundary = 14 µg/m^3
  Background level = 54 µg/m^3
  Predicted contribution from stacks does not exceed background level

- if the 90.4th percentile of daily mean PM10 concentrations attributable to stack emissions does not exceed that for the background, add 0.6 times the predicted stack contribution to the background level
  Peak Corus contribution beyond Boundary = 14 µg/m³
  Background level = 54 µg/m³
  Peak Corus plus background = 0.6 x 14 + 54 = 62 µg/m³
- for assessment of the annual mean objective add the predicted annual mean concentration from the stack to the estimated annual mean background concentration
  Peak Corus contribution beyond Boundary = 5 µg/m³
  Background level = 32 µg/m³
  Peak Corus plus background = 5 + 32 = 37 µg/m³

The measured PM10 results at the NETCEN station are similar to these predictions. However this assessment is subject to considerable uncertainty; apart from the potential errors attributable to the modelling process, emission rates from fugitive sources and exclusion of building effects, there is also uncertainty over the conversion of TEOM results to a gravimetric basis and the background levels to be used. As discussed in section 6, PM10 results (assuming a TEOM factor of 1.3) do exceed the short-term objectives specified in the Air Quality (Wales) Regulations 2000[5], and Neath Port Talbot Borough Council have declared an air quality management area for PM10 over an area between the Corus site and the M4 motorway.

7.3 NO_2

Modelling of atmospheric NO_x Chemistry resulted in dispersion modelling output giving overall NO_2 levels, from which the Corus contribution was deduced. The modelled overall levels, including both Corus' contribution and background, were:

- predicted 99.9th percentile of hourly means
  Peak Corus contribution = 13 µg/m³
  Peak Corus plus background = 57 µg/m³
- predicted annual average
  Peak Corus contribution = 4 µg/m³
  Peak Corus plus background = 17 µg/m³

The measured NO_2 results at the NETCEN station are greater than predicted above. Road traffic is likely to be contribute significantly to NO_2 concentrations at the station, and as discussed in section 5.3, predicted NO_2 concentrations are very sensitive to the assumed background ambient concentrations of total NO_x, NO_2 and ozone. NO_2 concentrations measured at the Port Talbot NETCEN site are only 40 to 65% of the objectives specified in the Air Quality (Wales) Regulations 2000[5].

8 Conclusions

Emissions of SO_2, PM10 and NO_x from 22 pollutant sources on the Corus integrated steelworks at Port Talbot have been included in a dispersion model. Most were emissions from stacks, but estimated fugitive emissions from roof vents and stockyards were also included. The results have been expressed in the averaging times specified in the Air Quality (Wales) Regulations[5], and reflect the contribution from emissions from the Corus site. The overall pollutant levels in the area will be the sum of this contribution and the contributions from road transport, other industry, domestic sources and natural sources. Background pollutant concentrations and predicted overall levels (including contributions from both Corus and background sources) have also been estimated.

A number of assumptions were made in the formulation of the model, and the sensitivity of the final results to some of these has been examined. Changes to the surface roughness (within realistic values), using a single point to model releases from stockyards and the inclusion of variable emission rates made less than 10% difference to the results. Exclusion of building effects made less than 10% difference at the NETCEN site, but up to 30% difference closer to the source considered. The results for PM10 are also very sensitive to the estimated emission rates from fugitive sources that are difficult to measure, and this is likely to be the most significant sensitivity for particulates. The results for NO_2 are very sensitive to the assumed background levels used in the NO_x chemistry module. On top of these sensitivities, all dispersion models have considerable uncertainty, as discussed in Section 2.1.

With the above provisos, Tables 1 to 3 summarise the modelled contribution of emissions from the Corus site to ambient pollutant levels. For SO_2 and PM10, Corus' contributions were more significant for short-term concentrations than for long-term levels. The peak modelled 99.9th percentile of 15-minute average SO_2 concentrations was around 23 µg/m^3, compared to the objective of 266 µg/m^3. For PM10, the highest off-site daily average concentration (allowing for 35 exceedences) was about 14 µg/m^3, compared to the objective of 50 µg/m^3, but this result is subject to more uncertainty than that for SO_2 as it is very sensitive to the emission rate of fugitive fume from No. 5 blast furnace casthouse roof. For NO_2, the long-term concentration was more significant than the short-term levels - the modelled annual average was 4 µg/m^3, compared to the objective of 40 µg/m^3, but this result is sensitive to the assumed background levels of pollutants.

Section 7 summarises the predicted overall effect of the emissions from the Corus site and background pollutant levels. For SO_2 the predicted levels are considerable less than the measured concentrations. It is likely that the discrepancy is attributable to emissions from other (non-Corus) sources not included in this modelling exercise, but the measured results are still within the objectives specified in the Air Quality (Wales) Regulations[(5)]. For PM10, overall short-term concentrations are predicted to exceed the objectives for future ambient air quality specified in the legislation, and this is borne out by measured values. Neath Port Talbot Borough Council have declared an air quality management area for PM10 over an area between the Corus site and the M4 motorway. Exercises to improve understanding of the nature of the particulates collected at the Port Talbot NETCEN station and to determine the contributions from different sources are in progress. The overall NO_2 values measured at the NETCEN station are greater than the modelling predicts, but predicted NO_2 concentrations are very sensitive to the assumed background ambient concentrations of total NO_x, NO_2 and ozone. NO_2 concentrations measured at the Port Talbot NETCEN site are only 40 to 65% of the objectives specified in the legislation.

References

1) "Validation of the UK-ADMS Dispersion Model and Assessment of its Performance Relative to R-91 and ISC using Archived LIDAR Data", Report No. DoE/HMIP/RR/95/022, Her Majesty's Inspectorate of Pollution, March 1996.

2) "ADMS 3 Validation Summary", Cambridge Environmental Research Consultants *http://www.cerc.co.uk/software/pubs/2 - ADMS 3 Validation Summary.pdf*

3) Carruthers, D.J., "Supplement to our Presentation of the ADMS Air Quality Models at the 7th Conference", Submission to US EPA, August 2000 *http://www.cerc.co.uk/epa/epa_sub.pdf*

4) Hanna, S.R., Egan, B.A, Purdum, J. and Wagler, J., "Evaluation of the ADMS, AERMOD and ISC3 Dispersion Models with the Optex, Duke Forest, Kincaid, Indianapolis and Lovett Field Data Sets", American Petroleum Institute *http://www.cerc.co.uk/software/pubs/9 - ADMS Aermod and ISC evaluation.pdf*

5) "The Air Quality (Wales) Regulations 2000", Statutory Instrument 2000 No. 1940 (W. 138), July 2000

6) "Automatic Site Data - Port Talbot", National Environmental Technology Centre, *http://www.aeat.co.uk/netcen/airqual/data/auto/pt.html*

7) "Source Apportionment of Airborne Particulate Matter in the United Kingdom", Report of the Airborne Particles Expert Group, 1999.

8) "Review and Assessment: Pollutant Specific Guidance", Report No. LAQM.TG4(00), Department of the Environment, Transport and the Regions, May 2000.

9) "Maps of Air Pollution in the UK", National Environmental Technology Centre, *http://www.aeat.co.uk/cgi-bin/concmaps1.pl*

TABLE 1
DISPERSION MODELLING RESULTS - SO_2

Year	Averaging Period	Peak Contribution from Corus Site (µg/m³)	Corus' Contribution at NETCEN Station (µg/m³)
1993	99.9th Percentile of 15-Minute Means	22.5	12.5
	99.7th Percentile of Hourly Means	14.5	8.3
	99.2nd Percentile of Daily Means	8.1	2.3
1994	99.9th Percentile of 15-Minute Means	22.6	13.7
	99.7th Percentile of Hourly Means	16.1	9.4
	99.2nd Percentile of Daily Means	7.7	1.9
1995	99.9th Percentile of 15-Minute Means	22.3	12.1
	99.7th Percentile of Hourly Means	14.3	7.9
	99.2nd Percentile of Daily Means	7.6	2.5
1996	99.9th Percentile of 15-Minute Means	21.7	12.4
	99.7th Percentile of Hourly Means	15.6	9.1
	99.2nd Percentile of Daily Means	7.4	2.3
1997	99.9th Percentile of 15-Minute Means	22.8	12.4
	99.7th Percentile of Hourly Means	15.5	8.7
	99.2nd Percentile of Daily Means	6.8	2.3

Range	99.9th Percentile of 15-Minute Means	22 - 23	12 - 14
	99.7th Percentile of Hourly Means	14 - 16	8 - 9
	99.2nd Percentile of Daily Means	7 - 8	2 - 3

Objectives from Air Quality (Wales) Regulations 2000[5]	
99.9th Percentile of 15-Minute Means	266 µg/m³
99.7th Percentile of Hourly Means	350 µg/m³
99.2nd Percentile of Daily Means	125 µg/m³

TABLE 2
DISPERSION MODELLING RESULTS - PM10

Year	Averaging Period	Peak Contribution Beyond Boundary from Corus Site (μg/m³)	Corus' Contribution at NETCEN Station (μg/m³)
1993	90.4th Percentile of Daily Means	12.3	5.9
	Annual Average	4.1	2.2
1994	90.4th Percentile of Daily Means	12.2	7.4
	Annual Average	4.6	2.5
1995	90.4th Percentile of Daily Means	10.8	5.3
	Annual Average	3.8	2.0
1996	90.4th Percentile of Daily Means	12.8	7.5
	Annual Average	4.0	2.4
1997	90.4th Percentile of Daily Means	13.8	7.7
	Annual Average	4.1	2.5
Range	90.4th Percentile of Daily Means	11 - 14	5 - 8
	Annual Average	4 - 5	2 - 3

Objectives from Air Quality (Wales) Regulations 2000[5]	
90.4th Percentile of Daily Means	50 μg/m³
Annual Average	40 μg/m³

TABLE 3
DISPERSION MODELLING RESULTS - NO_2

Year	Averaging Period	Peak Contribution from Corus Site (μg/m³)	Corus' Contribution at NETCEN Station (μg/m³)
1993	99.8th Percentile of Hourly Means	11.6	2.0
	Annual Average	3.3	1.4
1994	99.8th Percentile of Hourly Means	11.1	3.4
	Annual Average	4.0	1.9
1995	99.8th Percentile of Hourly Means	12.8	3.2
	Annual Average	3.3	1.5
1996	99.8th Percentile of Hourly Means	12.3	3.9
	Annual Average	2.9	1.4
1997	99.8th Percentile of Hourly Means	12.2	3.3
	Annual Average	2.9	1.5

Range	99.8th Percentile of Hourly Means	11 - 13	2 - 4
	Annual Average	3 - 4	1 - 2

Objectives from Air Quality (Wales) Regulations 2000[5]	
99.8th Percentile of Hourly Means	200 µg/m³
Annual Average	40 µg/m³

TABLE 4
SENSITIVITY OF SO_2 RESULTS TO SURFACE ROUGHNESS VALUES

Terrain Type	Surface Roughness (m)	Averaging Period	Peak Contribution from Corus Site (µg/m³)	Corus' Contribution at NETCEN Station (µg/m³)
Sea *Beach/Dunes* *Lakes* Industrial Sites *Marsh* Open Ground Residential Town Centre *Woods*	*0.001* *0.01* *0.005* 1 *0.01* 0.02 0.5 1.5 *1*	99.9th Percentile of 15-Minute Means	22.5	12.5
		99.7th Percentile of Hourly Means	14.5	8.3
		99.2nd Percentile of 24-Hour Means	8.1	2.3
Sea *Beach/Dunes* *Lakes* Industrial Sites *Marsh* Open Ground Residential Town Centre *Woods*	*0.001* *0.01* *0.005* 3 *0.01* 0.05 1 3 *1*	99.9th Percentile of 15-Minute Means	22.5	12.5
		99.7th Percentile of Hourly Means	14.5	8.3
		99.2nd Percentile of 24-Hour Means	8.1	2.3
Sea *Beach/Dunes* *Lakes* Industrial Sites *Marsh* Open Ground Residential Town Centre *Woods*	*0.001* *0.01* *0.005* 5 *0.01* 0.1 1 3 *1*	99.9th Percentile of 15-Minute Means	22.5	12.5
		99.7th Percentile of Hourly Means	14.5	8.3
		99.2nd Percentile of 24-Hour Means	8.1	2.3
Roughness values in *italics* were not altered in these three runs				
Surface roughness not varied - value of 0.02 metres over whole area (i.e. open ground)		99.9th Percentile of 15-Minute Means	29.9	24.2
		99.7th Percentile of Hourly Means	23.6	18.3
		99.2nd Percentile of 24-Hour Means	9.6	4.5
Sea Beach/Dunes Lakes Industrial Sites Marsh Open Ground Residential Town Centre Woods	0.1 0.5 0.1 10 0.1 0.4 2 5 5	99.9th Percentile of 15-Minute Means	26.5	20.5
		99.7th Percentile of Hourly Means	21.5	16.0
		99.2nd Percentile of 24-Hour Means	13.2	5.7

TABLE 5
SENSITIVITY OF PM10 RESULTS TO EMISSION RATE AND BUILDING EFFECTS

Emission Rate	Building Effects	Averaging Period	Contribution from No. 5 Blast Furnace Casthouse Roof	
			Peak Beyond Boundary (μg/m³)	Contribution at NETCEN Station (μg/m³)
60 g/s for one hour per day 50 g/s for one hour per day 40 g/s for one hour per day 30 g/s for one hour per day 20 g/s for one hour per day 10 g/s for 9 hours per day 2.8 g/s for 10 hours per day average = 13.25 g/s	Excluded	90.4th Percentile of Daily Means	8.4	5.4
		Annual Average	2.5	1.4
	Included	90.4th Percentile of Daily Means	11.0	5.5
		Annual Average	3.2	1.5
Constant emission rate = 13.25 g/s	Excluded	90.4th Percentile of Daily Means	8.4	5.0
		Annual Average	2.6	1.5
	Included	90.4th Percentile of Daily Means	11.0	5.1
		Annual Average	3.3	1.5
Constant emission rate = 26.5 g/s	Excluded	90.4th Percentile of Daily Means	16.8	9.9
		Annual Average	5.2	2.9
	Included	90.4th Percentile of Daily Means	21.9	10.3
		Annual Average	6.5	3.0

TABLE 6
SENSITIVITY OF PM10 RESULTS TO TREATMENT OF STOCKYARD EMISSIONS

Stockyards Modelled as	Averaging Period	Contribution from Corus Site (μg/m³)			
		Peak within Coal Stockyards	Peak on Western Boundary	Peak on Eastern Boundary	Contribution at NETCEN Station
Single point source	90.4th Percentile of Daily Means	61.9	13.8	11.6	7.7
	Annual Average	17.3	4.1	4.1	2.5
Four equal point sources	90.4th Percentile of Daily Means	37.8	13.1	11.7	7.7
	Annual Average	21.9	4.4	4.1	2.5
Nine equal point sources	90.4th Percentile of Daily Means	29.6	12.2	11.7	7.7
	Annual Average	13.5	4.2	4.1	2.5

TABLE 7
SENSITIVITY OF NO_2 RESULTS TO BACKGROUND AMBIENT LEVELS

Species	Background Ambient Concentration (ppb)	Averaging Period	Peak Contribution from Corus Site (μg/m³)	Corus' Contribution at NETCEN Station (μg/m³)
Total NO_x NO_2 ozone	22.8 13.0 24.9	99.8th Percentile of Hourly Means	12.8	3.2
		Annual Average	3.3	1.5
Total NO_x NO_2 ozone	20 10 35	99.8th Percentile of Hourly Means	18.1	8.2
		Annual Average	6.7	2.1
Total NO_x NO_2 ozone	15 10 50	99.8th Percentile of Hourly Means	26.7	13.1
		Annual Average	10.5	1.4

TABLE 8
BACKGROUND POLLUTANT LEVELS

Species	Averaging Period	Year	% Data Capture	Concentration in µg/m³		
				Measured Value at NETCEN Station	Objectives from Ref. 4	Corus' Contribution at NETCEN Station
SO_2	99.9th Percentile of 15-Minute Means	1997	85.3	205	266	12 - 14
		1998	95.1	189		
		1999	52.8	165		
	99.7th Percentile of Hourly Means	1997	87.0	139	350	8 - 9
		1998	95.0	123		
		1999	53.8	109		
	99.2nd Percentile of Daily Means	1997	85.8	48	125	2 - 3
		1998	96.4	45		
		1999	53.2	43		
	Annual Average	1997	87.0	19	-	-
		1998	97.2	13		
		1999	53.8	14		
PM10	90.4th Percentile of Daily Means	1997	87.7	(45) 59 *	50	5 - 8
		1998	97.5	(47) 61 *		
		1999	97.0	(48) 62 *		
	Annual Average	1997	88.1	(27) 35 *	40	2 - 3
		1998	97.6	(27) 35 *		
		1999	97.0	(26) 34 *		
NO_2	99.8th Percentile of Hourly Means	1997	85.0	92	200	2 - 4
		1998	97.4	84		
		1999	94.4	88		
	Annual Average	1997	85.0	26	40	1 - 2
		1998	97.4	25		
		1999	94.4	25		

* PM10 measurements in brackets are taken directly from the TEOM monitoring results. The second figure is an estimation of the concentration that would have been measured by a gravimetric sampler, obtained by multiplying the TEOM results by a factor of 1.3.

APPENDIX 1

Discussion of Dispersion Modelling Options Used

1 Buildings

Buildings in the vicinity of pollutant sources may affect dispersion, particularly at locations within the wake of a large building. Although ADMS can include the effect of a single structure, it cannot model the effect of several widely-spaced buildings simultaneously. This problem was discussed with Cambridge Environmental Research Consultants (CERC, the developers of ADMS) and their recommendation was that the effect of many buildings was best modelled by varying the surface roughness over the area studied, with a high value over the Corus site to reflect the influence of the buildings, large and small. CERC are preparing a technical report to support this method of accounting for the effects of widely-spaced buildings, and their report is expected to be published in April 2001.

2 Surface Roughness

To account for the presence of many widely-spaced buildings on the Corus site, CERC recommended the use of variable surface roughness over the area studied. A 32 x 32 grid was used and each 500 x 500 metre square was examined on the Ordnance Survey 1:50,000 scale map, and the dominant terrain type was chosen for each square. Figure A1.1 illustrates the distribution of nine different terrain types, along with the Ordnance Survey map for the same area. Table A1.1 shows the surface roughness value assigned to each of the different terrain types.

3 Complex Terrain

The hills close to the Corus site may significantly affect dispersion, and so the Complex Terrain module within ADMS has been used. A terrain file was generated from Ordnance Survey spot height data using the same grid as for the surface roughness. Figure A1.2 is a representation of the resulting terrain file, along with the location of the Corus site and the emission sources input to the dispersion model.

4 Coastline Effects

Under some weather conditions[1], the development of the boundary layer as the wind blows from the sea onto the land can affect dispersion. ADMS includes a module to take account of this effect, but it is not possible to combine this module with either the Complex Terrain module or the NO_x Chemistry module, and both of these were judged to be more significant than coastline effects.

5 NO_x Chemistry and Background Pollutant Data

The term NO_x is used to describe a mixture of different oxides of nitrogen. The species most commonly emitted (typically making up over 90% of the total NO_x) from industrial sources is NO, but the species of most concern in the environment is NO_2. Within the atmosphere, NO will slowly oxidise to NO_2 and ADMS includes a simplified model of NO_x atmospheric chemistry to account for this. This requires knowledge of the background ambient concentrations of total NO_x,

NO_2 and ozone, all of which are measured at a local authority air quality monitoring station, operated as part of the Automatic Urban Network by the National Environmental Technology Centre (NETCEN). Monitoring of NO_2, NO_x, ozone, SO_2, PM10 and CO commenced in January 1997 and the results are posted on the NETCEN Internet site[2]. The measured data do not precisely reflect background levels, as there will be some impact from the emissions from the Corus site, but it was considered that these were the most relevant data available. The data measured in the three complete years since the NETCEN station commenced operation are summarised in Table A1.2.

6 Output Grid

In order to cover a large area (7 x 8½ kilometres), but still have a fine resolution over the areas of most interest, a variable grid was initially specified. However, the combination of a variable grid and steep hills caused the ADMS code to fail under some conditions, and so the variable grid was replaced by two different regular output grids; Figure A1.3 shows these grids. About a kilometre from the Corus site is the NETCEN air quality monitoring station, and in addition to the gridded output, concentrations predicted at the NETCEN station were also output from the model.

7 Meteorological Data

The model was run using sequential (hour-by-hour) meteorological data for five complete years; each year's data being run as a separate model. At every point on the output grids around the Corus site, the ground-level pollutant concentrations were calculated for each hour of the year, and average levels and percentiles were determined for comparison with the objectives in the legislation.

8 Output Parameters

Objectives for ambient levels of SO_2, PM10 and NO_2 are included in the Air Quality (Wales) Regulations 2000[3], and the averaging times specified in those regulations have been used and are listed in Table A1.3.

References

1) "ADMS User Guide", Cambridge Environmental Research Consultants Ltd., February 1999.

2) "Automatic Site Data - Port Talbot", National Environmental Technology Centre, *http://www.aeat.co.uk/netcen/airqual/data/auto/pt.html*

3) "The Air Quality (Wales) Regulations 2000", Statutory Instrument 2000 No. 1940 (W. 138), July 2000

TABLE A1.1
SURFACE ROUGHNESS VALUES FOR DISPERSION MODELLING

Terrain Type	Surface Roughness (m)
Sea	0.001
Beach/Dunes	0.01
Lakes	0.005
Industrial Sites	1
Marsh	0.01
Open Ground	0.02
Residential	0.5
Town Centre	1.5
Woods	1

TABLE A1.2
BACKGROUND POLLUTANT LEVELS FOR NO_x CHEMISTRY MODULE

Species	Year	No. of Readings	Average (ppb)
Ozone	1997	7863	23.1
	1998	8351	24.4
	1999	8411	27.0
	Overall Average		24.9
Total NO_x	1997	7443	24.8
	1998	8529	22.5
	1999	8273	21.4
	Overall Average		22.8
NO_2	1997	7443	13.4
	1998	8529	12.8
	1999	8273	12.8
	Overall Average		13.0

TABLE A1.3
OBJECTIVES AND AVERAGING TIMES FROM AIR QUALITY REGULATIONS

Species	Objective (μg/m³)	Averaging Period	Exceedences Allowed Each Year	Equivalent Percentile
SO_2	266	Fifteen Minutes	35	100*(1-35/35040) = 99.9th %ile
	350	One Hour	24	100*(1-24/8760) = 99.7th %ile
	125	24 Hours	3	100*(1-3/365) = 99.2nd %ile
PM10	50	24 Hours	35	100*(1-35/365) = 90.4th %ile
	40	Annual Average		
NO_2	200	One Hour	18	100*(1-18/8760) = 99.8th %ile
	40	Annual Average		

APPENDIX 2
Emissions Data Entered to the Dispersion Model

Source Name	Margam A Boiler	Margam B Boiler	Margam C Boiler	Service Boiler	Morfa Coke Ovens	Grange Coke Ovens	Ammonia Incinerator	Sinter Plant Main Stack
Location	SS 7705 8855	SS 7710 8820	SS 7715 8845	SS 7785 8660	SS 7705 8580	SS 7750 8615	SS 7700 8580	SS 7650 8800
Height	32.0 metres	37.0 metres	121.0 metres	68.0 metres	127.0 metres	75.0 metres	50.0 metres	135.0 metres
Diameter	2.4 metres	2.7 metres	3.9 metres	2.9 metres	4.7 metres	3.0 metres	2.9 metres	6.3 metres
Waste Gas Temperature	177 °C	174 °C	215 °C	185 °C	222 °C	195 °C	330 °C	130 °C
Mean Molecular Weight	29.9 kg/kmol	30.4 kg/kmol	28.9 kg/kmol	29.2 kg/kmol	30.5 kg/kmol	28.2 kg/kmol	22.1 kg/kmol	29.4 kg/kmol
Volume Flow at Temperature	49.9 m³/s	80.4 m³/s	193.6 m³/s	84.3 m³/s	143.0 m³/s	86.9 m³/s	25.8 m³/s	468.0 m³/s
SO_2 Emission Rate	1.32 g/s	0.533 g/s	12.4 g/s	4.40 g/s	7.50 g/s	11.5 g/s	7.76 g/s	67.2 g/s
PM10 Emission Rate	0.0897 g/s	0.165 g/s	0.684 g/s	0.440 g/s	0.713 g/s	1.39 g/s		19.8 g/s
Total NO_x Emission Rate	1.08 g/s	0.920 g/s	10.00 g/s	3.87 g/s	94.0 g/s	14.3 g/s	0.409 g/s	73.1 g/s

Source Name	Sinter Plant Dedust System	No. 4 Blast Furnace Stoves	No. 5 Blast Furnace Stoves	BOS Primary Flares	BOS Secondary Extraction	Reheat Furnace	Continuous Annealing Process Line	No. 4 BF Casthouse Fume Extraction
Location	SS 7665 8805	SS 7710 8815	SS 7705 8790	SS 7715 8695	SS 7718 8669	SS 7800 8705	SS 7835 8595	SS 7700 8818
Height	55.0 metres	74.0 metres	74.0 metres	76.2 metres	20.0 metres	110.0 metres	57.0 metres	32.0 metres
Diameter	4.5 metres	3.5 metres	3.5 metres	2.0 metres	4.0 metres	4.7 metres	2.7 metres	4.0 metres
Waste Gas Temperature	59 °C	211 °C	236 °C	70 °C	44 °C	250 °C	250 °C	41 °C
Mean Molecular Weight	28.7 kg/kmol	30.2 kg/kmol	30.5 kg/kmol	31.2 kg/kmol	28.7 kg/kmol	27.4 kg/kmol	28.4 kg/kmol	28.7 kg/kmol
Volume Flow at Temperature	252.6 m³/s	164.6 m³/s	117.4 m³/s	130.0 m³/s	148.4 m³/s	159.6 m³/s	85.1 m³/s	169.3 m³/s
SO_2 Emission Rate		3.14 g/s	2.05 g/s			10.6 g/s		
PM10 Emission Rate	5.55 g/s	0.288 g/s	0.476 g/s	9.22 g/s	0.253 g/s	0.408 g/s		0.292 g/s
Total NO_x Emission Rate		5.58 g/s	3.62 g/s			29.4 g/s	2.64 g/s	

Source Name	No. 4 BF Casthouse Roof	No. 5 BF Casthouse Roof	BOS Plant Roof	Hot Metal Pour/ Desulphurisation	Coal Stockyards	Ore Stockyards
Location	SS 7714 8819	SS 7712 8811	SS 7715 8695	SS 7707 8704	SS 7740 8513	SS 7608 8816
Height	24.0 metres	24.0 metres	70.0 metres	29.0 metres	10.0 metres	10.0 metres
Diameter	7.9 metres	14.4 metres	30.4 metres	3.2 metres	N/A	N/A
Waste Gas Temperature	40 °C	40 °C	40 °C	40 °C	15 °C	15 °C
Mean Molecular Weight	28.7 kg/kmol	28.7 kg/kmol	28.7 kg/kmol	28.7 kg/kmol	28.8 kg/kmol	28.8 kg/kmol
Volume Flow at Temperature	135.3 m³/s	358.9 m³/s	2171.5 m³/s	175.8 m³/s	N/A	N/A
SO_2 Emission Rate						
PM10 Emission Rate	0.267 g/s	13.2 g/s	6.45 g/s	1.52 g/s	12.1 g/s	3.17 g/s
Total NO_x Emission Rate						

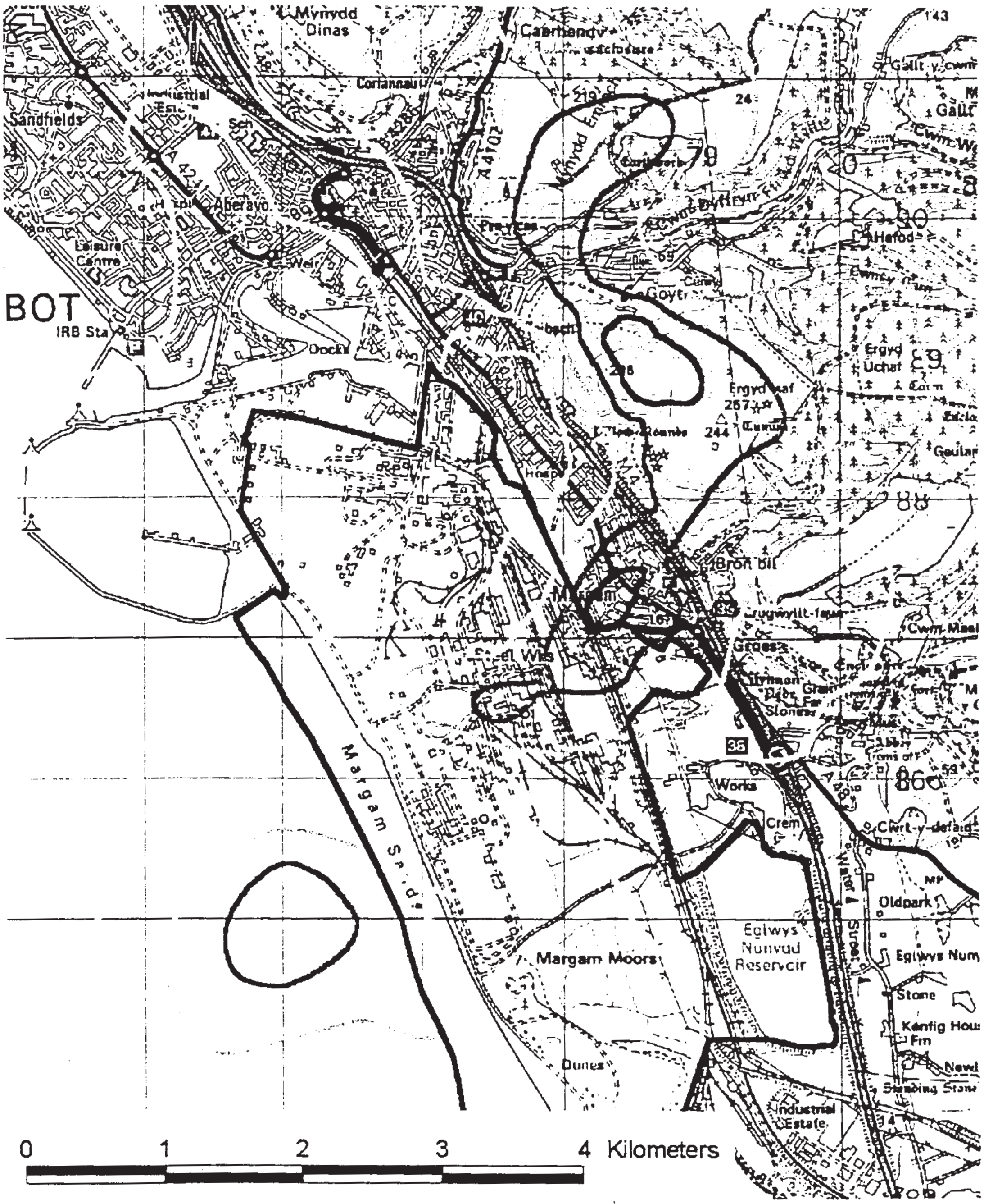
Total SO_2 = 128.3 g/s
4047 tonnes/year

Total PM10 = 76.5 g/s
2413 tonnes/year

Total NO_x = 239.0 g/s
7537 tonnes/year
(assumed 10% as NO_2, rest as NO)

Dispersion Modelling Output - SO2

Figure 1



Works Boundary

99.9th %ile 15-Minute SO2

12.5 µg/m³

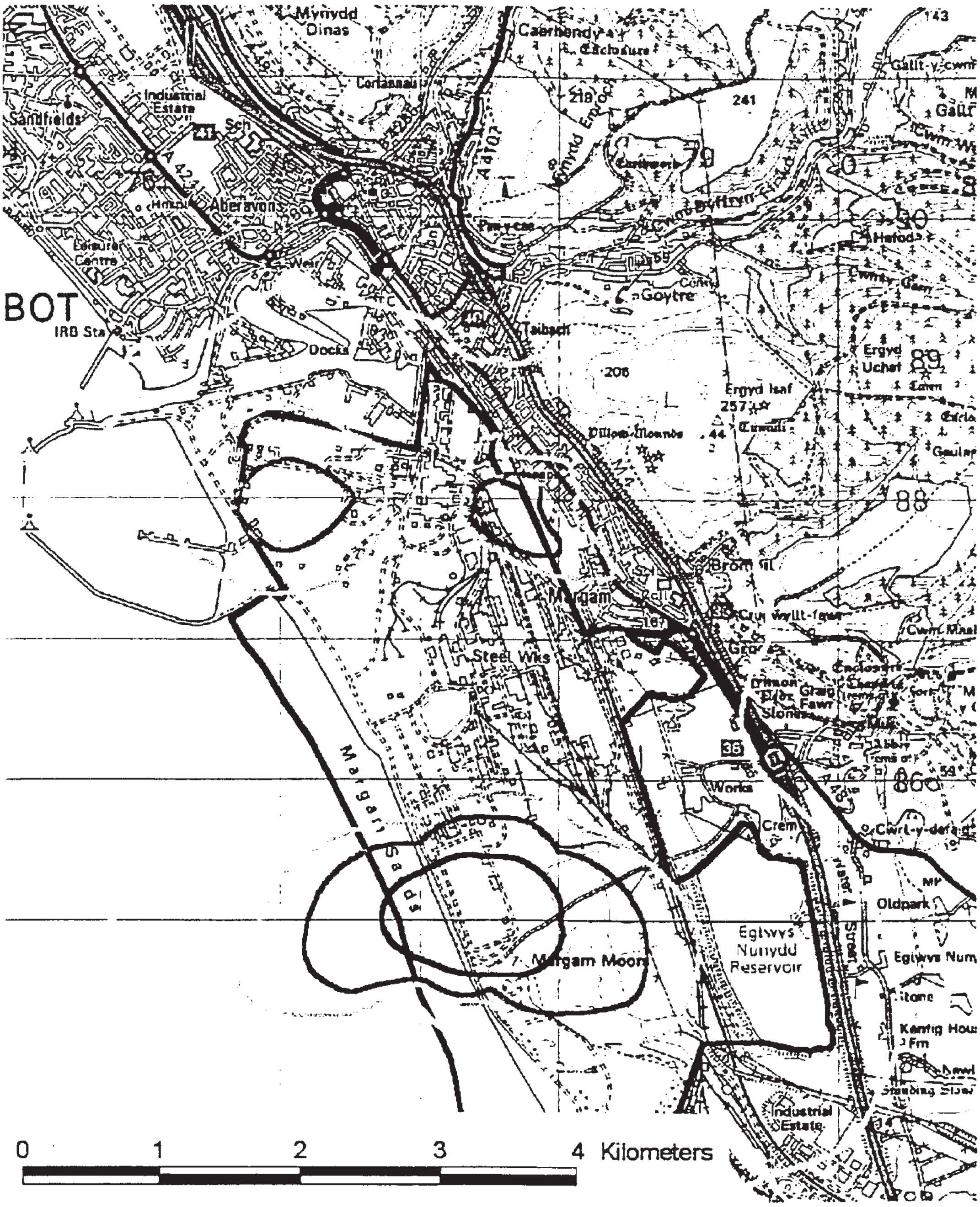
15 µg/m³

17.5 µg/m³

20 µg/m³

Dispersion Modelling Output - PM10

Figure 2



90.4th %ile 24-Hour PM10

4 µg/m³

7.5 µg/m³

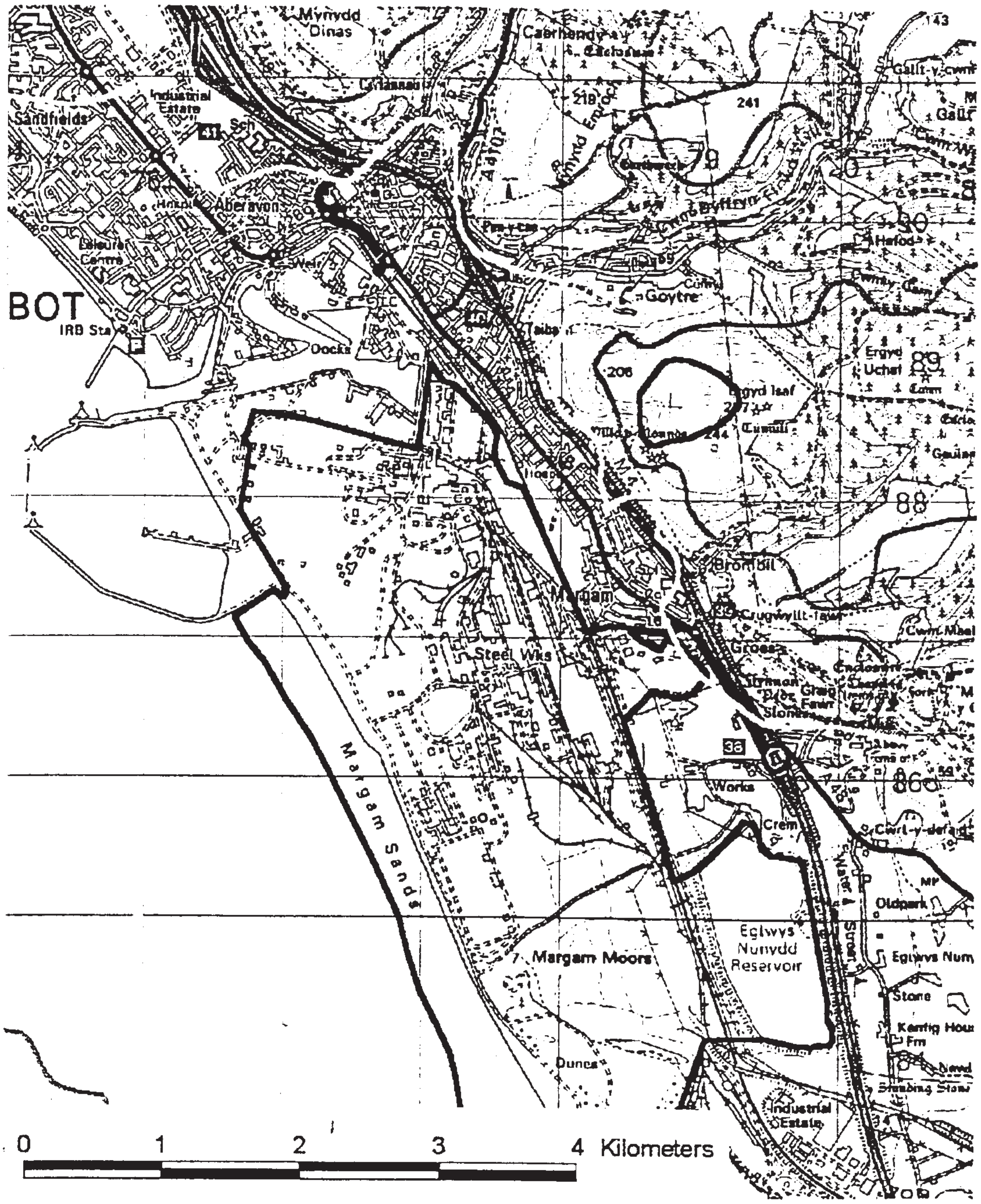
10 µg/m³

20 µg/m³

Works Boundary

Dispersion Modelling Output - NO2

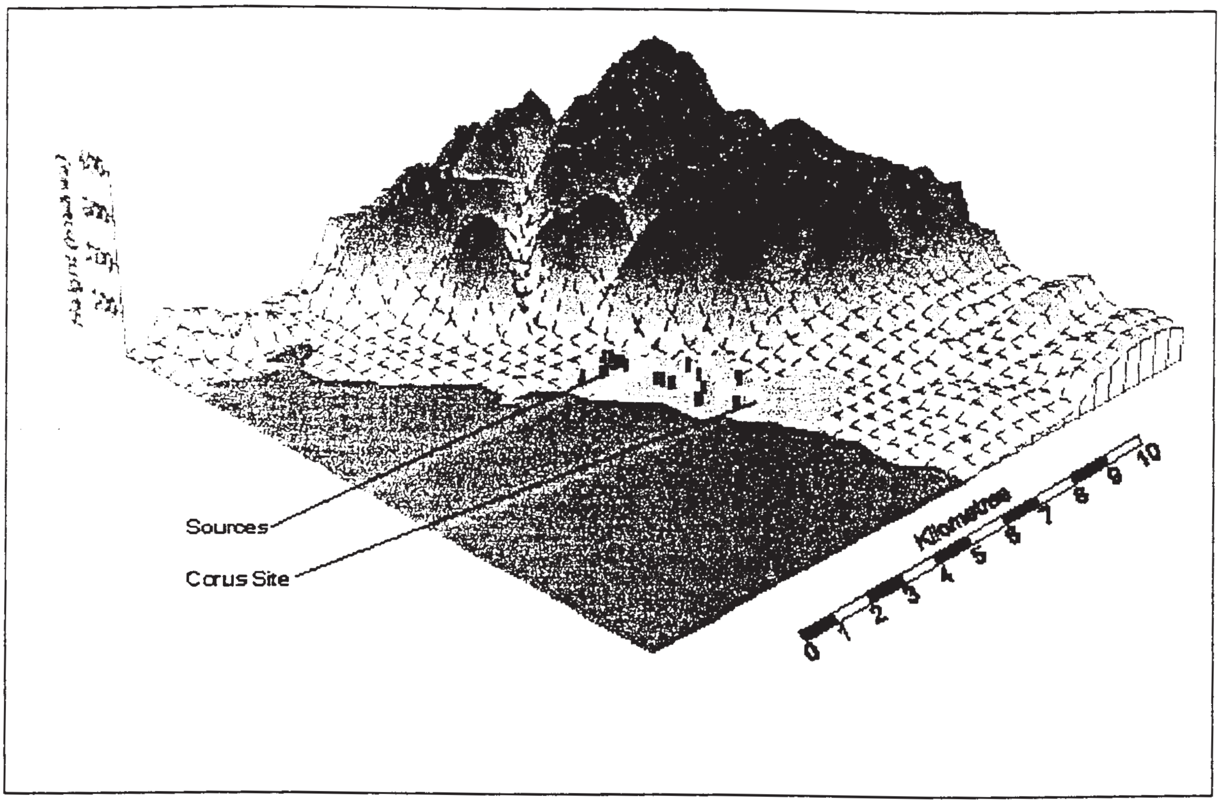
Figure 3



99.8th %ile Hourly NO2
- 5 µg/m³
- 7.5 µg/m³
- 10 µg/m³
- Works Boundary

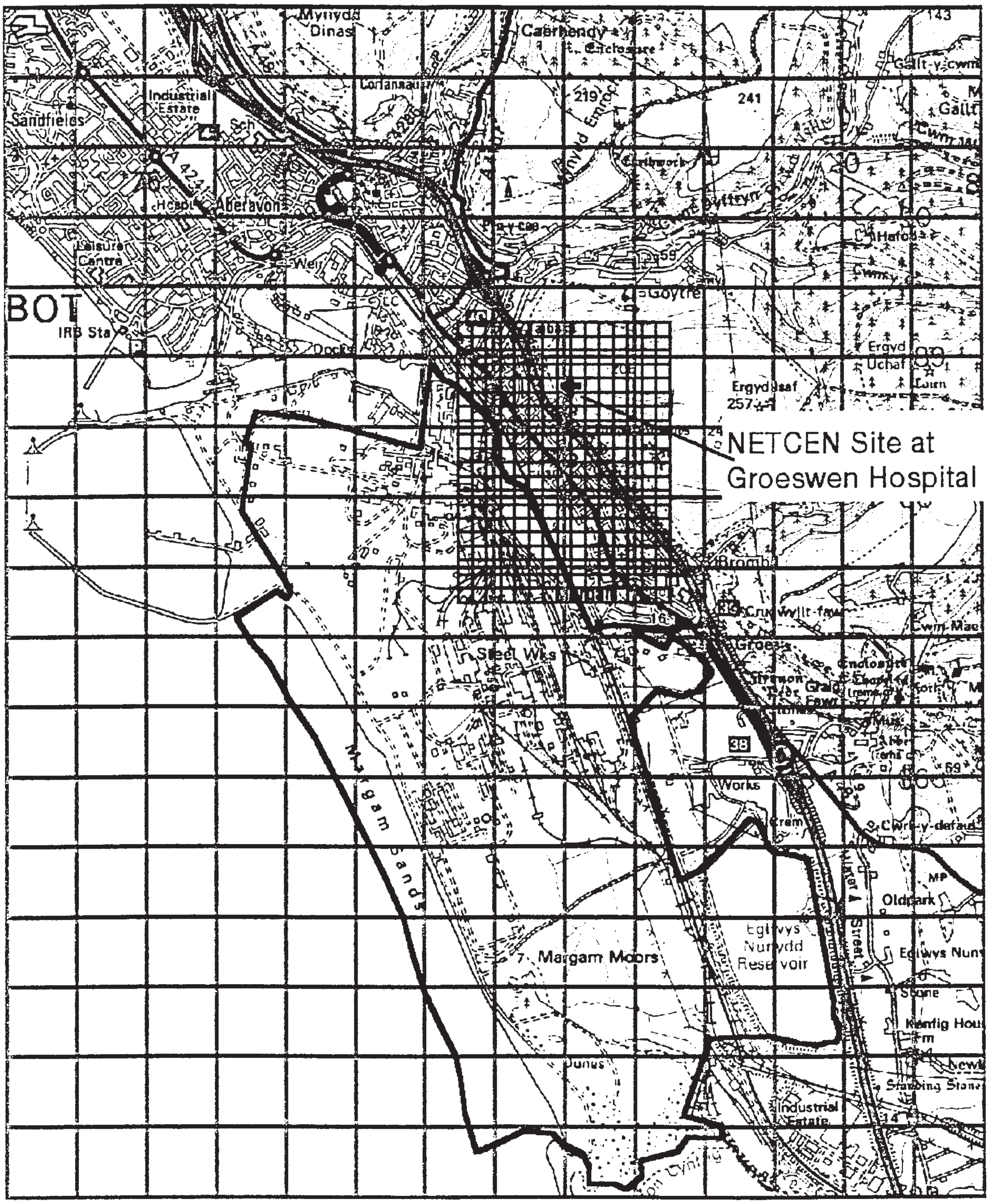
Background map reproduced from Ordnance Survey 1:50,000 colour raster data with the permission of the Controller of Her Majesty's Stationery Office

Figure A1.2



Output Grids

Figure A1.3



Works Boundary

Output Grids

Fine Grid - spacing = 100 metres

Coarse Grid - spacing = 500 metres

Background map reproduced from Ordnance Survey 1:50,000 colour raster data with the permission of the Controller of Her Majesty's Stationery Office

Annex 2 Internal Report by Environment Agency Air Quality Modelling and Assessment Unit

Summary report for Corus PM_{10} air dispersion modelling work

(1) Summary of the air dispersion model used and why?
Breeze AERMOD was used.

This is because Breeze AERMOD can deal with terrain and volume sources simultaneously. The building effect was also considered in the model by choosing the corresponding initial vertical dimension of the volume source.

(2) Summary of the input data and assumptions
Assumptions:
The characteristics of emission e.g., fugitive emission, multiple exits, suggest that the assumption volume source is the most appropriate. The emission from Furnace 5 has been modelled as 16 adjacent volume sources. If the emission was modelled as a point release then the assessment of plume rise is critical. Excessive plume rise could artificially reduce the predicted impact. For this reason it is considered that modelling the release as a volume source is most appropriate.

Input data:
Fugitive emission data supplied by Corus (emission rate: 13.2 g/s before abatement and 0.267 g/s after abatement) were used in the model predictions. In initial modelling study, hourly sequential meteorological data of Cardiff 97, Neath 97 and Swansea 97 were used.

(3) Summary of output data
Preliminary modelling study shows that the use of met. data from different stations produces similar model predictions. Therefore, only Cardiff 97 data were used in the modelling.

(a) Maximum hourly average of PM_{10} ($\mu g/m^3$) produced by blast furnace 5 at emission rate of 13.2 g/s. See contour map 1.

(b) Maximum daily average of PM_{10} ($\mu g/m^3$) produced by blast furnace 5 at emission rate of 13.2 g/s. See contour map 2.

(c) Maximum hourly average of PM_{10} ($\mu g/m^3$) produced by blast furnace 5 at emission rate of 0.267g/s. See contour map 3.

(d) Maximum daily average of PM_{10} ($\mu g/m^3$) produced by blast furnace 5 at emission rate of 0.267 g/s. See contour map 4.

(e) Summary Tables from the modelling results
The proposed PM_{10} air quality standards, due for implementation from 31 December 2004, are as follows: -

50 $\mu g/m^3$ - 24 hour mean not to be exceeded more than 35 times a year.
40 $\mu g/m^3$ - Annual mean.

1-hour average, source emission rate 13.2 g/s from Blast Furnace 5 (i.e. unabated release)

Receptor	Percentile							
	100	99.9	99.8	99.7	99.5	90	85	80
Con. At Hospital (µg/m³) (grid ref. 278053 188277)	1301	950	858	805	583	9.2	0.4	0.001
Con. At Prince St. (µg/m³) (grid ref. 277925 188070)	550	362	342	324	282	35.2	5.8	0.09
Number of exceedances calculated from percentile figures	0	9	18	26	44	876	1314	1752

1-hour average, source emission rate 0.267 g/s from Blast Furnace 5 (i.e. abated release)

Receptor	Percentile							
	100	99.9	99.8	99.7	99.5	90	85	80
Con. At Hospital (µg/m³) (grid ref. 278053 188277)	26.3	19.2	17.4	16.3	11.8	0.2	0.008	0.0
Con. At Prince St. (µg/m³) (grid ref. 277925 188070)	11.1	7.3	6.9	6.5	5.7	0.7	0.1	0.002
Number of exceedances calculated from percentile figures	0	9	18	26	44	876	1314	1752

24-hour average, source emission rate 13.2 g/s from Blast Furnace 5 (i.e. unabated release)

Receptor	Percentile				
	90	85	80	70	60
Con. At Hospital (µg/m³) (grid ref. 278053 188277)	40.6	28.1	18.8	8.8	4.1
Reading at the Hospital as a percentage of the proposed air quality standard (%)	81.1	56.3	37.6	17.6	8.2
Con. At Prince St. (µg/m³) (grid ref. 277925 188070)	34.0	29.4	25.1	17.1	9.7
Reading at Prince Street as a percentage of the proposed air quality standard (%)	68.0	58.8	50.1	34.1	19.4
Number of exceedances calculated from percentile figures	37	55	73	110	146

24-hour average, source emission rate 0.267 g/s from Blast Furnace 5 (i.e. abated release)

Receptor	Percentiles				
	90	85	80	70	60
Con. At Hospital (µg/m³) (grid ref. 278053 188277)	0.8	0.6	0.4	0.2	0.1
Reading at the Hospital as a percentage of the proposed air quality standard (%)	1.6	1.1	0.8	0.4	0.2
Con. At Prince St. (µg/m³) (grid ref. 277925 188070)	0.7	0.6	0.5	0.3	0.2
Reading at Prince Street as a percentage of the proposed air quality standard (%)	1.4	1.2	1.0	0.7	0.4
Number of exceedances calculated from percentile figures	37	55	73	110	146

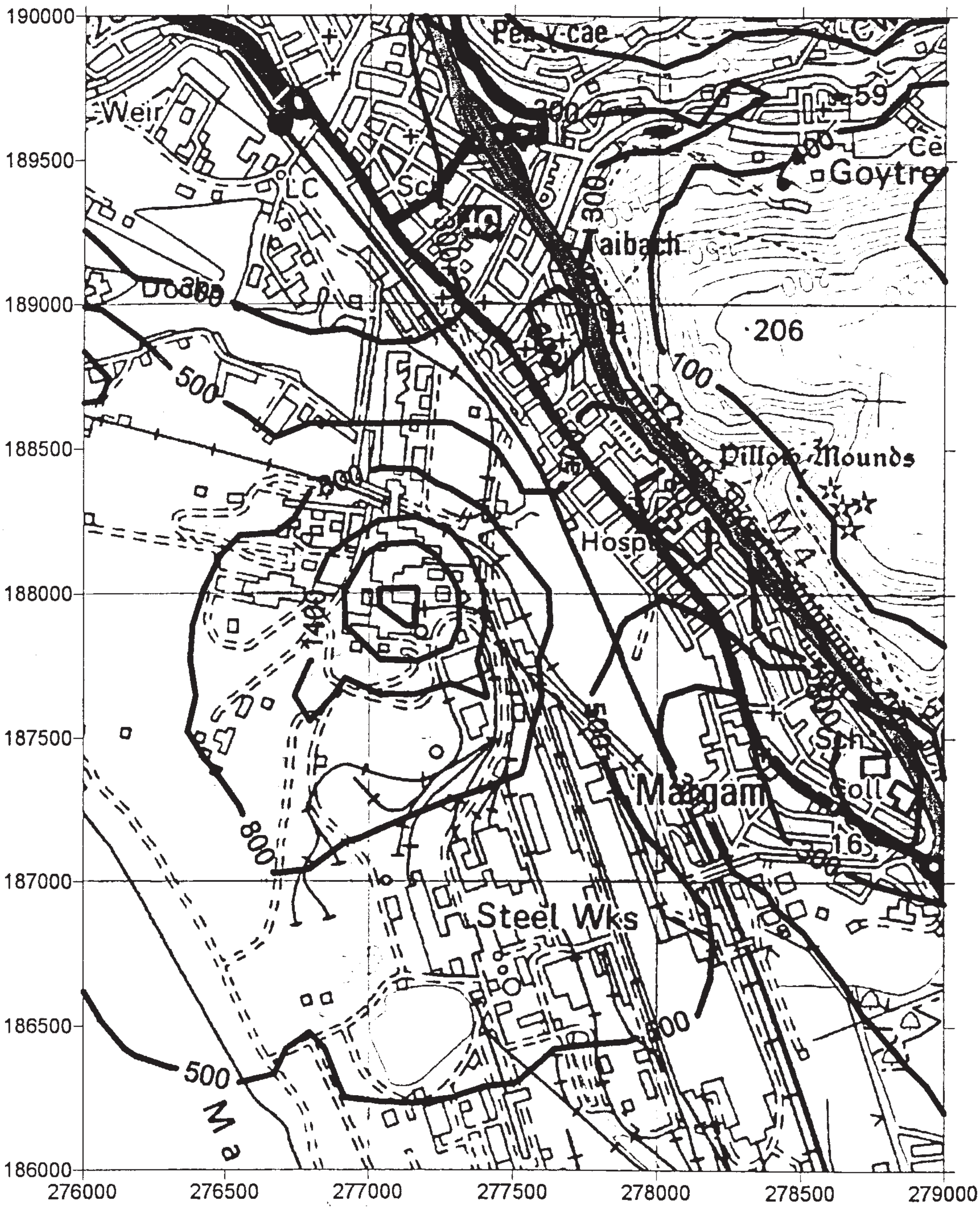
Annual average

Receptor	Annual average ($\mu g/m^3$)	
	Emission rate 13.2 g/s (i.e. unabated release)	Emission rate 0.267 g/s (i.e. abated release)
Con. at Hospital (grid ref. 278053 188277)	12.0	0.24
As a percentage of the proposed air quality standard (%)	30	0.6
Con. at Prince St. (grid ref. 277925 188070)	12.5	0.25
As a percentage of the proposed air quality standard (%)	31.3	0.6

4. Conclusions

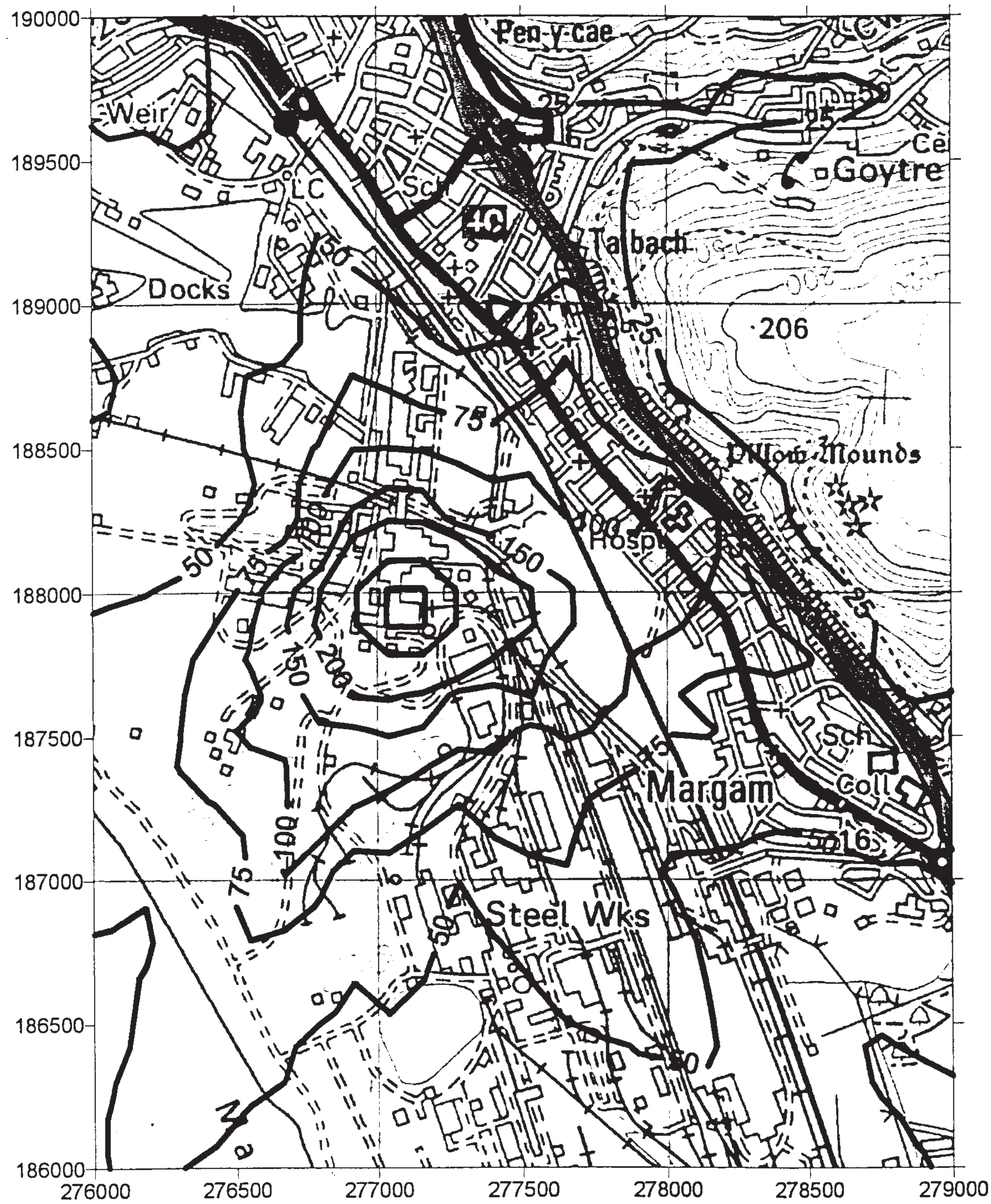
Based on the emission rates (without and with abatement) given by Corus, the predicted improvement in air quality due to casthouse fume abatement is significant.

Concentration levels of PM10 (ug/m3) produced by blast furnace 5.



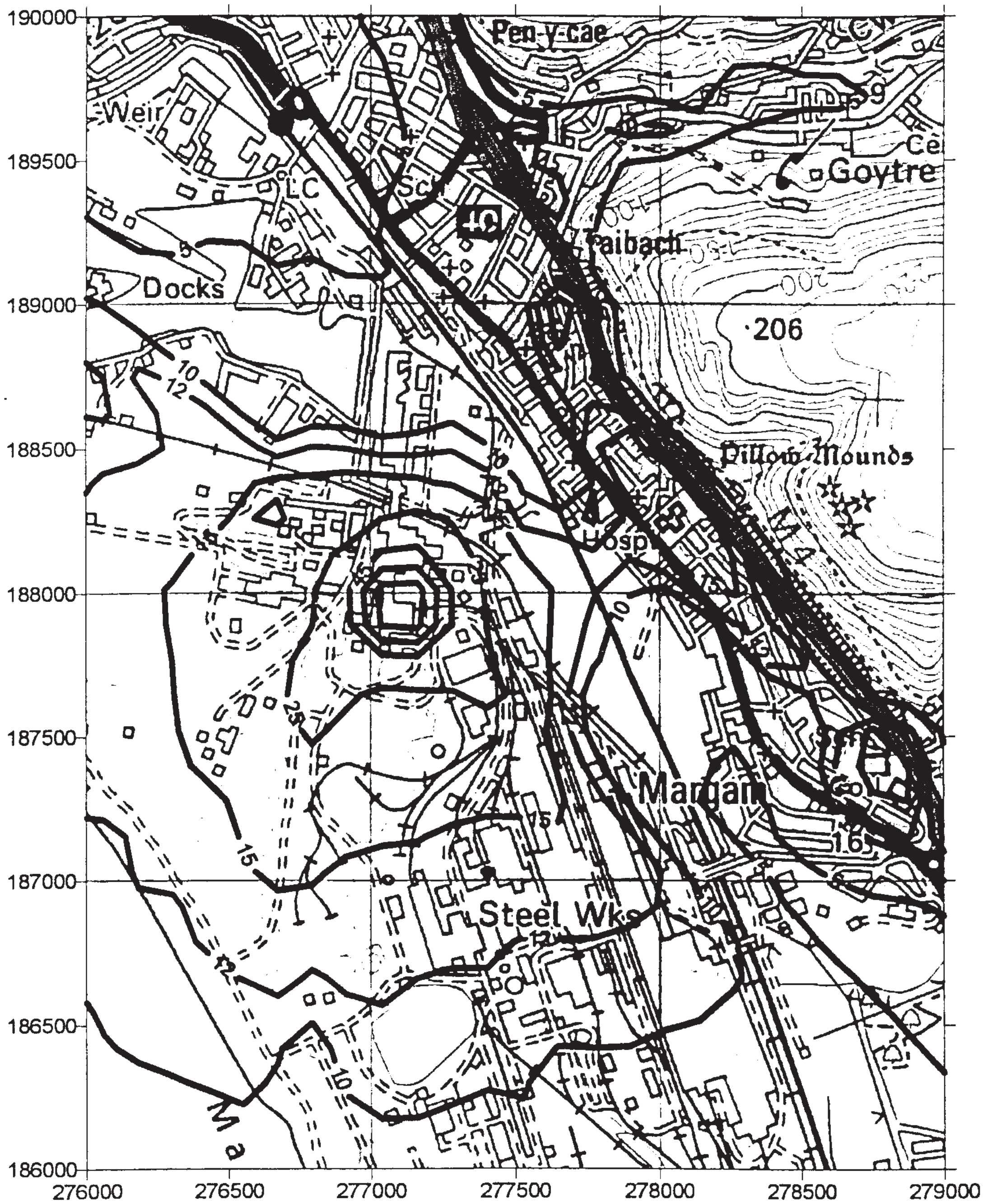
Source rate 13.2 g/s. Maximum hourly average, Cardiff 97 met data.

Concentration levels of PM10 (ug/m3) produced by blast furnace 5.



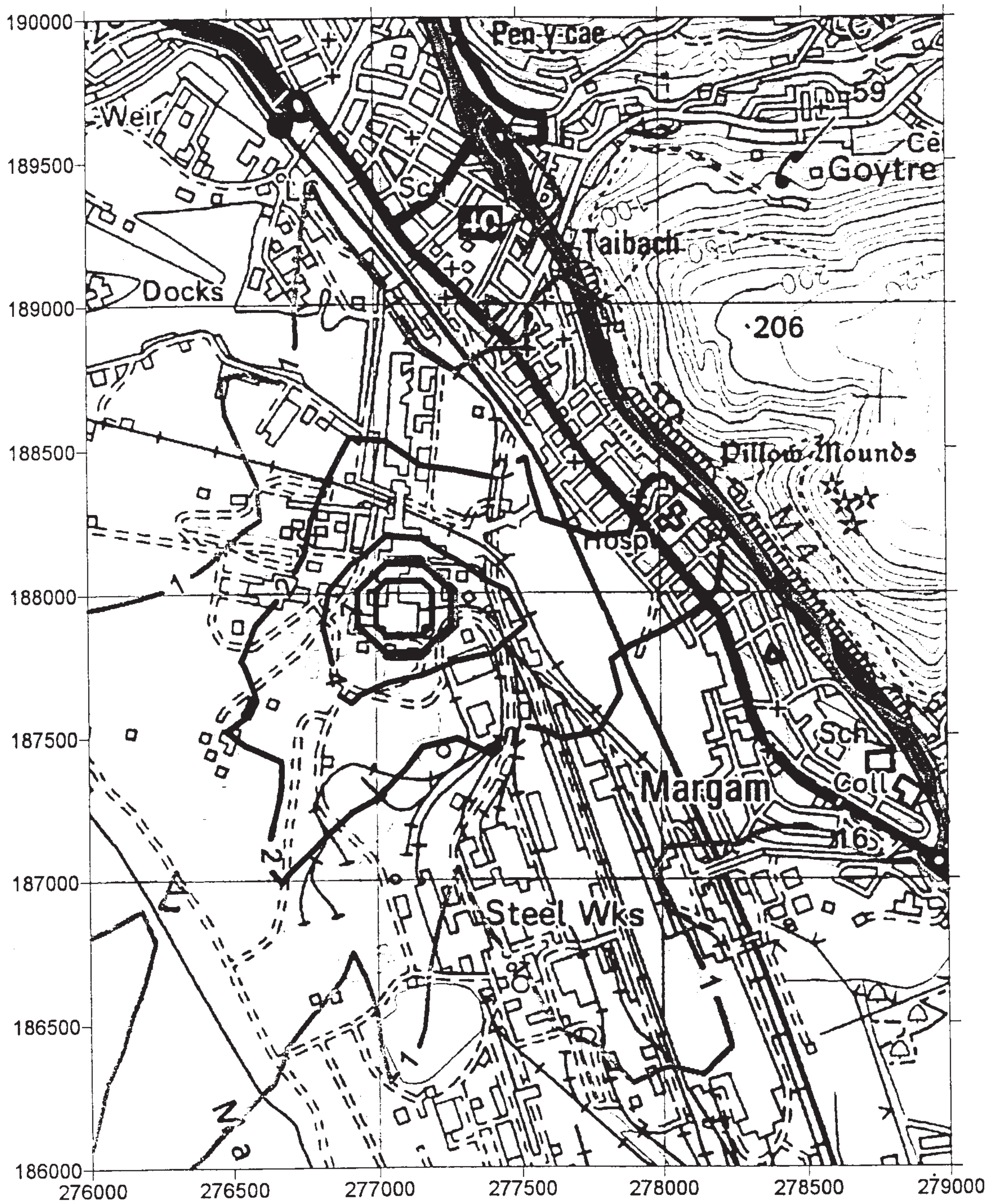
Source rate 13.2 g/s. Maximum daily average, Cardiff 97 met data.

Concentration levels of PM10 (ug/m3) produced by blast furnace 5.



Source rate 0.267 g/s. Maximum hourly average, Cardiff 97 met data.

Concentration levels of PM10 (ug/m3) produced by blast furnace 5.



Source rate 0.267 g/s. Maximum daily average, Cardiff 97 met data.

APPENDIX 4

Summary of Output of Workshop Day held on the 14th March 2002 at Taibach Community Centre

Re. Air Quality Action Planning Workshop for Taibach/Margam Air Quality Management Area

The output from the 5 workshop groups has been summarised and a consensus view drawn from the whole workshop proceedings. Each of the 24 actions proposed and discussed on the day has been given a rating based on its popularity with all groups. These then have been ranked in priority order according to the average rating derived from the groups.

All the actions have then been subdivided into four bands according to their ranking.

Finally a summary has been made of the implications of each action discussed on the day by the groups and again a general consensus view taken which has then been placed in the table alongside each individual action considered.

The next step in the Action Plan development process will be for the output from the workshop to be considered in detail, prior to a further consultation, consideration and adoption by the Council.

The table below summarises the workshops output and general views.

Workshops views

Ranking	Air Quality Benefit	Non Air Quality Benefits	Disadvantage	Cost	Practicability
1) Blast Furnace improvement	Large	-Cleanliness -Less fallout -H&S of employees -Town image	-Displaced pollution	Large	High
2) Planning Policies	Medium	-Social -Economic -Health	-inflexibility -diverting development	Low	High

			-mixed messages re. housing		
3} Cleaner Vehicles (including fleet vehicles)	Small - medium	-Financial savings -Economy of fuel or fuel change -Cleaner vehicles	Costs	Medium	High
4) Tree planting in area	Medium	-Visual impact -Ecological benefits -Tourism -Recreation -Reduced surface dust	-Maintenance costs -Leaf litter -Resourcing	Small - medium	High
5) Dust reduction/ improvement programme at Corus	Large	-Health -Improve profits -Cleaner houses -Reduced maintenance costs	Cost	Large	Low-medium
6) Action to prevent bonfires/ divert green waste: [-Ban [-Health [promotion [-recycle [green waste	Small-medium	-Better quality of life -Better Town image	Extra green waste collection costs	Small-Educ. Medium-Waste disposal	Low-medium
7) Traffic	Small-	-Safety	Potentially	Medium	Low-

Management A48 [-Congestion reduction [-speed reduction etc.	medium	(Accident reduction) -Noise reduction	worse air quality if stop start		medium
8) School Bus Service (to reduce traffic)	Small-medium	-Reducing road congestion -Health benefit -Improved children's safety	Costs	Large	Low
9) Industrial Bunding	Medium	Visual impact	Land take	Medium-large	Medium
10) Traffic off A48 via PDR	Small	-Reduced congestion -Noise reduction -Accident reduction -Increased Economic benefit	Traffic increases to fill the road	Large	High
11) Car sharing schemes	Insignifi-cant	-Social -Reduced cost	Inconvenience	Small	Medium-high
12) Dormant dust clean up	Small				
13) Integrated transport policy	Large	Safety		High	Low

14) Walking Bus	Medium	Health			
15) Educating people	Small	Changed attitudes	Reluctance to change	Small	Low
16) Congestion tax	Small-medium	Reduced congestion	Costs	Large	Low
17) Vehicle emission checks	Small	More attention to vehicle safety	Driver resistance	Medium	Medium
18) Car scrapping schemes	Small	Remove old vehicles		Medium	High
19) More rail freight		Reduced noise and odour			
20) Improve home insulation	Medium	Financial		Small-medium	High
21) Change from solid fuel	Small	-Fuel saving (efficiency) -Safety	Impact on fuel companies	Medium	Impractical
22) Clean up of Corus contractors vehicles					
23) Stagger School times	Small	-Congestion reduction & Quality of life	Resistance to change	Small	Medium
24) Tax older vehicles	Insignificant	-Road safety -Efficiency		Insignificant	Medium

APPENDIX 5

Ranking of Actions by Air Quality Action Plan Team

Action	**Cost Benefit** (Large benefit and small cost gives highest cost benefit ratio)	**Air Quality Benefit**	**Number of persons positively affected**	**Derived ranking**
Blast furnace number 5 rebuild and up grade	High	Large	Large	1
Dust reduction programme at Corus site	High	Medium	Large	1
Planning Policies	High	Medium	Large	1
Transport infrastructure (PDR)	Medium	Small - Medium	Medium	2
Green Transport Plans	Medium	Small	Medium	2
School Travel Plans	Medium	Small	Medium	2
Bonfire discouragement	Medium	Small	Small	3
Tree Planting	Medium	Small	Medium	3
Fleet vehicle emissions	Medium	Small	Small	3
Road side emission testing	Low	Small	Small	4
Transport in the Community	Low	Small	Small	4
Increased street sweeping	Low	Small	Small	4

APPENDIX 6

Extracts in relation to Air Quality Policy from Chapter 7 Environment of the draft deposited Unitary Development Plan

POLICY 4

The creation of pollution or risks to health and amenities that would have unacceptable impacts upon the environment, communities or individuals will be resisted.

7.19 POLICY ENV15 – AIR QUALITY

Proposals which would be likely to have an unacceptable adverse effect on air quality, or would expose people to an unacceptable level of air pollution will not be permitted.

7.19.1 Through its control over where different types of development can be located, the UDP can play an important role in helping improve air quality. This is part of a co-ordinated approach including the Authority's role in terms of local air pollution control and the Environment Agency's control under the Integrated Pollution Prevention and Control process.

7.19.2 While concerned to ensure that the area makes its contribution to addressing global air pollution problems, studies of the potential pollutants identified by the Government and Assembly Government (i.e. Benzene, 1.3 – Butadiene, Carbon Monoxide, Lead, Nitrogen dioxide, Particles (PM_{10}) and Sulphur dioxide) indicated that there was only a local problem in terms of Particulates (PM_{10}). The Authority declared the Taibach - Margam area as a Local Air Quality Management Area (AQMA) under the 1995 Environment Act and this together with the level of Particulates are important concerns in the preparation of the plan and when taking planning decisions which affect the Area.

7.19.3 A significant contribution to the problem (which is defined as the number of occasions when the Assembly Government's Air Quality Objective for PM_{10} is exceeded) has been attributed to processes within the Corus Steel works. A programme of investment has been committed by Corus which is anticipated should substantially address the problem by the end of 2004. This programme has been accelerated by Corus's decision to replace Blast Furnace No 5 following the tragic incident in 2001.

7.19.4 Unless the Particulate standards are satisfied, proposals for new or expanded activities or developments which would be likely to create additional PM_{10} within the AQMA, or cause adjacent areas to exceed the national standards will be likely to be resisted. Amounts of PM_{10} less than 0.2% of the National Air Quality Management Objective for PM_{10} will be likely to be considered as insignificant. Amounts of PM_{10} greater than 2% will be regarded as significant, and potentially creating unacceptable impacts, while developments contributing between 0.2% and 2% will be considered on their merits.

7.19.5 Where existing businesses or organisations put forward a proposal which would result in a net improvement in emissions, and this would not prejudice the likelihood of emissions in the whole of the AQMA area breaching the national targets, the proposal would be likely to be considered favourably in terms of air pollution considerations.

7.19.6 Where there is the potential for a proposal to have an unacceptable impact on air quality, the developer is likely to be required to prepare a specialist assessment of the impacts of the proposal. This should take into account any relevant proposals to reduce polluting emissions and any planning permissions and commitments for proposals which would create emissions which would affect the area concerned.

7.19.7 The Authority will assess proposals for new sensitive uses (such as housing) within the area on air quality grounds (see policy ENV28).

7.19.8 Policies throughout the plan are designed to tackle air quality problems and they include the location and design of developments and new roads, measures to reduce traffic, to increase the recycling of waste, energy efficiency measures and the encouragement of renewable energy.

7.19.9 While improvements in technology will help reduce emissions from industry and road and rail traffic, it is likely that the Assembly Government will introduce more stringent air quality targets. The Authority will carefully monitor the situation and address any need to amend its policies when the UDP is reviewed.

7.32 POLICY ENV28 – LOCATION OF SENSITIVE USES

The development of land for housing or other sensitive uses will not be permitted where the proximity of an existing use or installation or exposure to pollutants would unacceptably affect amenity, safety, health or environmental quality.

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Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council Cyngor Bwrdeistref Sirol

Making a difference Gwahaniaeth er gwell