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Proposal

Air Quality Review and Assessment – 'Stage 4'

Proposal to Three Rivers District Council

**netcen/ED48136/Issue 1
December/2002**

RESTRICTED - COMMERCIAL



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Title	Air Quality Review and Assessment – 'Screening and Detailed Assessment'
Customer	Three Rivers District Council
Customer reference	NW/AQ-R&A
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	Signature	<i>Beth Conlan</i>
	Date	12/12/02

Executive Summary

BACKGROUND

This proposal outlines the work that **netcen** will complete for Three Rivers District Council. This work will involve detailed dispersion modelling to predict the concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀) released from traffic in the area. This will be concentrated along the road links that were identified within the Stage 3 review and assessments and have subsequently been declared as Air Quality Management Areas. This work will take account of the latest guidance from DEFRA which is currently in consultation. Analysis will also greatly rely on the current monitoring programmes, both automatic and diffusion tubes, in each authority area. The effects of a range of Action Plans on these concentrations will be considered.

BENEFITS OF USING netcen

AEA Technology plc, working through its operating division **netcen**, is extremely well placed to undertake Three Rivers District Council's review and assessment. **netcen** can provide:

- An approach to air quality review and assessment that has been approved by the DEFRA. Examples of our approach for Stage 3 can be seen on the DEFRA Pollutant Specific website as good examples – see Basingstoke and Deane District Council and Derby City Council Stage 3 reports on www.uwe.ac.uk/aqm/review/index.html.
- Great experience of Stage 1, 2 and 3 and 4 air quality reviews and Action Plans gained from our work for over 50 local authorities.
- High quality, independent advice.
- A thorough understanding of the new air quality standards and objectives and traffic emission factors.
- Immediate access to historic and current data on pollutant concentrations and emissions throughout the UK.
- A modelling approach (at the 'detailed' stage) that indicates the probabilities of exceedences of the objectives at the detailed stage of assessment, and well as the expected pollutant concentrations, and so will give Three Rivers all the information necessary to set the boundaries of Air Quality Management Area (if one is necessary).
- A proven background in the field of air monitoring, having operated or quality managed all of the UK's national air monitoring networks.
- An appreciation of the costs and benefits of the options for future local air quality monitoring which may be recommended as a result of this study.

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1 Introduction

Three Rivers District Council have completed a Stage 3 Air Quality Review and Assessment. The results of this indicated that exceedences of objectives for nitrogen dioxide (NO₂) and particulate matter (PM₁₀) are likely along several busy road links in the local authorities.

The local authorities now requires further review and assessment of its air quality under Section 84 of the Environment Act(1995). Netcen welcomes the opportunity to submit a proposal for this work.

1.1 OVERVIEW OF THE WORK

We will prepare and report to the Councils the findings and recommendations for further action to enable the Councils meet their review and assessment Stage 4 obligations. To do this, the following are needed:

- an inventory of air pollution sources both present and future
- an assessment of the impact of the emissions
- an assessment of relevant air quality data
- an assessment of likely future air quality

The 1995 Environment Act places duties on local authorities with regard to local air quality review and, where potential problems are identified, management. The air quality review is designed as a multi-stage process, with progressively more complex assessment at each stage. In this way, local authorities for which there is unlikely to be an air quality problem are expected not to incur large costs of compliance with the 1995 Act.

Within a Stage 4 Review and Assessment, **netcen** propose to review and assess the air quality impact from roads using two approaches which we believe will be most cost-effective to the respective local authorities. These are;

1. review all monitoring data within the AQMAs to ascertain that these are located in the area of highest predicted concentration and determine if an exceedence of the air quality objectives are likely based on current concentrations and predictive factors within LAQM.TG(02).
2. Review and assess air quality using our proprietary urban model. This advanced model can take account of building effects, complex terrain, and street canyon environments and is suitable for modelling road traffic emissions as defined in "Annex 3, LAQM.TG(02)".

For the assessment of roads, annual average concentrations will be calculated and surrogate statistical factors will be utilised to determine the hourly concentrations. This approach has the advantage that only one map is required to present both the modelled annual mean and hourly concentrations.

This model has been used in numerous Stage 3 review and assessments which has undergone peer review by the DEFRA Pollutant specific appraisal contractor.

1.2 POLLUTANTS TO BE CONSIDERED AND THEIR SOURCES

Emissions of oxides of nitrogen and PM₁₀ from traffic and background sources will be considered. No point sources need to be considered explicitly, but their effects on the background will be accounted for in the National Atmospheric Emissions Inventory. Local ratified automatic monitoring data will be used to calibrate the model.

2 Project appreciation

Within a Stage 4 Review and Assessment the work areas and issues that need to be covered are:

- Review and Assessment
- Source apportionment
- Presentation (output) of the assessment
- Scenarios for LAQM Action Plan

The identified roads of concern from the Stage 3 reports include the following:

Three Rivers District Council: M25, M1, A405, A412 and A404

Following the publication of the Stage 3 reports Air Quality Management Areas have been declared which may not include all of the above identified roads owing to the uncertainty within the modelling process. **netcen** will concentrate efforts for the Stage 4 on those roads that are within or significantly influence the AQMA.

2.1 REVIEW AND ASSESSMENT

The Review and Assessment should:

- Consider the relevant objectives as detailed in the National Air Quality Strategy, 2000
- Confirm the results of and corroborate the assumptions applied in the original Stage 3 Review and Assessment for the local authority against the prescribed objectives, ensuring that the designation of the AQMA is correct
- Consider the annual average NO₂ and PM₁₀ objective for the year 2000 and 2004 (for PM₁₀) and 2005 (for NO₂)
- Include the local authority's real time monitoring data, which has been validated, ratified and included within the Hertfordshire and Bedfordshire Air Quality Network
- Include, the latest available emissions estimates, based on the new emission factors for traffic sources
- Include geographically accurate road emissions, enabling complex road junctions and roundabouts to be modelled thoroughly
- Allow emissions to be estimated for every 10 m of road in the borough.
- Include an estimate of model uncertainty
- Validate the model against data (monitoring) measured from other sites
- Consider major new developments that may have an effect on air quality (details to be provided by the each local authority)
- Use appropriate meteorological data, which should include meteorology for an average year

2.2 SOURCE APPORTIONMENT

The source apportionment should:

- Inform how much of an improvement is needed in air quality to deliver the air quality objectives within the AQMA
- Confirm that exceedences of NO₂ and PM₁₀ are due to road traffic
- Determine the extent to which different vehicle types are responsible for the emission contributions to NO₂ and PM₁₀ within the local authority AQMA. This will allow traffic management scenarios to be modelled/tested to reduce the exceedences
- Quantify what proportion of the exceedences of NO₂ and PM₁₀ are due to background emissions, or, local emissions from busy roads in the local area. This will help determine whether local traffic management measures would have a significant impact on reducing emissions in the area of exceedence, or, whether nation wide measures would be a suitable approach to achieving the air quality objectives
- The NO_x to NO₂ relationships used must be indicated, and the effects of urban heat islands and urban morphology considered. (Urban heat island effects and urban morphology effects will be accounted for by adjustments to the dispersion kernel used within our modelling).

2.3 PRESENTATION OF ASSESSMENT

The output from the work should:

- Be plotted directly onto OS survey base maps. All relevant busy roads will be modelled at a resolution of 10 m.

2.4 SCENARIOS FOR LOCAL AUTHORITY ACTION PLAN

Here, we will:

- Consider three scenarios for the local authority. A scenario would include changes to the traffic flow along selected road links, changes to vehicle mix, or speed. The local authority would need to make suggestions about the scenarios they consider relevant to model. To do this, each local authority may need to liaise with their planning, transport planning departments, other neighbouring Local Authorities, and the Highways Agency.
- Each local authority would need to liaise with their traffic planners and development department to provide **netcen** with an idea of the costs of implementing the scenarios modelled.

3 Technical Proposal

3.1 NATIONAL CHANGES SINCE THE COMPLETION OF STAGE 3

3.1.1 The implications of the recent changes in the vehicle emission factors to the results of the previous review and assessments

The DEFRA have recently updated the vehicle emission factors.¹ The key implication of this is that emissions of NO_x from vehicles in 2005 may be higher than expected, and so air quality management areas may have to be declared where none existed before, or, existing air quality management areas may increase in size. The exact implications depend on the vehicles fleet mix and age profile in different areas. Forecast emissions of most pollutants (including CO and VOCs) will be largely unaffected by the new factors. But there will be changes to forecast NO_x emissions in particular, the size of which will vary according to the base year chosen for the calculations. As a rule of thumb, the following generalisations are helpful:

- Forecast emissions of NO_x in 2005 from newer petrol and diesel vehicles may increase by anything up to 36% using the new factors, with the main change being to the performance of Euro 2 vehicles. But emissions from road transport in the base year will also need to be adjusted upwards, and the modelling of these and other emissions will then need to be revalidated. This means that NO_x forecasts from road transport for 2005 are likely to be out by between 10 and 20%. It also means that NO_x missions from other sources (such as industry) may have been overestimated.
- This would mean that authorities may have underestimated 2005 NO₂ concentrations at the roadside by between 5% and 10% (assuming that roughly 75% of NO_x emissions come from road transport in their area). Away from roadsides, the difference is likely to be less marked. For an authority that was forecasting annual NO₂ concentrations of close to 40 µg/m³, this may mean a difference of between 2 and 4 µg/m³.
- Overall emissions of PM₁₀ in 2004 are likely to stay more or less the same using the new factors. But within this total, emissions of PM₁₀ from petrol vehicles are likely to decrease by as much as 5%, while emissions from diesel vehicles of all types are likely to increase by as much as 5%. This may have significant implications for the targeting of transport measures in AQMA action plans.

3.2 ROAD TRAFFIC MODELLING

The Stage 4 review and assessment will be completed using the newly published Technical Guidance. This approach will predict the concentrations of NO₂ and PM₁₀ from traffic emissions and determine whether exceedences of the air quality objectives are likely in 2004/2005. The detailed dispersion modelling must be supported with automatic nitrogen dioxide monitoring (and if necessary, PM₁₀). We will rely on the background site at Rectory Road, Rickmansworth for verifying the background and another appropriate site within the Hertfordshire region for verifying the roadside contribution. The NO₂ diffusion tube data will also be used within the assessment following appropriate correction for laboratory bias.

The modelling will consider the following:

- complex junction geometry,
- vehicle speed and queue lengths at traffic lights,
- %HDV,
- how close the nearest sensitive receptors are to the roads modelled.

¹ **The new set of emission factors on the NAEI website (www.naei.org.uk/emissions/index.php) approved by DEFRA and DTLR for use in emissions and air quality modelling, following consultation of the TRL Report "Exhaust Emission Factors 2001: Database and Emission Factors" by TJ Barlow, AJ Hickman and P Boulter, TRL, September 2001"**

3.2.1 Defining the probability and spatial magnitude of exceedences

In the 'stage 4' assessment, in addition to identifying any exceedences, **netcen** will quantify the magnitude and probability of any predicted exceedence, and determine the geographical extent of any exceedence area. This approach will enable Three Rivers to judge the correct size and location of an Air Quality Management Area (AQMA), if this is necessary. This will provide the information required to confirm, amend or revoke the existing AQMAs.

The output from the model will be presented in a variety of forms, including, mapped results at various geographical scales. The highest resolution mapped data will be presented on OS LandLine™ electronic maps. The concentration contours on these maps will have been derived from concentrations that have been predicted using a maximum resolution of 10 m grid - this allows exceedences to be determined to the scale of an individual house. Examples of the high-resolution output of our modelling approach, here taken from a Stage 3 Air Quality Review and Assessment of South Lanarkshire, are shown in the figure below. The figures show modelled annual mean concentrations of NO₂ close to a junction of the M74. The modelled concentrations are from road traffic travelling in complex terrain (on flyovers etc.). With our approach to statistically quantifying the probability of exceedences, only one map is required to present exceedences of the annual and hourly objectives for NO₂.

3.2.2 Modelling runs included in the final report

The following model runs will be included in the final report:

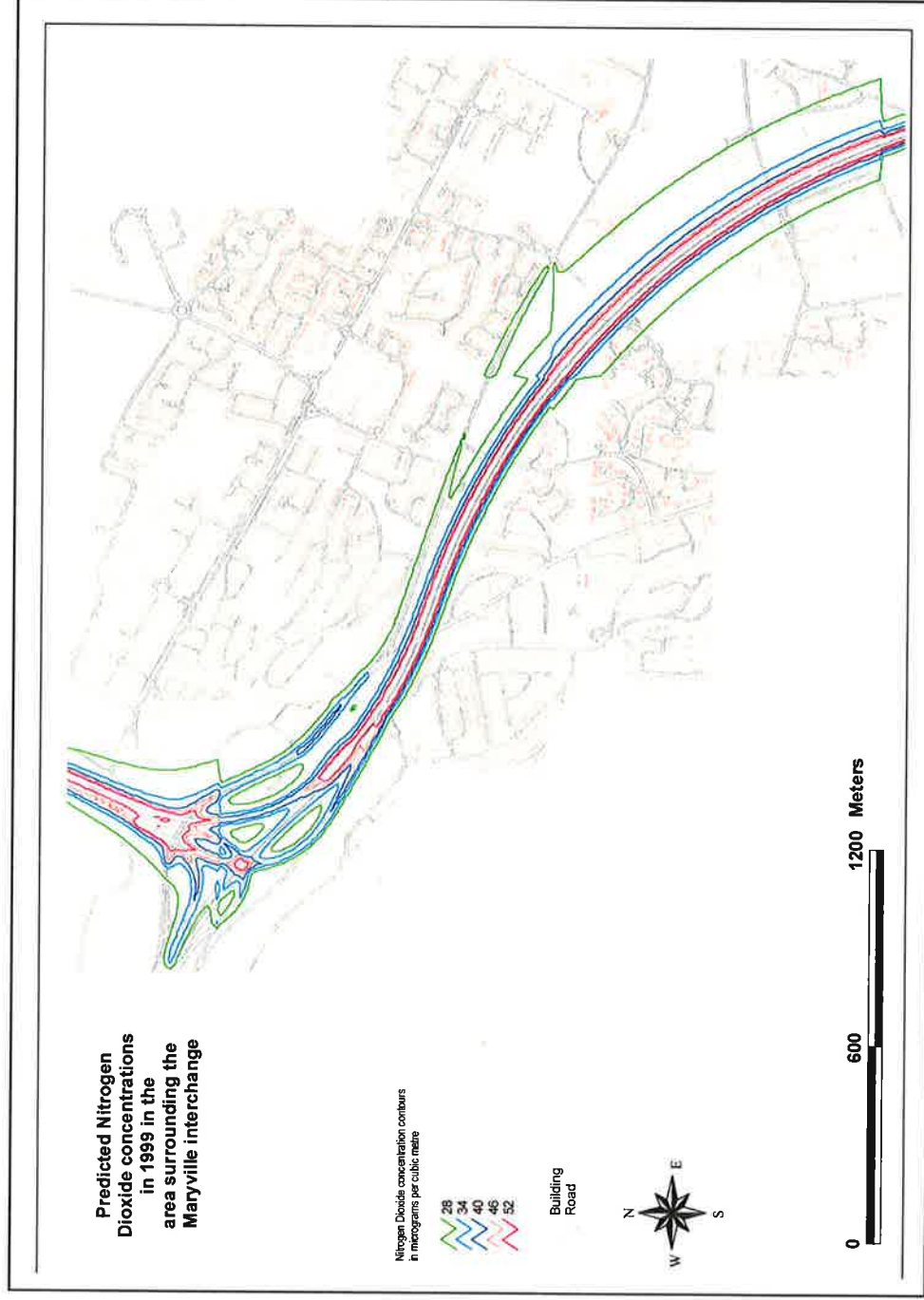
Year	Pollutant	Meteorological conditions	Area
2000 (base case)	NO ₂ and PM ₁₀	Typical	All relevant roads
2004 (BAU)	PM ₁₀	Typical	All relevant roads
2004 (AP scenario 1)	PM ₁₀	Typical	All relevant roads
2004 (AP scenario 2)	PM ₁₀	Typical	All relevant roads
2004 (AP scenario 3)	PM ₁₀	Typical	All relevant roads
2005 (BAU)	NO ₂	Typical	All relevant roads
2005 (AP scenario 1)	NO ₂	Typical	All relevant roads
2005 (AP scenario 2)	NO ₂	Typical	All relevant roads
2005 (AP scenario 3)	NO ₂	Typical	All relevant roads

Notes:

BAU Business As Usual – assuming expected traffic growth given by the each local authority or Highways Agency

AP Action Plan

Example figure Detail of modelled concentrations of NO_2 in part of South Lanarkshire (exceedences at individual houses can be predicted (Please note the following map should not be reproduced owing to copyright restrictions.)



Model verification is important and the modelling would be verified against the measurements from continuous monitoring data. Year to year variation in background concentrations will be estimated and confidence limits for the best-estimated predicted concentration calculated. These are essential steps to successfully complete a 'detailed' review and assessment.

3.23 Data sources

The accuracy and reliability of modelling is critically dependent on the quality of the data used. We will utilise all appropriate available local data, and support this with data from national sources. In particular, **netcen** will provide and use:

- emissions estimates from the National Atmospheric Emissions Inventory (to estimate the background concentrations of NO_x, PM₁₀ and other pollutants in the UK Air Quality Strategy)
- national air quality archive data
- Numerical Weather Prediction (NWP) meteorological data for Three Rivers from the Met. Office or alternatively meteorological data from the closest meteorological station.

Meteorological data suitable for use with the atmospheric dispersion model ADMS will be obtained from the Meteorological Office.

netcen will collect and review, with the help of Three Rivers, updated information on:

- local traffic flow data
- local emissions and stack parameter data for point sources
- local information on fugitive sources
- maps of the District in electronic format suitable for use in Geographical Information System (GIS) system

These data will support the dispersion modelling, and this modelling will be undertaken to predict the concentrations at the locations of the nearest sensitive receptors. Typically, these sensitive receptors are residential housing, schools, hospitals etc.

Further details of the models to be used in the detailed assessment are included in Appendix 1.

3.2.4 Deliverables

The content of the 'stage 4' report have been specified by DEFRA, and we will ensure that the reports written meet their criteria.

The following table summarises the key elements of the work that will be completed in the study.

Work area	'detailed' report
• A clear introductory discussion of each pollutant, including their sources and effects	✓
• An examination of existing local, regional and national air quality data	✓
• Identification of relevant emissions sources	✓
• An evaluation of air quality in Three Rivers District relating to the current Air Quality Strategy for England and Wales	✓
• An evaluation of likely exceedences of the Air Quality Strategy standards/objectives in 2005 and other relevant years	✓
• Summary of the 'screening' modelling results	✓
• Clear maps showing the concentrations of the modelled pollutants and the relevant receptors	✓
• Tabulated results of the calibrated and validated dispersion modelling work – receptors exposed to concentrations above the objectives in the AQS identified	✓
• The magnitude and geographical extent of any exceedence area	✓
• Probabilities of any exceedences of the air quality objectives explained in simple English	✓
• Suggestions made for area(s) that should be declared as an Air Quality Management Area (AQMA)	✓
• Recommendations for future assessment and monitoring work	✓
• An executive summary	✓
• All main data included in Appendices of the report	✓
• Report and any maps in electronic format	✓

If requested by Three Rivers District Council, electronic copies of the contour plots can be supplied and the data presented in a form that is suitable for input to a geographical information system (GIS). There is no extra charge for this. The report can be made available in electronic format, including a format that will allow the report to be presented on an Internet site. There is no extra charge for this.

3.3 CUSTOMER LIAISON

We aim:

- to keep in close contact with Three Rivers District Council throughout the period when the review and assessment reports are being written and monitoring is being undertaken;
- to agree with you the local data used in your review and assessment.

4 Management Proposal

4.1 PROJECT MANAGEMENT

The responsibility for all aspects of commercial and business activity for this project rests with the Technical Director of **netcen** - Dr Geoff Dollard.

The nominated Project Director for this work is Beth Conlan who will manage the work on a day-to-day basis, with particular emphasis on ensuring appropriate liaison with Three Rivers District Council and other **netcen** team members. Beth has extensive experience in air quality management within the local authority sector, and is currently managing Review & Assessments for several local authorities.

4.2 PROJECT TEAM

This project draws on a range of skills from within **netcen**. Further specialist input will be provided by John Abbott and Melanie Hobson. Both John and Melanie have extensive experience in (ADMS) air dispersion modelling, and are currently undertaking Review and Assessments for a number of local authorities.

CVs of these staff are provided in Appendix 1.

4.3 PROJECT PLAN

The project plans for the 'stage 4' review and assessments is given below.

Weeks	1	2	3	4	5	6	7	8	9	10	11	12
Data collection		*										
Assessment							*					
Modelling							*					
Analysis												
Preparation of report												
Delivery of Report												

* = review points

4.4 QUALITY ASSURANCE

AEA Technology operates Quality Management Systems that ensure that Customer requirements are met and that all the necessary technical work is planned, undertaken and documented in a manner that can be subjected to audit.

AEA Technology's Quality Management arrangements have been assessed by Lloyds Register Quality Assurance (LRQA) against the requirements of the BS EN ISO 9000 series and a corporate certificate has been awarded, Ref. 944198.

The constituent parts of AEA Technology have been assessed separately by LRQA against the appropriate part of ISO 9000 and certificates with specific scopes awarded.

The Quality Management arrangements for those parts of AEA Technology relevant to this submission have been assessed by LRQA against BS EN ISO 9001, including TickIT, and have been awarded the appropriate certificate Ref. 911108/A.

The calibration of calibration gas mixtures, and the on-site audit of analyser performance, are covered by **netcen's** scope of accreditation to ISO17025 (calibration laboratory no 0401)

netcen is also certificated to ISO14001 for environmental management.

5 Commercial Proposal

5.1 CONTRACT DETAILS

For Contractual purposes, any contract placed should be with AEA Technology plc whose registered address is Building 329 Harwell, Didcot, Oxfordshire OX11 0QJ.

Our terms and conditions are attached in Appendix 3. If you wish to accept these (terms and conditions presented for the 'screening' review only), please sign both copies and return one copy to us.

5.2 PRICES

netcen offers to undertake the following options outlined for the fixed prices below for monitoring and screening assessment only. The price range provided for the detailed assessment is a budgetary estimate, which is supplied for your guidance only at this stage and do not constitute an offer to supply. We would be very pleased to provide you with a formal quotation once the work programme for a detailed assessment has been finalised at the end of the screening assessment. Any work to be carried out shall be subject to contract.

Type of work	Note	Price (£) excludes VAT
Stage 4 Review and Assessment	<ul style="list-style-type: none">Modelling within AQMA's	£4500

5.3 PROPOSAL VALIDITY

This proposal is valid for 30 days from date of this signed proposal.

5.4 INVOICING

The amount of the invoice will depend on the work that Three Rivers District Council wish to commission (see table above). The invoice(s) will be submitted after the relevant portion of the work is complete (modelling) or submitted earlier if Three Rivers District Council request this.

Our payment terms are 28 days from the date of AEA Technology's invoice.

5.5 NUMBER OF COPIES OF THE FINAL REPORT

Two copies of the final report with colour diagrams can be provided. Two additional black and white copies of the report can be provided. If required, the report can be provided in electronic format on CD; there is no charge for this.

Additional copies of the final report can be provided, but because of the cost of colour photocopying, extra copies will be charged at £35 each.

5.6 GIS DATA REQUIRED FROM THREE RIVERS DISTRICT COUNCIL

To produce maps overlaid with concentration contours, we need electronic map data for the Three Rivers region. OS LandLine data is normally required. A department within the Local Authority, such as the planning department, normally holds this data. The local authority licence number for these data is usually required for quotation within the report to comply with your licence agreement.

5.7 CONTACT DETAILS – TECHNICAL AND COMMERCIAL

AEA Technology's registered address is: AEA Technology plc, 329 Harwell, Didcot, Oxfordshire OX11 0QJ. However, all correspondence relating to this project should be forwarded to Dr Beth Conlan at the Culham address below.

Technical Contact (air quality review and assessment)

Dr Beth Conlan

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6 Organisation experience

netcen is the UK's leading centre of expertise in the field of air quality. Its work spans air emission and ambient quality measurement and management, air quality mapping and forecasting, compilation of the national air emission inventory.

netcen is in an excellent position to undertake the proposed work, already having considerable experience both in the requirements of the Air Quality Strategy and its implementation within local authorities. **netcen** is working closely with DEFRA in the provision of air quality information in support of the National Air Quality Strategy and in particular, has assisted DEFRA in the preparation of guidance for local authorities, a review of the work of all "first phase" authorities, training for local authorities and the assessment of applications for Supplementary Credit Approval. In addition, through a series of training seminars on air quality review and assessment that we are undertaking with CIEH, we have existing contacts with the Environmental Health Officers responsible for local air quality in over 150 authorities in England. We are or have recently undertaken Stage 1, 2, 3 and 4 review and assessments and action plans for a number of individual local authorities.

A selection of our most relevant experience on which we will be able to draw for the proposed work is summarised in the following box:

Local Authority Stage 1, 2, 3 and 4 Review and Assessment

netcen have or are currently undertaking reviews and assessments and providing modelling results for a number of individual local authorities, including Epping Forest, Derby, Liverpool, Oxford, King's Lynn, South Lanarkshire, Stevenage, Basingstoke, Selby, Mansfield, Rugby, Erewash, Lancashire, Christchurch, Aylesbury, Vale of White Horse, Christchurch, Braintree, Aylesbury, Blackburn and Darwin, Blackpool, Burnley, Chorley, Fylde, Hyndburn, Preston, Ribble Valley, Rossendale, South Ribble, West Lancashire and Wyre. We have also presented results and conclusions from R&A to a public audience and to Members of Councils during consultation exercises.

Dispersion Modelling - DEFRA , Environment Agency, Local Authorities and private sector

netcen have undertaken numerous dispersion modelling projects using a variety of models including ADMS, the USEPA suite of models such as ISC, CALINE, and in-house gaussian models. This includes support for DEFRA during the review of the National Air Quality Strategy, local authority air quality review and assessment and for Heathrow Terminal 5 planning application, numerous environmental impact assessments for proposed developments including incinerators and other industrial plant, road links and bypasses, commercial development. The common gaseous pollutants have been modelled but we retain a specialism in odour assessment and have undertaken numerous studies around odourous industrial plant and sewage works.

Management or operation of the following national air quality networks for DEFRA:

- The Automatic Urban Network
- The Hydrocarbons Monitoring Network
- The Smoke and Sulphur Dioxide Monitoring Networks · The Acid Deposition Monitoring Networks
- The Toxic Organic Micropollutants Monitoring Network
- The Rural Ozone Monitoring Network
- The National Nitrogen Dioxide Diffusion Tube Survey
- The Paris Commission Metals Deposition Monitoring Network

Assisted DEFRA to draft Local Authority Guidance on:

- Monitoring for Air Quality Reviews and Assessments
- Review and Assessment: Pollutant Specific Guidance.

Provision of Air Pollution Monitoring and Emissions Inventory "Helpline" - as part of the Local Authority air quality review process, commissioned by DEFRA.

Training Courses in Air Quality Review and Assessment

netcen have run 30 training seminars, in association with CIEH, on the implementation of Air Quality Management and the practicalities of Review and Assessment. Over 180 local authorities have attended these seminars and feedback has been gained on their current and likely future situation. Further seminars are planned during the Autumn of 2001.

Assistance with "First Phase" Local Authorities

netcen have prepared several local authority air quality data summaries, have advised "first phase" authorities in their work in developing the air quality review and have summarised the work of all "first phase" authorities for DEFRA.

Assessment of Applications for Supplementary Credit Approval

netcen have assisted DEFRA to assess local authority applications for SCA for the purchase of monitoring equipment and emissions inventory calculations.

UK Atmospheric Emission Mapping and Forecasting - DEFRA

Development of empirical national-scale models of atmospheric pollutants for application in support of a cost of compliance assessment for the National Air Quality Strategy.

UK National Atmospheric Emissions Inventories - DEFRA:

Maintaining the UK National Atmospheric Emissions Inventory which covers 11 major air pollutants, on both nationally and spatially disaggregated scales. This information provides the UK input to international compilations, including CORINAIR (an atmospheric emissions inventory for the European Commission) and EMEP (a co-operative programme for monitoring and evaluating the long range transmissions of air pollutants in Europe).

European Topic Centre on Air Emissions - European Environment Agency:

netcen is a leading member of the consortium operating the Topic Centre. The Topic Centre has reviewed the achievements of the most recent European Air Emissions Inventory CORINAIR 90 and is responsible for developing guidelines for the production of future inventories. It will be co-ordinating the production of a European-wide air emissions inventory for 1994.

Appendix 1

Further details on the models to be used in the review and assessment

CONTENTS

Models used to predict the impact of emissions from road traffic in the 'detailed' assessment

Modelling industrial sources in the 'detailed' assessment

Appendices

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Appendix 1	Further details on the models to be used in the review and assessment
Appendix 2	Curricula Vitae
Appendix 3	Terms and conditions

Further details on the models to be used in the review and assessment process.

This part of the proposal contains the technical details of the modelling approach to predicting concentrations in the 'detailed' assessment of nitrogen dioxide and PM₁₀ from traffic in Three Rivers.

Models used to predict the impact of emissions from road traffic

The air quality impact from roads in the ('detailed') assessment will be assessed using our proprietary urban model. There are two parts to this model:

- The *Local Area Dispersion System (LADS) model*. This model calculates background concentrations of oxides of nitrogen and PM₁₀ on a 1 km x 1 km grid. The estimates of emissions of oxides of nitrogen and PM₁₀ for each 1 km x 1 km area grid square will be obtained from the 1999 National Atmospheric Emission Inventory disaggregated inventory (projected forward to 2000 and 2005 using factors in the DEFRA Technical Guidance).
- The *DISP model*. This model is a tool for calculating atmospheric dispersion using a point-source kernel. Estimates of emissions from vehicles will be calculated using the latest emission factors. The dispersion kernels for the DISP model are derived from model runs using ADMS V3.1.

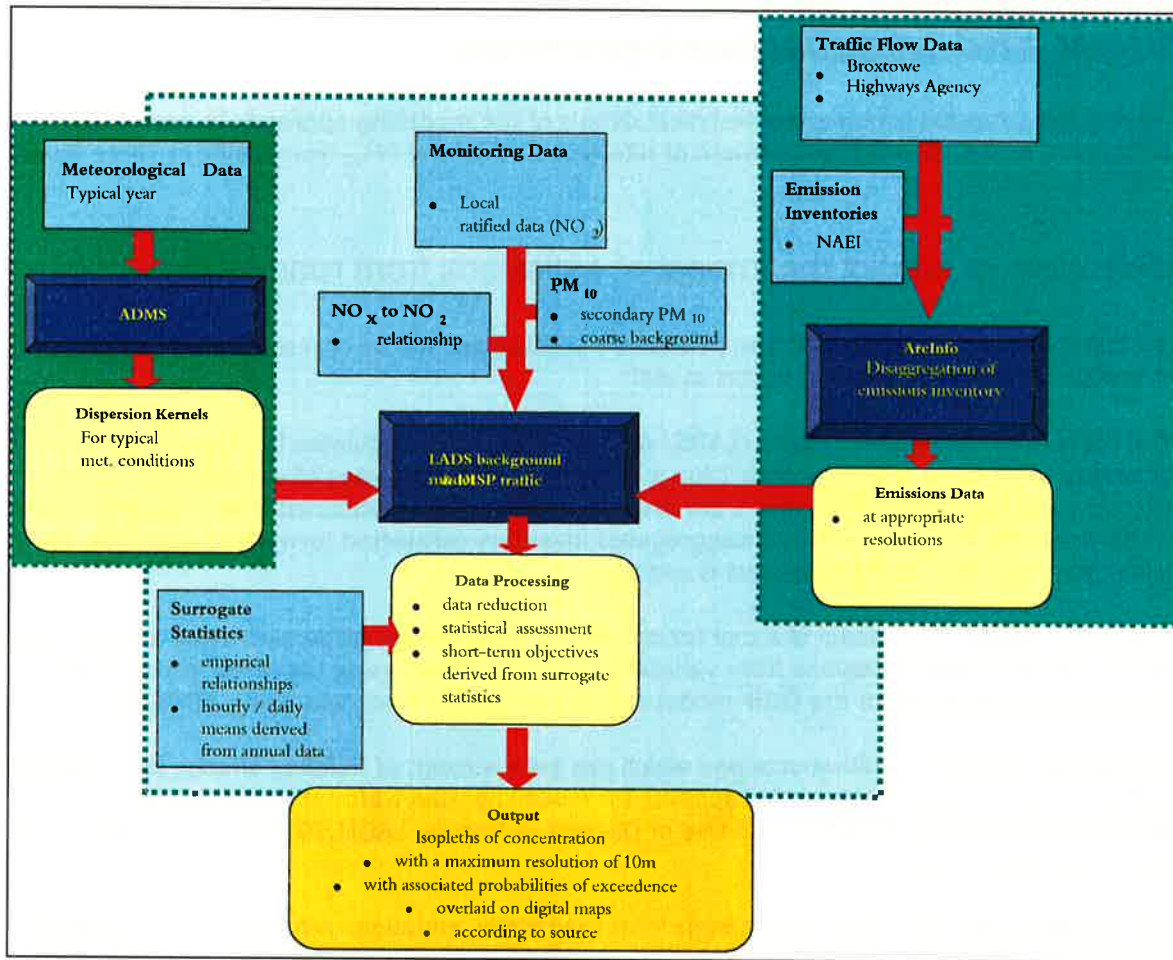
This advanced model is a multi-source one which can take account of building effects, complex terrain, and street canyon environments and is suitable for modelling road traffic emissions as defined in "Review and assessment: Selection and Use of Dispersion Models, LAQM.TG3(00)", and in the Draft Technical Guidance LAQM.TG(02).

Concentrations of NO₂ (and PM₁₀ if required) from road traffic emissions will be assessed using a high-resolution approach. The air quality will be modelled at 10 m intervals along all of the roads assessed. This is a high resolution approach as recommended in LAQM.TG3(00) and in the Draft Technical Guidance LAQM.TG(02). In addition significant point source emissions will be combined with the road traffic impact to give an overall result.

The model will be run for the current and 2005 case (and 2004 if PM₁₀ modelling is required). In addition, existing monitoring of air quality will be utilised to assess current air quality against the national air quality standards and objectives according to government guidance. However, a detailed review and assessment requires a quantification of the magnitude of the exceedence that should be undertaken with automatic monitors.

In addition to total concentrations of NO₂, concentrations of primary PM₁₀ (from traffic emissions alone) will also be predicted from the modelling if required.

The figure below shows the schematic view of our modelling approach.



This modelling approach has been used in a number of Stage 3 and 4 studies that NETCEN have previously completed, and the approach has been accepted by the DEFRA.

The benefits of our modelling approach are that it:

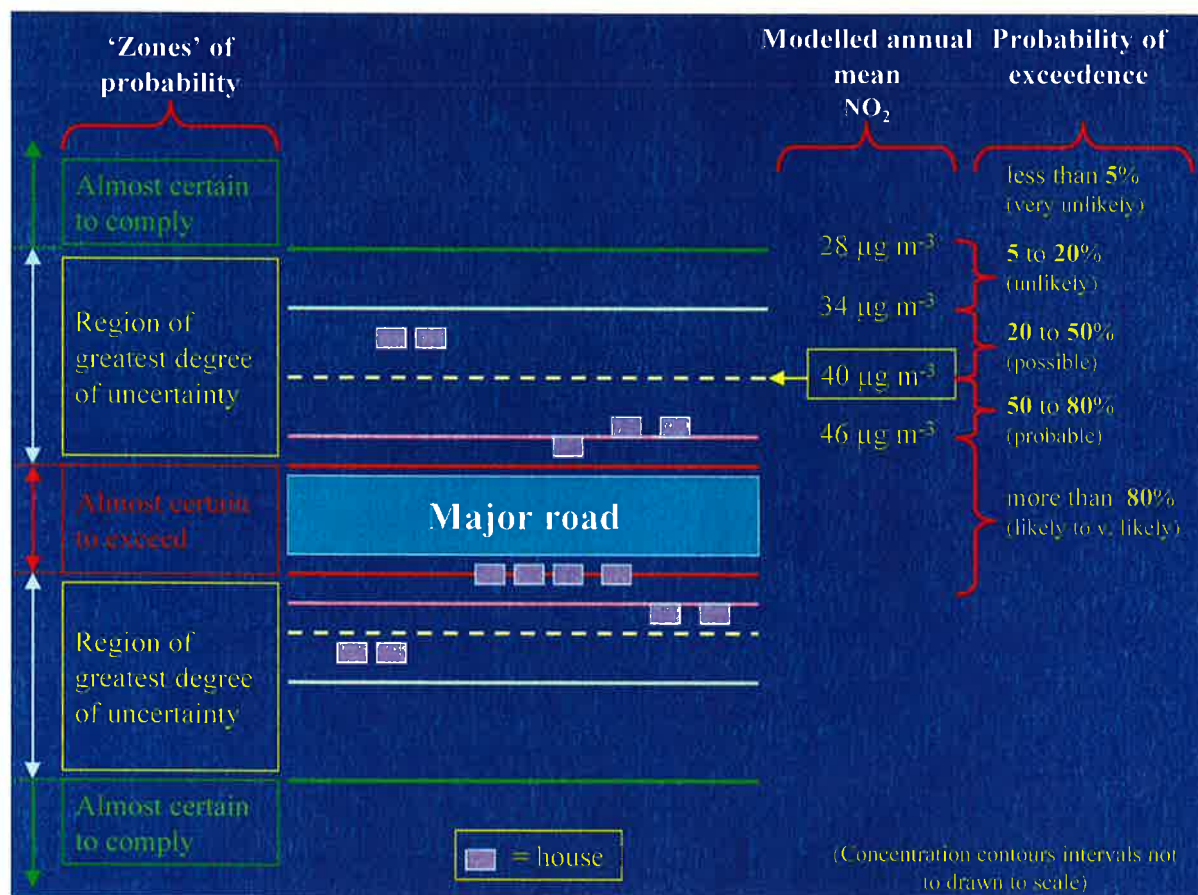
- ✓ Utilises *high quality modelling* with a range of tested and validated models and model extensions.
- ✓ Provides a *statistical assessment of public exposure to exceedences* of current and proposed air quality objectives and provides *transparent interpretation* of their implications.
- ✓ Allows *rapid sensitivity testing of the effects of various transport options*, such as 'low emissions zones' (new model runs will take hours, not days);
- ✓ Ensures *consistency* so there are no discontinuities between predictions of pollutant concentrations between adjacent areas modelled;
- ✓ Provides clear *mapping outputs*, allowing personal exposure and geographical areas of exceedence to be easily visualised and assessed.

A stylised example of the relationship between the concentrations of NO₂ and the probability of exceeding the annual mean objective, in this case for the concentrations predicted from road traffic, is shown below in Figure 2.

Modelling industrial sources in the 'detailed' assessment.

If required, dispersion modelling will be carried out for sources that failed to meet the 'screening' assessment. The impact of the industrial sources on ground level pollutant concentrations will be predicted using the dispersion model ADMS v3.1. The model will be set up to provide concentrations over the relevant averaging periods for the pollutant of concern.

Stylised example of concentrations of NO₂ and associated uncertainties of exceeding the annual mean objective of 40 µg m⁻³



Our modelling approach allows the probability of exceedences of both the annual and hourly objectives for NO₂ to be assessed from predictions of the annual mean alone. The table below shows an example of how our modelling approach will allow us to calculate the ranges of concentrations of NO₂ that can be associated directly with probabilities of exceedences of the short and long-term air quality objectives. These tables have been taken from our Stage 3 air quality review and assessment of South Lanarkshire.

Example of table presenting the probability of exceedences of the annual and hourly objectives for nitrogen dioxide

Description	Chance of exceeding objective	Confidence limits for the modelled annual average concentrations (µg m ⁻³)	
		Annual average objective	Hourly average objective
Very unlikely	Less than 5%	< 28	< 39
Unlikely	5 to 20%	28 to 34	39 to 52
Possible	20 to 50%	34 to 40	52 to 67
Probable	50 to 80%	40 to 46	67 to 81
Likely	80 to 95%	46 to 55	81 to 94
Very likely	More than 95%	> 52	> 94

Appendix 2

Curricula Vitae

CONTENTS

Beth Conlan
John Abbott
Melanie Hobson

Beth Conlan

Qualifications PhD, MSc Environmental Pollution, BSc (Hons) Environmental Science
Year of birth 1965
Nationality British

KEY SKILLS

- Air quality review and assessment for local authorities
- Air quality impact assessment of industrial and transportation schemes
- Air quality monitoring using a range of automatic and non-automatic instruments
- Emission assessment and development of emission inventories for local authorities
- Air quality modelling of industrial and transportation sources
- Preparation of reports

SELECTION OF PROJECT EXPERIENCE

2002- DEFRA – Local Authority Emissions Inventory Helpline; Preparation of Technical Guidance notes for LAQM

2001- 2002 – Local Authorities – Stage 4 and Action Plan preparation for several local authorities

1999- 2002 Local Authorities – Over 100 Stage 1, 2 and 3 air quality review and assessment for local authorities

1999 DETR Assistance in the re-write of the Local Air Quality Management Technical Guidance

1998 - 2001 Chartered Institute of Environmental Health - Trainer of air quality management to nearly 200 local authorities in accordance with the Environment Act 1995 and government guidance.

1998 Secretariat of the Airborne Particle Expert Group - Provision of secretarial support and data analysis.

1998 Department of the Environment, Transport and the Regions - Production of summary report of the local authority first phase air quality review and assessment.

1997 South Shropshire Borough Council - Air Quality Review and assessment of air quality in accordance with the Environment Act 1995.

1997 Environment Agency - Acid deposition study in the Afan catchment.

1997 Highways Agency - Effect of air quality on roadside vegetation which involves vegetation survey and experimental investigations along the M62.

1997 Greater Manchester Authorities - Management and update of the air quality emissions database.

1997 Slough City Council - Air quality review and assessment in accordance with the Environment Act 1995.

1996 Gallagher Security - Precipitation chemistry assessment for Greater Manchester.

1996 Eurocom Enterprise Ltd - UK Precipitation chemistry assessment.

1996 Wigan City Challenge and Wigan Metropolitan City Council - An air quality assessment of Wigan MBC and production of an air quality management proposal

1996 John Anderson Planning - Establishment of a short term ammonia monitoring programme in connection with a planning application in Lincolnshire.

1995 Warrington City Council - An air quality assessment and a production of an air quality management proposal.

1995 Bury Metropolitan City Council and Salford City Council - Study on the air quality impacts of the proposed widening of the M62.

1995 - 1996 Cheshire County Council and Chester City Council - Establishment of a short term air quality monitoring programme in Chester in connection with a change in transport policy.

1994 Chris Blandford Associates - An air quality assessment for the River Irwell Flood Defence Scheme concentrating on the impact of particulates.

1994 Environmental Resources Management - An air quality review of Spata Airport, Greece.

1994 Manchester City Council - An air quality assessment and a production of an air quality management proposal.

1994 Bootle Maritime City Challenge - An air quality assessment and management of a monitoring campaign using a mobile facility.

1994 Sefton City Council - Advice and guidance on purchasing and siting of two AUN compatible stations.

1994 - 1996 Welsh Office - Establishment of a 30 site nitrogen dioxide and ammonia diffusion tube survey in rural Wales including an assessment of critical load exceedence.

1993 - 1997 Birmingham Airport plc - Air quality programme and impact assessment including an environmental impact assessment for proposed development.

1992 - 1994 London Borough of Hillingdon - Data management from an opsis DOAS monitoring system including monthly and annual reports.

1991 - 1997 Association of Greater Manchester Authorities, High Peak City Council, Rossendale City Council and Warrington City Council - Management of an acid deposition, nitrogen dioxide and ammonia monitoring programme throughout the conurbation encompassing 19 sites.

1991 - 1997 Manchester Airport plc - Air quality programme and impact assessment. This included a developing and maintaining an ambient monitoring programme, provision of dispersion modelling, advice and assistance with the Runway 2 public inquiry.

1991 - 1997 Department of the Environment, Transport and the Regions - Assistance in the operation of the national centre for air quality information.

CAREER HISTORY

1998-current: AEA Technology **netcen**: Senior Air Quality Scientist.

1991-1998: Environmental Project Manager at the Atmospheric Research and Information Centre (ARIC), Manchester Metropolitan University.



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John Abbott

Qualifications	BSc (Hons) Chemical Engineering
Year of birth	1952
Nationality	British

KEY SKILLS

- Materials handling
- Health impact assessment
- Air quality modelling
- Air quality impact assessment
- Emission assessment
- Assessment and technical support of IPC/IPPC and Planning applications
- Expert witness

SELECTION OF RECENT PROJECT EXPERIENCE

2001 Octagon Motorsport – assessment of the impacts of proposed developments at Silverstone for F1 British Grand Prix

2001 Surrey County Council - Independent expert - assessment of environmental statements for proposed EFW developments in the county.

2001 First Renewables - assessment of environmental and health impacts as part of the IPPC and planning application for a proposed Coppice wood fired Power Station in Yorkshire

2000- Shanks Waste Services - Assessment of environmental and health impacts from the operation of landfill gas engines and flares at Ruabon landfill site. Calculation of dioxin and furan intake by local residents through contamination of air, soil and water. Presentation of evidence as expert witness at Public Inquiry.

2000- Severn Waste - Assessment of air quality and health impacts from North Worcestershire Integrated Waste Management Facility at Kidderminster. Assessment of heavy metal deposition. Assessment of dioxin and furan intake by local residents. Assessment of the extent of contamination by heavy metals and dioxins and furans of processed sugar at adjacent beet processing plant.

2000-Crawley Borough Council - Assessment of dust impacts from aggregate handling plant on proposed residential development.



CAREER HISTORY

- 1994-Date : AEA Technology **netcen**: Independent Expert and Project manager for air quality impact assessment. Responsible for the technical, managerial and financial control of air quality impact assessment projects. Projects included:
- urban modelling of smoke and sulphur dioxide;
 - modelling of nitrogen oxides, carbon monoxide and hydrocarbons from vehicles and aircraft;
 - air quality impact assessment from Energy from Waste facilities.
- 1988-1993 : Project manager (Grade 7) for onshore marine pollution and bulk solids handling projects. Responsible for the technical, managerial and financial control of projects concerned with the clean-up and modelling of coastal marine pollution and with bulk solids handling. Projects included:
- clean-up of oil spills from beaches;
 - estuarine modelling;
 - computerized information system for beach clean-up;
 - satellite remote sensing of oil spills;
 - silo design;
 - powder testing;
 - vapour cloud modelling;
 - cargo stability;
 - health and safety at enclosed wastewater treatment works.
- 1981-1988 Senior Scientific Officer (Project Leader) in the Materials Handling Division. Responsible for the technical control of projects concerned with the safe design of bulk materials handling systems. Projects included:
- dust explosion prevention and protection;
 - prevention of fires and explosions in dryers;
 - aerated silo design;
 - silo design;
 - powder testing;
 - beltweighing;
 - bulk solids consultancy.
- 1980-1981 Higher Scientific Officer (Technical Officer) in the Materials Handling Division. Responsible for the technical control of research into errors in beltweighing.
- 1978-1980 Scientific Officer in the Materials Handling Division. Responsible for experiments in beltweighing.

SELECTION OF PUBLICATIONS

John Abbott. Prevention of fires and explosions in dryers. Institution of Chemical Engineers, 1990.

C.Schofield and J.A.Abbott. Guide to dust explosion prevention and protection, Part 2- Ignition prevention, containment, inserting , suppression and isolation. Institution of Chemical Engineers, 1988.

John Abbott. Recommendations for beltweighing. WSL Report LR 648 (MH), 1986.

John Abbott. Control of ignition sources, inerting and containment. British Materials Handling Board Seminar on Dust Explosions-Assessment, Prevention and Protection. London, 1989.

John Abbott. Beltweighing Research at Warren Spring Laboratory. British Society for Strain Measurement, International Conference, London, 1989.

J.A.Abbott, P.L.Bransby, R.Clark and W.T.Lee. Belt weighing test facility at Warren Spring Laboratory. Bulk solids handling, 1(2), 239-243, 1981.

J.A.Abbott. Beltweighers-Sources of error and recommended practice. Institution of Mechanical Engineers seminar on the control and measurement of bulk solids, 1984.

J.A.Abbott. The effect of idler misalignment and belt stiffness on beltweighing errors. Bulk solids handling, 6(1), 121-128, 1986.

J.A.Abbott. The effect of conveyor belt mistracking on beltweighing errors, 9(1), 107-117, 1989.

J.A.Abbott. British Materials Handling Board Survey of dust fires and explosions in the United Kingdom 1979-1984. Warren Spring Laboratory Report LR 597 (MH).

J.A.Abbott. Survey of dust fires and explosions in the United Kingdom 1979-1984. Europex Newsletter, 8, 4-10, 1988.

J.A.Abbott. Bulk solids storage methods. Factory Equipment News, 1986.

J.A.Abbott. Alignment Experiments: one part of the troughed belt weighing research programme at Warren Spring Laboratory. Weightech 2 conference, Harrogate 1981.

J.A.Abbott and D Tookey. Clean-up of oil spills from soft sediments. 1993 Oil spill conference. Tampa.

Melanie Hobson

Qualifications: MSc Environmental Technology, Imperial College
BSc Environmental Sciences, University of East Anglia, Norwich
Year of birth 1974
Nationality British

KEY SKILLS

- Air quality review and assessment
- Developing emission estimates and inventories
- Road transport policy support work
- Odour modelling and assessment

SELECTION OF PROJECT EXPERIENCE

- 2002 - Production of an interactive workshop for shell using mind map to lead the user through the tasks involved in an environmental impact assessment.
- 2000 - 2002 Local Authority Air Quality Reviews. Completed four Stage 3 air quality reviews and ten Stage 2 reviews.
- 2000/2001 - Co-author of the 1999 UK National Atmospheric Emissions Inventory Report.
- 2002 - Secretariat to Working Group 19 on emission monitoring strategy
- 2001 - Environmental Impact Assessment of the re-development of Derby town centre. Dispersion modelling was used to predict the air quality impact of the proposed development in the town centre.
- 2001 - Assessment of odour from a cocoa plant. Estimated the impact of various operating scenarios on local odour concentrations. This required dispersion modelling to be carried out to predict ground level concentrations at receptor locations.
- 2001 - Assessment of odour control from an animal incinerator and knackers yard. Odour emissions were measured from these two sites and then dispersion modelling was used to quantify the impact each was having on the local environment and therefore where abatement was most needed.

- 2001 – Assessment of odour from a composting site. Measured and assessed odours and volatile organic compounds from this site
- 2001 Environmental Impact assessment of a flare stack in Qatar in the Middle East. Different burning scenarios were modelled to assess the impact of the proposed stack on local air pollutant concentrations.
- 2001 - Assessment of the emissions of pollutants from animal pyres arising from the foot and mouth outbreak.
- 2001 / 2002 - Olfactometry analysis for various customers
- 2002 - Involved in a project developing emission estimates of fluorocarbons (HFCs, PFCs & SF6)

CAREER HISTORY

2000 - present. Air Quality Consultant Researcher, Environmental Quality Group, AEA Technology, Culham, Oxfordshire.

1997 - Research Assistant, Global Environmental Issues Group, ICF Consulting, Washington DC, USA. Carrying out research and writing reports on greenhouse gas emissions and mitigation strategies for the US EPA.

Appendix 3

Terms and conditions

CONTENTS

Fixed price agreement

Agreement



netcen

netcen is an operating division of AEA Technology plc

Telephone: 01235 463554
Facsimile: 01235 463005

Your Reference:
Our Reference: netcen/ED48139/Issue 1

AEA TECHNOLOGY plc ("AEA Technology") whose registered office is at 329 Harwell, Didcot, Oxfordshire OX11 0QJ, United Kingdom (Registered in England and Wales, number 3095862), acting through its operating division **netcen** hereby offers to undertake the programme of work ("the Work") indicated in the schedule below ("the Schedule") and/or in any document(s) specified in the Schedule for **Three Rivers District Council** ("the Customer") of **Northway, Rickmansworth, Hertfordshire, WD3 1RL**. (Registered Office or other address)

Telephone Number: 01923 727005 Facsimile Number:

AEA Technology estimates that the Work will be completed within 3 months. AEA Technology's charges for the Work will be £4,500 sterling (plus VAT where applicable). Invoices will be sent at the latest, on completion of the work, or provided the date is before the completion of the work, at the customer's request.

This offer, which expires on 10th January 2003, may be accepted by the Customer by returning a signed and dated copy of this document (including invoicing address and VAT number where applicable) to Dr Beth Conlan at the following address:
netcen, AEA Technology plc, Building E5, Culham, Abingdon, Oxon., OX14 3ED.

The Customer's acceptance shall be subject to the Conditions overleaf.

THE SCHEDULE Air Quality Review and Assessment – 'Stage 4'

THE CUSTOMER'S INVOICING ADDRESS (if different from above)

.....

For the attention of:

THE CUSTOMER'S VAT NUMBER (if applicable):

AUTHORISATION

Signed Date:

On behalf of the Customer

Name (print)

Post held in the Customer's Organisation

Signed *Beth Conlan* Date: *12/12/02*

On behalf of AEA Technology

Name (print) *B. Conlan*

Post held in AEA Technology *Project Director*

98/218(Issue 4)



CONDITIONS

LAW	1	Acceptance of this offer constitutes an Agreement made in England and subject to the laws of England and the sole jurisdiction of the courts of England between the Customer and AEA Technology plc ("AEA Technology") whose registered office is at 329 Harwell, Didcot, Oxfordshire OX11 0QJ, United Kingdom.
PAYMENT	2	The Customer shall pay in Sterling the charges made by AEA Technology in respect of the Work within twenty-eight (28) days of the submission of any invoice by AEA Technology. Such payment to AEA Technology shall mean that payment exclusive of any taxes and duties chargeable thereon by any central government, local government or statutory body whatsoever, all of which taxes and duties shall be paid by the Customer.
INFORMATION	3	Unless specified to the contrary in the Schedule, all relevant information resulting from the Work shall be described in a written report which shall be sent to the Customer. Subject to Clause 6 hereof, the Customer shall have the right to use such information for any purpose.
LIABILITY	4	AEA Technology makes no warranty or representation that the use of any information arising from the Work will not infringe the rights of third parties but, if any of AEA Technology's employees whilst engaged on the Work become aware of any apparent infringement, AEA Technology will inform the Customer.
	5(a)	AEA Technology shall be liable for any loss or damage suffered by the Customer only insofar as such loss or damage is attributable to negligent acts or negligent omissions of AEA Technology's employees or agents in the performance of the Work.
	5(b)	AEA Technology accepts no responsibility for the use made of any information, materials or equipment arising from the Work either by the Customer or by any third party who has obtained any of the said information, materials or equipment directly or indirectly from the Customer, except to the extent that AEA Technology can be shown to have been negligent in providing such information, materials or equipment.
	5(c)	AEA Technology's total liability to the Customer under this Agreement, in tort (including negligence), under statute or otherwise in respect of such loss or damage shall be limited to one hundred thousand pounds (£100,000) Sterling or five times the total payment made to AEA Technology under this Agreement, whichever sum is the greater.
PUBLICITY	6	Either party shall have the right to make general references to the Work in press releases or promotional materials, but neither party shall include therein any detailed results of the Work without the consent of the other, which consent shall not be unreasonably withheld.
CONFIDENTIALITY	7(a)	Subject to the provisions of Clause 3 hereof, each party shall take all reasonable measures to keep confidential for the period of seven (7) years next following the date of acceptance of this offer all information which is received from the other party under this Agreement and which is specified by the disclosing party to be confidential at the time of disclosure or which may come to one party's knowledge or is disclosed to it as a result of visiting the premises of the other party.
	7(b)	This obligation shall not apply to information which either at the time of disclosure or after disclosure is published or generally available to the public other than through a breach hereof or information already in the receiving party's possession at the time of receipt and which was not acquired directly or indirectly from the disclosing party or information acquired by the receiving party in good faith from a third party.
CUSTOMER'S SAMPLES ETC.	8	As soon as practicable after acceptance of this offer, the Customer shall arrange, free of charge and risk to AEA Technology, the delivery to AEA Technology of any samples, equipment, materials and/or information required by AEA Technology in order to carry out the Work. On completion of the Work, the said samples, equipment and/or materials shall be treated as detailed in the Schedule or, if no provision is made in the Schedule, the said samples, equipment and/or materials shall be retained by AEA Technology for the period of two (2) months next following the completion of the Work, during which time the Customer may make arrangements for their collection. Should the Customer not make such arrangements, AEA Technology shall be entitled to dispose of the said samples, equipment and/or materials.
CUSTOMER'S ORDER	9	Unless specifically agreed otherwise in writing by the Customer and AEA Technology, the terms contained in any purchase order or any other form of contract document issued by the Customer to AEA Technology shall not apply in any way whatsoever to the performance of the Work except for the purposes of specifying the Customer's contract reference number(s) and the Customer's relevant invoicing address(es).