

**ENVIRONMENTAL SERVICES DIVISION**

**UPDATING & SCREENING ASSESSMENT**

**OF AIR QUALITY IN THE**

**BABERGH DISTRICT**

**APRIL 2006**

## **EXECUTIVE SUMMARY**

In January 2000 the Government published its revised Air Quality Strategy in response to the requirements of the Environment Act 1995. The Strategy set health-based Air Quality Standards and Objectives for seven prescribed pollutants of greatest local concern: carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide, nitrogen dioxide and particulate matter (PM<sub>10</sub>).

The Environment Act 1995 requires local authorities to periodically review and assess air quality within their areas to determine whether the Air Quality Objectives will be met by specified target dates. This Updating & Screening Assessment report commences the Council's third round of review and assessment. It is intended to update previous studies in 1999 and 2003 by screening the various potential sources of prescribed pollutants that could impact on the Babergh district. Where the screening process identifies a significant risk that a potential emission source could lead to an exceedance of the Air Quality Objectives, the Council is required to proceed to a Detailed Assessment. The screening models and monitoring data used in the assessment were as recommended in the Government's pollutant specific guidance.

The Updating & Screening Assessment has concluded that for each of the seven prescribed pollutants, the Air Quality Objectives are likely to be met and that a more Detailed Assessment is not required.

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## **1. INTRODUCTION**

### **1.1 Air Quality Strategy**

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in January 2000 and establishes the framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. It is recognised, however, that despite these measures, areas of poor air quality will remain, and that these will best be dealt with using local measures implemented through the Local Air Quality Management regime.

Central to the Air Quality Strategy are health-based standards for seven air pollutants of current greatest local concern i.e. benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, particulate matter (PM<sub>10</sub>), and sulphur dioxide. These standards are based on recommendations made by the Government's Expert Panel on Air Quality Standards. From these standards, Air Quality Objectives have been derived, which take account of the costs and benefits, as well as of the feasibility and practicality, of moving towards the standards. The Air Quality Objectives are specified in the Air Quality Regulations 2000, and the Air Quality (Amendment) Regulations 2002. In addition, the EU has set limit values for certain pollutants. Local authorities currently have no statutory obligation to assess air quality against these limit values, but they may find it helpful to do so in order to assist with longer-term planning and the assessment of development proposals in their local areas. This report includes an assessment against the EU limit values for benzene and nitrogen dioxide.

### **1.2 The Review and Assessment Process**

Part IV of the Environment Act 1995 placed a requirement on local authorities to periodically review and assess air quality in their districts. This involves identifying those areas where it is considered likely that the Air Quality Objectives will be exceeded. Local authorities have a duty to designate any such locations as Air Quality Management Areas (AQMA) and pursue improvements in air quality in those areas.

Babergh District Council has carried out two previous rounds of review and assessment commencing in 1999 and 2003, both of which concluded that the Air Quality Objectives were likely to be achieved in the Babergh district. Authorities are now required to carry out a third round of review and assessment and this report fulfils that requirement.

The Government has recommended a phased approach to the review and assessment process. The first step is an *Updating & Screening Assessment*, which is to be undertaken by all authorities. This is based on a checklist to identify those matters that have changed since the last round was completed, and which may now require further assessment. This Updating & Screening Assessment should consider new monitoring data, new sources or significant changes to existing sources (either locally or in neighbouring authorities), or any other local changes that may be significant. Authorities should also consider any relevant changes to public exposure e.g. new residential developments alongside busy roads. If there is a risk that these changes may be significant, then a simple screening assessment should be carried out.

Where the Updating & Screening Assessment identifies a risk that an Air Quality Objective will be exceeded at a location with relevant public exposure, then a *Detailed*

*Assessment* must be carried out. The aim of this Detailed Assessment should be to identify with reasonable certainty whether or not a likely exceedence will occur. The assumptions within the Detailed Assessment will need to be considered in depth, and the data that are collected or used, should be quality-assured to a high standard. Where a likely exceedence is identified, then the assessment should be sufficiently detailed to determine both its magnitude and geographical extent. Local authorities should not declare an AQMA unless a Detailed Assessment has been completed.

### **1.3 Methodology**

Guidance has been issued by the Department for Environment, Food and Rural Affairs (DEFRA) to assist local authorities in completing their reviews and assessments. Specifically, the Government's Technical Guidance LAQM.TG(03), (hereinafter referred to as TG(03)) specifies the procedures and methods for completing the review and assessment. This guidance can be viewed on the Internet at [www.defra.gov.uk/environment/airquality/laqm.htm](http://www.defra.gov.uk/environment/airquality/laqm.htm).

The checklists in TG(03) for completing the Updating & Screening phase have been updated for the current round of review and assessments. The revised checklists can be viewed at [www.uwe.ac.uk/aqm/review/guidance\\_05.html](http://www.uwe.ac.uk/aqm/review/guidance_05.html). In using the revised checklists DEFRA advises that authorities *do not* need to re-assess the issues that have already been adequately considered in previous rounds, but they should make it clear that due consideration has been given to each item in the checklist, and as a minimum confirm that the item is not relevant or has not changed.

TG(03) makes it clear that likely exceedences of the Air Quality Objectives should be assessed in relation to 'the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present'. Reviews and assessments should thus be focussed on those locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective – hereinafter termed 'relevant receptor locations'. Authorities should not consider exceedences of the objectives at any location where relevant public exposure would not be realistic. Further guidance on what constitutes a relevant receptor location for the purposes of this Updating & Screening Assessment is given in Appendix I.

This authority's 2003 Updating & Screening Assessment described the main sources of the prescribed pollutants and their effects on human health and it is not intended to repeat that information in this report.

## 2. CARBON MONOXIDE

### 2.1 Introduction

The Government's Air Quality Objective for carbon monoxide is 10.0 mg/m<sup>3</sup> measured as a maximum daily 8-hour mean concentration. The objective was to have been achieved by the end of 2003.

Studies at a national level based on both measured and modelling data, suggest that there is little likelihood of the objective for carbon monoxide being exceeded. Carbon monoxide concentrations were expected to continue to decline to 2003 and the likelihood of any exceedance is considered to be low. However, whilst national-scale studies suggest that the objective will be achieved, it is important that local circumstances are fully taken into consideration. All local authorities are therefore required to carry out a review and assessment for carbon monoxide. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedances of the Air Quality Objective for carbon monoxide.

### 2.2 Updating & Screening Assessment

#### 2.2.1 Monitoring Data

The Council has not conducted any monitoring campaigns of carbon monoxide concentrations in the district. The Council is not aware of any monitoring campaigns having been carried out by other agencies. **Accordingly, there is no data to review under this category.**

#### 2.2.2 Very Busy Roads or Junctions in Built-up Areas

TG(03) requires local authorities to identify 'very busy' roads and junctions in areas where the current year background concentration of carbon monoxide is expected to be above 1 mg/m<sup>3</sup>. The following criteria are specified to define 'very busy':

- Single carriageway roads with daily average traffic flows which exceed 80,000 vehicles per day.
- Dual carriageway (2 or 3 lane) roads with daily average traffic flows which exceed 120,000 vehicles per day.
- Motorways with daily average traffic flows which exceed 140,000 vehicles per day.
- Traffic flows should be added at junctions in accordance with the guidance in TG(03).

Traffic flow data for roads in the Babergh district are given in Appendix II. There are no roads or junctions falling within the 'very busy' criteria specified in TG(03). **No further assessment is therefore necessary at this time.**

### 2.3 Conclusion for Carbon Monoxide

The Updating & Screening Assessment confirms that there are no sources of carbon monoxide either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objective. **No further assessment of carbon monoxide is therefore required at this time.**

### 3. BENZENE

#### 3.1 Introduction

The Government's Air Quality Objectives for benzene are:

- A running annual mean concentration of  $16.25 \mu\text{g}/\text{m}^3$ . This objective was to have been achieved by the end of 2003;
- A fixed annual mean of  $5 \mu\text{g}/\text{m}^3$  to be achieved by the end of 2010.

The second Air Quality Daughter Directive also sets a limit value for benzene, which has been transposed into UK legislation. The Directive includes an annual mean limit value of  $5 \mu\text{g}/\text{m}^3$  to be achieved by 1 January 2010.

Forecasts based on national mapping suggest that the policy measures currently in place will achieve the 2003 objective at all urban background and roadside/kerbside locations. Whilst the 2010 objectives are expected to be met at all urban background, and most roadside locations, there is the possibility for some remaining exceedences, which will require additional measures at a local level. Local authorities are therefore required to complete the review and assessment for benzene. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedences of the Air Quality Objectives for benzene.

#### 3.2 Updating & Screening Assessment

##### 3.2.1 Monitoring Data – Within and Outside an AQMA

The Council has not designated any AQMAs with respect to benzene, and since the 2003 Updating & Screening Assessment it has not conducted any monitoring campaigns of benzene concentrations in the district. The Council is not aware of any monitoring campaigns having been carried out by other agencies. **Accordingly, there is no data to review under this category.**

##### 3.2.2 Very Busy Roads or Junctions in Built-up Areas

TG(03) requires local authorities to identify 'very busy' roads and junctions in areas where the 2010 background concentration of benzene is expected to be above  $2 \mu\text{g}/\text{m}^3$ . The following criteria are specified to define 'very busy':

- Single carriageway roads with daily average traffic flows which exceed 80,000 vehicles per day.
- Dual carriageway (2 or 3 lane) roads with daily average traffic flows which exceed 120,000 vehicles per day.
- Motorways with daily average traffic flows which exceed 140,000 vehicles per day.
- Traffic flows should be added at junctions in accordance with the guidance in TG(03).

Traffic flow data for roads in the Babergh district are given in Appendix II. There are no roads or junctions falling within the 'very busy' criteria specified in TG(03). **No further assessment is therefore necessary at this time.**

### 3.2.3 New Industrial Sources and Existing Industrial Sources with Substantially Increased Emissions or New Relevant Exposure

TG(03) provides a list of industrial processes regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 which have the potential to emit significant quantities of benzene. New and existing industries in the Babergh and neighbouring districts have been compared against this list and only the following sites have been identified as potentially significant sources of benzene:

- Vopak Terminal, Cliff Quay, Ipswich, Suffolk. Process type: Part B Petrol Terminal. Grid reference: 617200 242800.
- Petrochem Carless Ltd, Harwich Refinery, Refinery Road, Parkeston, Essex CO12 4SS. Process type: Part A(1) Refinery. Grid reference: 622850 232125.

Liaison with Ipswich Borough Council has confirmed that emissions from the Vopak petrol terminal are 'fugitive' i.e. not vented to a stack or other extraction equipment. TG(03) advises that, since the terminal is over 1km from the nearest residential properties in the Babergh district and the emissions are fugitive, they will have no significant impact on air quality in the Babergh district. **No further assessment is therefore necessary at this time.**

Petrochem Carless Ltd is a refinery located within the Tendring District Council area and regulated by the Environment Agency. The refinery is 2.1 km from the nearest receptor location in the Babergh district which could be subject to long-term exposure as defined under the objectives

TG(03) states that "local authorities will need to consider the impact of emissions from stacks within neighbouring areas, if there is a potential for these to be significant. As a guide .... for small sources with chimneys between about 20 to 40 metres, impacts should be considered at a distance up to about 2 km. For fugitive emissions sources, impacts should be considered up to a distance of about 1 km". The local Environment Agency office has confirmed that emissions of benzene from the refinery process are of a fugitive nature. A small amount of benzene is emitted from 'breather vents', but these are below 20 metres in height. Since the emissions are principally fugitive and the nearest relevant receptor location in Babergh is 2.1 km away, **no further assessment is necessary at this time.**

### 3.2.4 Petrol Stations

There is some evidence that petrol stations will emit sufficient benzene to put the 2010 objective at risk of being exceeded, especially if combined with higher levels from nearby busy roads. TG(03) advises that a Detailed Assessment is required where there are relevant receptor locations within 10m of the pumps of petrol stations with an annual throughput of more than 2 million litres of petrol and with a busy road nearby (defined as more than 30,000 vehicles per day). A survey has confirmed that there are no petrol stations in the district which have relevant receptor locations within 10m of the pumps. **No further assessment is therefore necessary at this time.**

### 3.2.5 Major Fuel Storage Depots (Petrol Only)

According to TG(03), the nearest petrol terminals (major fuel storage depots) to the Babergh district are in Wymondham in Norfolk and Thurrock in Essex. Given the

distance to these terminals, they are not considered to have any significant impact on the air quality within the Babergh district. **No further assessment is therefore necessary at this time.**

### **3.3 Conclusion for Benzene**

The Updating & Screening Assessment confirms that there are no sources of benzene either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objectives. **No further assessment of benzene is therefore required at this time.**

## **4. 1,3-BUTADIENE**

### **4.1 Introduction**

The Government's Air Quality Objective for 1,3-butadiene is 2.25 µg/m<sup>3</sup> measured as a maximum running annual mean concentration. The objective was to have been achieved by the end of 2003.

Studies based on both measured and modelling data, suggest that the objective for 1,3-butadiene was achieved at a national level by the end of 2003. Maximum running annual mean concentrations of 1,3-butadiene measured at all urban background/centre and roadside locations are well below the objective level. However, it is important that local circumstances are fully taken into consideration within the review and assessment process. Local authorities are therefore required to complete the review and assessment for 1,3-butadiene. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedances of the Air Quality Objective for 1,3-butadiene.

### **4.2 Updating & Screening Assessment**

#### **4.2.1 Monitoring Data**

The Council has not conducted any monitoring campaigns of 1,3-butadiene concentrations in the district. The Council is not aware of any monitoring campaigns having been carried out by other agencies. **Accordingly there is no data to review under this category.**

#### **4.2.2 New Industrial Sources and Existing Industrial Sources with Substantially Increased Emissions or New Relevant Exposure**

TG(03) provides a list of industrial processes regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 which have the potential to emit significant quantities of 1,3-butadiene. New and existing industries in the Babergh and neighbouring districts have been compared against this list and only the following site has been identified as a potentially significant source of 1,3-butadiene:

Prosynth Ltd, Bull Lane Industrial Estate, Unit 2, Bull Lane, Acton, Suffolk, CO10 0BD. Process type: Part A(1) Manufacture of organic chemicals. Grid reference: 588313 245887. However, the Environment Agency's Pollution Inventory (Internet address: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)) confirms that 1,3-butadiene is not emitted from the site. **No further assessment is therefore necessary at this time.**

### **4.3 Conclusion for 1,3-butadiene**

The Updating & Screening Assessment confirms that there are no sources of 1,3-butadiene either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objective. **No further assessment of 1,3-butadiene is therefore required at this time.**

## 5.0 LEAD

### 5.1 Introduction

The Government's Air Quality Objectives for lead are:

- 0.5 µg/m<sup>3</sup> measured as an annual mean concentration. This objective was to have been achieved by the end of 2004;
- 0.25 µg/m<sup>3</sup> measured as an annual mean concentration, to be achieved by the end of 2008.

TG(03) advises that only those local authorities with relevant receptor locations in the vicinity of major industrial processes that emit significant quantities of lead, will need to progress beyond the Updating & Screening Assessment. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedances of the Air Quality Objectives for lead.

### 5.2 Updating & Screening Assessment

#### 5.2.1 Monitoring Data

The Council has not conducted any monitoring campaigns of lead concentrations in the district. The Council is not aware of any monitoring campaigns having been carried out by other agencies. **Accordingly, there is no data to review under this category.**

#### 5.2.2 New Industrial Sources and Existing Industrial Sources with Substantially Increased Emissions or New Relevant Exposure

TG(03) provides a list of industrial processes regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 which have the potential to emit significant quantities of lead. New and existing industries in the Babergh and neighbouring districts have been compared against this list and only the following sites have been identified as potentially significant sources of lead:

- Prosynth Ltd, Bull Lane Industrial Estate, Unit 2, Bull Lane, Acton, Suffolk, CO10 0BD. Process type: Part A(1) Manufacture of organic chemicals. Grid reference: 588313 245887. However, the Environment Agency's Pollution Inventory (which can be viewed on the Internet at [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)) confirms that lead is not emitted from the site. **No further assessment is therefore necessary at this time.**
- Hadleigh Castings Limited, Pond Hall Road, Hadleigh, Ipswich, Suffolk, IP7 5PW. Process type: Part B Aluminium foundry. Grid reference: 604741 241757.

In respect of existing industrial sources, TG(03) advises that local authorities need only consider those processes which have 'substantially' increased emissions since the last round of review and assessment. A 'substantial' increase is defined as one greater than 30%.

The Council's first round of review and assessment (March 1999) concluded that the process operated by Hadleigh Castings Ltd did not have any significant impact on the air quality within the district. Lead is only a trace component of the metal used at the foundry, comprising less than 0.1% of the metal content of the ingots used. There have

been no significant changes to the manufacturing processes or raw materials used at the foundry. As demonstrated in Table 1, the quantities of metals used at the foundry has also declined, which indicates that there has not been a ‘substantial’ increase in emissions since previous rounds of reviews and assessments. **No further assessment of this potential source is therefore necessary at this time.**

<b>Table 1: Hadleigh Castings Ltd, Percentage Change in Metal Cast since last Review and Assessment (Base Year = 1999)</b>				
<b>Year</b>	<b>1999</b>	<b>2001</b>	<b>2003</b>	<b>2005</b>
<b>Percentage Change</b>	100.00%	84.30%	44.22	55.53

According to TG(03) and the Updating & Screening Assessments carried out by neighbouring local authorities, there are three existing potential sources within adjoining districts which could impact on air quality in Babergh:

- Cerro Manganese Bronze Ltd, Hadleigh Road Industrial Estate, Ipswich, Suffolk, IP2 0EG. Process type: Part A(1) Non-ferrous metal process. Grid reference: 614800 244830.
- Ipswich Hospital NHS Trust, Heath Road, Ipswich, Suffolk, IP4 5PD. Process type: Part A(1) Clinical Waste Incinerator. Grid reference: 619400 244900.
- Crane Ltd, Nacton Road, Ipswich, Suffolk, IP3 9QH. Process type: Part A(2) Foundry process. Grid reference: 619700 242100.

The Environment Agency regulates emissions from the processes at Cerro Manganese Bronze Ltd and Ipswich Hospital. The local Environment Agency office has confirmed that there has been no increase in lead emissions from either process since the last round of review and assessment. **No further assessment of these potential sources is therefore necessary at this time.**

TG(03) advises that emissions of lead from chimneys between 20 and 40 metres in height will only have an impact at distances of up to 2 km. Ipswich Borough Council has confirmed that the chimney of concern at Crane UK Ltd is 27.4 m high. Since the Babergh district boundary is more than 2 km from the Crane Ltd site, this potential source can be discounted and so **no further assessment is necessary at this time.**

### **5.3 Conclusion for Lead**

The Updating & Screening Assessment confirms that there are no sources of lead either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objectives. **No further assessment of lead is therefore required at this time.**

## 6. SULPHUR DIOXIDE

### 6.1 Introduction

The Government's Air Quality Objectives for sulphur dioxide are:

- A 15-minute mean of 266  $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times in a year. This objective was to have been achieved by the end of 2005;
- A 1-hour mean of 350  $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times in a year. This objective was to have been achieved by the end of 2004;
- A 24-hour mean of 125  $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times in a year. This objective was to have been achieved by the end of 2004.

Nationally, concentrations of sulphur dioxide are falling and it is likely that the objectives will be met in all but a small number of areas where there are localised sources e.g. in the vicinity of small combustion plant or areas where solid fuel is the predominant source of domestic heating. Local authorities are therefore required to complete the review and assessment for sulphur dioxide. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedances of the Air Quality Objectives for sulphur dioxide.

### 6.2 Updating & Screening Assessment

#### 6.2.1 Monitoring Data – Within and Outside an AQMA

The Council has not designated any AQMAs with respect to sulphur dioxide and it has not conducted any monitoring campaigns of sulphur dioxide concentrations in the district. The Council is not aware of any monitoring campaigns having been carried out by other agencies. **Accordingly, there is no data to review under this category.**

#### 6.2.2 New Industrial Sources and Existing Industrial Sources with Substantially Increased Emissions or New Relevant Exposure

TG(03) provides a list of industrial processes regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 which have the potential to emit significant quantities of sulphur dioxide. New and existing industries in the Babergh and neighbouring districts have been compared against this list and only the following sites have been identified as potentially significant sources of sulphur dioxide:

- Petrochem Carless Ltd, Harwich Refinery, Refinery Road, Parkeston, Essex CO12 4SS. Process type: Part A(1) Refinery. Grid reference: 623500 232300.
- Cerro Manganese Bronze Ltd, 22 Handford Works, Hadleigh Road Industrial Estate, Ipswich, Suffolk, IP2 0EG. Process type: Part A(1) Non-ferrous metal process. Grid reference: 614800 244830.
- Ipswich Hospital NHS Trust, Heath Road, Ipswich, Suffolk, IP4 5PD. Process type: Part A(1) Clinical Waste Incinerator. Grid reference: 619400 244900.
- The Bulmer Brick and Tile Co. Ltd, The Brickfields, Bulmer, Essex, CO10 7EF. Process type: Part B Ceramic production. Grid reference: 583269 238171.

In respect of existing industrial sources, TG(03) advises that local authorities need only consider those processes which have 'substantially' increased emissions since the last

round of review and assessment. A ‘substantial’ increase is defined as one greater than 30%.

Petrochem Carless Ltd is a refinery located within the Tendring District Council area and regulated by the Environment Agency. The refinery is 1.9km from the nearest receptor location in the Babergh district which could be subject to short-term exposure as defined under the objectives.

The local Environment Agency office has confirmed that the principal sources of sulphur dioxide emissions are four chimneys serving boiler plant at the refinery, which are 22.4m, 24.4m, 24.5m and 26.2m in height. Data provided by the Environment Agency confirm that there has been a ‘substantial’ increase in emissions of sulphur oxides from the factory since the first round of reviews and assessments in 1999, as detailed in Table 2. For the purposes of this preliminary assessment, it has been assumed that all of the sulphur oxides are emitted as sulphur dioxide, in order to present a ‘worst case’ scenario.

<b>Year</b>	<b>1999</b>	<b>2004</b>
Emissions	0.396	0.748

TG(03) provides a methodology for assessing sulphur dioxide emissions from industrial chimneys in cases where the 30% threshold has been exceeded. This is based on a nomogram (Figure 7.1), which allows the Actual Emission Rate from the process to be compared against a permitted threshold level that would cause an exceedance of the Air Quality Objectives.

Correspondence with the DEFRA’s Local Air Quality Management Support Helpdesk confirms it is possible to show by reference to Figure 7.1 that sulphur dioxide emissions for these boilers are not significant. From Figure 7.1 it can be determined that even if the total annual sulphur dioxide emission in 2004 (0.748 tonnes) was emitted from the shortest of the single stacks (22.4 m), assuming a minimum (‘worst case’) diameter of 0.5 m, then the sulphur dioxide emissions are unlikely to give rise to a 99.8<sup>th</sup> percentile of 15-minute mean ground-level mean concentration of 53.2 µg/m<sup>3</sup>. This is equivalent to 20% of the Air Quality Objective for 15-minute mean sulphur dioxide concentrations. This does account for tall buildings in the vicinity of the stack, which may reduce the effective stack height, but as the nomogram only considers annual sulphur dioxide emissions above 10 tonnes it can be assumed that this will not be a significant source. **No further assessment of this potential source is therefore necessary at this time.**

The Environment Agency regulates emissions from the processes at Cerro Manganese Bronze Ltd and Ipswich Hospital. The local Environment Agency office has confirmed that there has been no increase in sulphur dioxide emissions from either process since the last round of review and assessment. **No further assessment of these potential sources is therefore necessary at this time.**

Bulmer Brick and Tile Co. Ltd use coal for fuel, which is a potential source of sulphur dioxide. Braintree District Council has confirmed that the process was considered and discounted during the first round of review and assessment in 1999 and since then there has not been a ‘substantial’ increase in emissions. **No further assessment of this potential source is therefore necessary at this time.**

### 6.2.3 Areas of Domestic Coal Burning

Domestic coal burning can be a significant source of sulphur dioxide. TG(03) requires local authorities to identify areas where ‘significant’ coal burning still takes place which were not covered by previous reviews and assessments, or where there is new relevant exposure. ‘Significant’ is defined as any area of about 0.25 km<sup>2</sup> where there may be more than 100 houses burning solid fuel as their primary source of heating.

A survey of local coal merchants for the 2003 Updating & Screening Assessment confirmed that the highest density of houses in towns or villages in Babergh that still burn solid fuel as their primary source of heating was approximately 20 houses per 0.25 km<sup>2</sup> i.e. below the screening criteria in TG(03). The Southern England Regional Co-ordinator of the Approved Coal Merchants Scheme has also confirmed that since 2003, “two merchants have ceased trading, two others no longer offer a delivery service and none have increased their tonnage band, and .... the overall burn of solid fuel in domestic appliances in Suffolk has reduced”. **No further assessment is therefore necessary at this time.**

### 6.2.4 Small Boilers (>5MW<sub>(thermal)</sub>) Burning Coal or Oil

TG(03) advises that boiler plant (>5 MW<sub>(thermal)</sub>) burning coal or fuel oil can give rise to high short-term concentrations, with the risk that the 15-minute Air Quality Objective may be exceeded. A survey of industries and other premises likely to have such plant has been carried out, but has revealed that there are no such boilers in the district. **No further assessment is therefore necessary at this time.**

### 6.2.5 Shipping – Current Operations at the Ports of Felixstowe and Harwich

Large ships generally burn oils with a high sulphur content in their main engines. TG(03) advises that if there are sufficient movements of large ships in a port they can give rise to short-term concentrations above the 15-minute objective. TG(03) advises that a Detailed Assessment should be undertaken if:

- There is relevant exposure within 250m of the berths and main areas of manoeuvring and the total number of shipping movements per year from ‘large’ ships (e.g. cross-Channel ferries, Ro-Ro, container ships, cruise liners) is between 5,000 and 10,000; or
- There is relevant exposure within 1,000m of the berths and main areas of manoeuvring and the total number of shipping movements per year from ‘large’ ships is more than 15,000.

The nearest relevant receptor location in the Babergh district at Shotley is approximately 750m from Felixstowe Port (Trinity III terminal) and 1050m from the nearest berths at Harwich. Harwich Haven Authority has confirmed that the total number of shipping movements in 2005 was 8558 at Felixstowe Port and 5886 at Harwich. It is evident that the current operations do not exceed the screening criteria in TG(03) and therefore **no further assessment of the current operations is necessary at this time.**

## **6.2.6 Shipping - Future Developments at the Ports of Felixstowe and Harwich**

### **Felixstowe South Reconfiguration**

Planning permission has recently been granted by the Secretary of State for redevelopment at Felixstowe South to realign the Landguard Terminal and adjacent areas to provide additional deep water berths and container handling capacity. A detailed air quality assessment of the scheme proposals was undertaken for the application and accepted by the Planning Inspector as part of the Public Inquiry. The assessment of the potential impact of the construction phase was based on a ‘worst case’ approach and it was determined that concentrations of pollutants would be well below their respective Air Quality Objectives in the Babergh district. For the operational phase of the reconfiguration project, pollutant concentrations would increase marginally, but all would continue to be within the Air Quality Objectives. The Planning Inspector therefore concluded that additional pollutant emissions arising from the reconfiguration scheme would not have a significant impact on receptors in Felixstowe or the Babergh district.

### **Bathside Bay Container Terminal, Harwich**

Planning permission has recently been granted by the Secretary of State for Hutchison Ports (UK) Ltd to reclaim Bathside Bay and develop a container port. A detailed air quality assessment of the scheme proposals was undertaken for the application and accepted by the Planning Inspector as part of the Public Inquiry. The Inspector concluded that “modelling of pollutant levels arising from the port under construction and in its operational phase indicates that health-based national Air Quality Objectives would be unlikely to be breached. Even if port productivity were to be higher than that assumed within the modelling, it is still unlikely that breaches would occur. There is no substantive evidence to suggest that the modelling or assumptions made are anything but robust, with the assessed impacts of the different pollutants being generally of either Negligible or Minor Adverse significance.”

### **In-Combination Effects of Felixstowe South Reconfiguration and Bathside Bay Container Terminal**

The Planning Inspectors considered the potential combined effects of the two developments and the possibility that the short-term Air Quality Objectives may, on occasion, be exceeded if both schemes were to proceed. However, the inspectors noted that a proposed EU Directive for the reduction of sulphur in shipping fuels is likely to give rise to lower concentrations of sulphur dioxide in future around major ports. The Inspector for the Felixstowe South Reconfiguration inquiry concluded that “in combination with the impact of the Bathside Bay development, although the 2023 pollutant concentrations are predicted to be higher with both terminals in operation, at no selected sensitive receptor location would the combined impact cause any breach of any of the health based statutory objectives”.

Even if the screening criteria for shipping movements listed in TG(03) and at Paragraph 6.2.5, were to be exceeded at some point in the future, **the detailed air quality assessments carried out for the development proposals confirm that it is unlikely that the Air Quality Objectives would be exceeded in the Babergh district. Any developments at Felixstowe and Bathside Bay will nevertheless be considered in future Updating & Screening Assessments.**

### **6.2.7 Railway Locomotives**

Diesel and coal-fired locomotives emit sulphur dioxide. Moving locomotives do not make a significant contribution to short-term concentrations and do not need to be considered further. However, exposure to stationary locomotives may be more significant, but only in terms of the 15-minute objective. TG(03) requires local authorities to identify locations where diesel or steam locomotives are regularly stationary for periods of 15 minutes or more with their engines running. There are no such locations on the Ipswich-London line. On the Sudbury-Marks Tey line, trains halt at Sudbury station and typically wait for between 4 and 8 minutes, with the longest stationary period being the 06:30 train, which waits for 14 minutes. **No further assessment is therefore necessary at this time.**

### **6.3 Conclusion for Sulphur Dioxide**

The Updating & Screening Assessment confirms that there are no sources of sulphur dioxide either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objectives. **No further assessment of sulphur dioxide is therefore required at this time.**

## 7. NITROGEN DIOXIDE

### 7.1 Introduction

The Government's Air Quality Objectives for nitrogen dioxide are:

- An annual mean concentration of 40  $\mu\text{g}/\text{m}^3$ . This objective was to have been achieved by the end of 2005;
- A 1-hour mean of 200  $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 18 times in a year. This objective was to have been achieved by the end of 2005.

The first Air Quality Daughter Directive also sets limit values for nitrogen dioxide, which have been transposed into UK legislation. The Directive includes:

- An annual mean limit value of 40  $\mu\text{g}/\text{m}^3$  to be achieved by 1 January 2010.
- A 1-hour limit value of 200  $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 18 times in a year, to be achieved by 1 January 2010.

Meeting the 2005 annual mean objective and the limit value in 2010 is expected to be considerably more demanding than achieving the 1-hour objective. National studies have indicated that the 2005 annual mean objective is likely to be achieved at all urban background locations outside of London, but that the objective may be exceeded more widely at roadside sites throughout the UK in close proximity to busy road links. Projections for 2010 indicate that the EU limit value may still be exceeded at urban background sites in London, and at roadside locations in other cities. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedances of the Air Quality Objectives for nitrogen dioxide.

### 7.2 Updating & Screening Assessment

#### 7.2.1 Monitoring Data Within an AQMA

Since the 2003 Updating & Screening Assessment the Council has not designated any AQMAs with respect to nitrogen dioxide and accordingly **there is no data to review under this category.**

#### 7.2.2 Monitoring Data Outside an AQMA

#### **Babergh District Council Continuous Nitrogen Oxides (NO<sub>x</sub>) Monitor, A12, Lattinford Hill**

In October 2002, the Council commissioned a continuous NO<sub>x</sub> monitor alongside the A12 dual carriageway at Lattinford Bridge between Capel St Mary and Stratford St Mary. The location of the monitor is shown in Appendix III. The site was chosen to represent the exposure of the nearest houses to significant traffic pollution and is located 9.0m from the kerbside i.e. at a similar distance as the closest houses to this section of the A12. There have been no significant changes in local circumstances, such as road works, which may have affected the results. Details of calibration of the monitor and data capture are presented in Appendix IV. The results from the monitor for 2003-2005 are presented below.

## Annual Mean Air Quality Objective

<b>2003</b>	<b>2004</b>	<b>2005</b>
28.1	24.0	24.0

It can be seen that the annual mean objective of  $40 \mu\text{g}/\text{m}^3$  was not exceeded in any of the three years since the last review and assessment. **No further assessment is therefore necessary at this time.**

## 1-Hour Mean Air Quality Objective

It is not possible to list all of the 1-hour measurements since the 2003 Updating & Screening Assessment. However, the 1-hour measurements can be viewed on the Council's Internet site at the following address: [www.air-quality.net/stationStatus.php?stationNo=17](http://www.air-quality.net/stationStatus.php?stationNo=17). When using this website it should be noted that the measurements are given in parts per billion (ppb). The 1-hour objective of  $200 \mu\text{g}/\text{m}^3$  equates to 105 ppb and concentrations of nitrogen dioxide can be converted between ppb and  $\mu\text{g}/\text{m}^3$  using the following factor:  $1.91 \times \text{ppb} = \mu\text{g}/\text{m}^3$ .

There have been no exceedances of the 1-hour mean objective of  $200 \mu\text{g}/\text{m}^3$  since the 2003 Updating & Screening Assessment. **No further assessment is therefore necessary at this time.**

## **Babergh District Council Diffusion Tube Survey**

Babergh District Council has continued its ongoing diffusion tube monitoring programme at a number of locations across the district using tubes supplied and analysed by Harwell Scientifics. Details of the monitoring locations and the results of the survey are presented in full at Appendices III and V.

Diffusion tubes are widely used to measure ambient annual mean nitrogen dioxide concentrations. However, TG(03) advises that, for the purpose of review and assessment, only diffusion tube data that has been appropriately corrected for laboratory bias should be used. The Council has therefore 'co-located' diffusion tubes on its continuous monitor in order to compare the accuracy of the two monitoring methods and thereby derive appropriate bias correction factors.

The Council's co-location site has consistently had good data capture and good precision for the diffusion tubes, as calculated using the 'Spreadsheet for Calculating Precision, Accuracy and Bias Adjustment Factors of Diffusion Tubes, Version 1', published by NETCEN. In addition, although not part of the UK Automatic Urban & Rural Network (AURN) organised by DEFRA, the results from the Council's continuous monitor are rescaled and validated using the same practices used by the AURN network. For these reasons the bias correction factors obtained from the co-location studies have been applied to the diffusion tubes results. Further details of the co-location studies, explaining how the bias correction factors were derived, are presented in Appendix VI. The bias correction factors derived are 0.830 for 2003, 0.784 for 2004 and 0.818 for 2005, and these have been applied to the results from the diffusion tube survey.

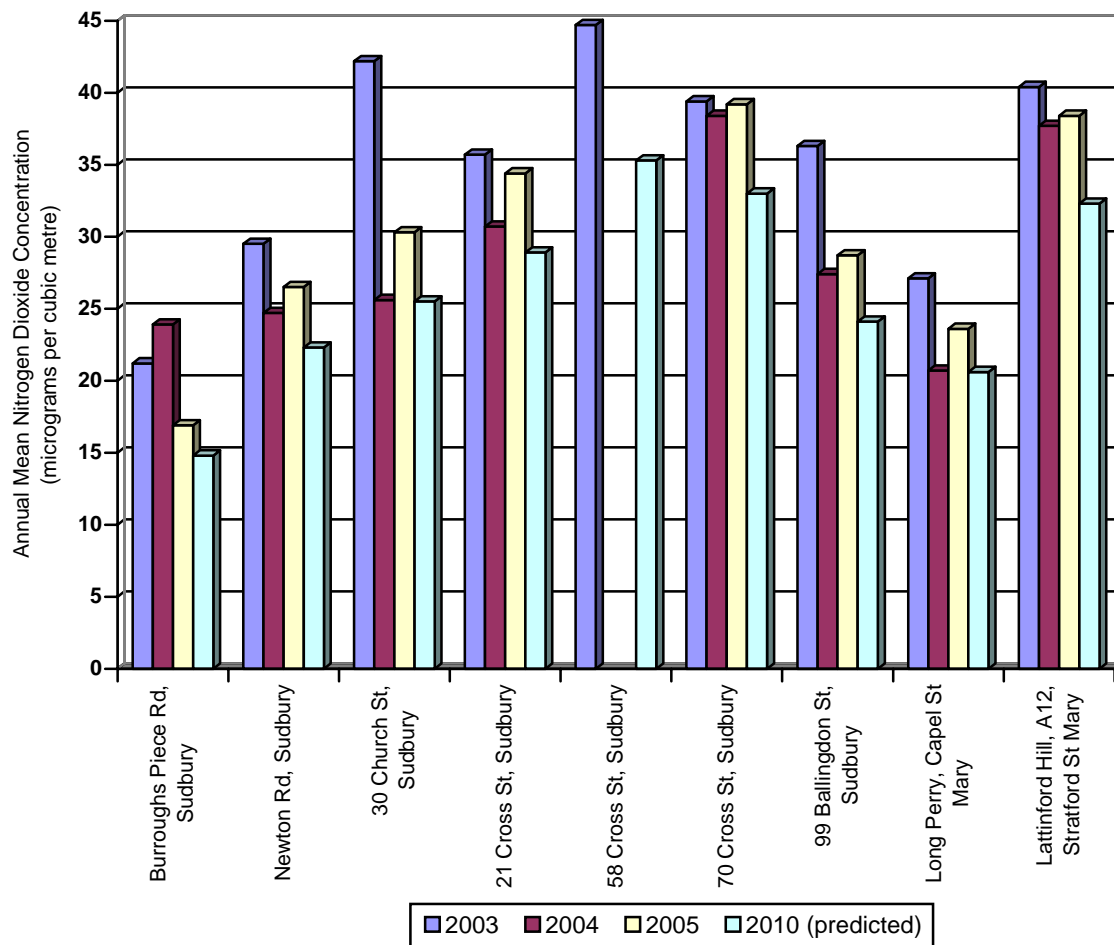
A summary of the bias corrected results for each diffusion tube location is shown in Table 4 and presented graphically in Figure 1. In considering the results it is important to note that the relevant years for achieving the Air Quality Objectives are 2005 and 2010. Nitrogen dioxide values for the year 2010 have been predicted using the ‘Year Adjustment Factors Spreadsheet (v2.2a)’ published by NETCEN, which applies appropriate correction factors to measured data according to whether the site is at a roadside or background location.

<b>Table 4: Annual Mean Nitrogen Dioxide Concentrations from Diffusion Tube Monitoring, 2003-2005</b>			
<b>Location</b>	<b>Average Concentration (<math>\mu\text{g}/\text{m}^3</math>)</b>		
	<b>Uncorrected Mean</b>	<b>Bias Corrected Mean</b>	<b>2010 Prediction Based on Measured Year Value</b>
Burroughs Piece Rd, Sudbury			
2003	25.4	21.1	17.7
2004	23.9	23.9	20.5
2005	20.6	16.9	14.8
Newton Rd, Sudbury			
2003	35.5	29.5	23.3
2004	31.5	24.7	20.2
2005	32.4	26.5	22.3
30 Church Street, Sudbury			
2003	50.9	42.2	33.3
2004	32.6	25.6	20.9
2005	37.0	30.3	25.5
21 Cross Street, Sudbury			
2003	43.0	35.7	28.2
2004	39.1	30.7	25.1
2005	42.0	34.4	28.9
58 Cross Street, Sudbury			
2003	53.9	44.7	35.3
2004	-	-	-
2005	-	-	-
70 Cross Street, Sudbury			
2003	47.5	39.4	31.1
2004	49.0	38.4	31.2
2005	47.9	39.2	33.0
99 Ballingdon Street, Sudbury			
2003	43.7	36.3	28.7
2004	34.9	27.4	22.4
2005	35.1	28.7	24.1
Long Perry, Capel St Mary			
2003	32.7	27.1	22.7
2004	26.4	20.7	17.8
2005	28.9	23.6	20.6
Lattinford Hill, A12, Stratford St Mary			
2003	48.7	40.4	31.9
2004	48.1	37.7	30.8
2005	47.0	38.4	32.3

The results of the diffusion tube survey and the predicted concentrations in 2010 are presented in Figure 1. The results confirm that neither the 2005 annual mean objective

nor the 2010 annual mean limit value will be exceeded at the monitoring locations. **No further assessment is therefore necessary at these locations at this time.**

**Figure 1: Trend in Nitrogen Dioxide Concentrations**



### **Future Monitoring Programme**

Suffolk County Council implemented a trial traffic management scheme in Cross Street, Sudbury in July 2005, to prevent passing vehicles mounting the kerb. This entailed the construction of a build-out in the road to give priority to southbound traffic, thereby ensuring single lane traffic at certain points. It was recognised that this scheme could have an impact on local air quality and so, as part of the trial, the County Council and Babergh District Council have worked in partnership to extend the diffusion tube monitoring along Cross Street. The results of this extended monitoring will be used to assess the success of the trial scheme and will be reported in future Updating & Screening Assessments.

### **7.2.3 Narrow Congested Streets with Residential Properties Close to the Kerb**

Concentrations of nitrogen dioxide are often higher where traffic is slow moving with stop/start driving and where buildings either side reduce the dispersion. Three such roads (Ballingdon Street/Cross Street/Stour Street, Sudbury; Melford Road, Sudbury; and Southgate Street/Hall Street, Long Melford) met the screening criteria in TG(03) and so were considered in the 2003 Updating & Screening Assessment, but no exceedances of the Air Quality Objectives were found.

Traffic flows on these roads were predicted for 2005 in the 2003-Updating & Screening Assessment. These predictions have been updated based on subsequent traffic counts by Suffolk County Council and the results are shown in Appendix II. A comparison of the previous and updated predictions has been made, which confirms that the data used in the 2003 Updating & Screening Assessment was valid.

There is no new relevant exposure closer to the roads concerned and so, according to the current TG(03) guidance, there is no need to proceed further with the review of those roads. Since 2003 no 'new' roads have been identified as falling within this category. **No further assessment is therefore necessary at this time.**

#### **7.2.4 Junctions**

TG(03) advises that concentrations of nitrogen dioxide are often higher close to busy junctions, but states that assessment of such locations is only required if they were not specifically considered during previous Updating & Screening Assessments.

The following junctions were considered during the 2003 Updating & Screening Assessment:

Ballingdon St – Middleton Rd – Bulmer Rd, Sudbury  
Cross St – Church St, Sudbury  
Stour St – Gainsborough St – Gregory St, Sudbury  
Melford Rd – York Rd, Sudbury  
Melford Rd – Woodhall Rd, Sudbury  
Girling St – East St, Sudbury  
Newton Rd – Girling St – King St, Sudbury  
King St – Market Hill, Sudbury  
Market Hill – Gainsborough St – Friars St, Sudbury  
Cornard Rd - Cats Lane, Sudbury  
Bramford Rd – High St – Lower St – Burstall Lane, Sproughton

Since no exceedances of the Air Quality Objectives were found at these junctions, they do not strictly require reassessment. Nevertheless, the predicted traffic data upon which the 2003 Assessment was based has been reviewed. Traffic flows at these junctions were predicted for 2005 in the 2003-Updating & Screening Assessment. These predictions have been updated based on subsequent traffic counts by Suffolk County Council and the results are shown in Appendix II.

The traffic data currently available for Sudbury is not as detailed as during the 2003 Updating & Screening Assessment because the County Council had commissioned a comprehensive traffic study of the town at that time. Nevertheless, data from the County Council's long-term monitoring sites on the main routes into the town have been examined, which confirms that the predicted traffic flows used in the 2003 Updating & Screening Assessment were valid.

A comparison of the available traffic data for the Bramford Rd – High St – Lower St – Burstall Lane in Sproughton also confirms that the predicted 2005 traffic flows used in the 2003 Updating & Screening Assessment were valid.

There is no new relevant exposure closer to the roads concerned, and since 2003 no 'new' junctions have been identified as falling within this category. **No further assessment is therefore necessary at this time.**

### **7.2.5 Busy Roads where People may spend 1-Hour or more Close to Traffic**

There will be some street locations where members of the public may regularly spend 1-hour or more close to traffic and are thereby exposed to high concentrations of nitrogen dioxide. TG(03) advises that assessment of such locations is only required if they were not specifically considered during previous Updating & Screening Assessments.

King Street in Sudbury was the only road meeting the screening criteria in TG(03) and therefore considered in the 2003 Updating & Screening Assessment. No exceedances of the Air Quality Objectives were found at this location and there is no new relevant exposure closer to the road.

Since 2003 no 'new' roads have been identified as falling within this category.

**No further assessment is therefore necessary at this time.**

### **7.2.6 Roads with High Flow of Buses and/or HGVs**

TG(03) advises that roads with an 'unusually high proportion' of heavy duty vehicles (HDVs) could potentially lead to exceedances of the Air Quality Objectives. TG(03) advises that exceedances could result if:

- (a) The HDV percentage exceeds 25%; and
- (b) The flow of HDVs is greater than 2500 vehicles per day; and
- (c) There is relevant exposure within 10m of the road.

Traffic data obtained from the Highways Agency and Suffolk County Council confirms that the only road in the district falling within Categories (a) or (b) above is the A14 at Sproughton, with an HDV percentage in 2004 of 26.3%. However, there are no relevant receptor locations within 10m of the A14 in the Babergh district. **No further assessment is therefore necessary at this time.**

### **7.2.7 New Roads Constructed or Proposed since the Previous Updating & Screening Assessment**

#### **New Roads**

New roads will require an assessment to determine whether there is a risk of exceedances of the Air Quality Objectives alongside the new road, or existing roads with a significant change in flows. TG(03) requires local authorities to identify any roads where:

- (a) The traffic flow on the new road is greater than 10,000 vehicles per day; or
- (b) Where the new road has increased traffic flows on existing roads previously identified as having 2005 annual mean concentrations greater than  $36 \mu\text{g}/\text{m}^3$  or more than 15 1-hour exceedances of  $200 \mu\text{g}/\text{m}^3$ ; and
- (c) There are relevant receptor locations within 10m of the road.

Excluding minor road improvement schemes and developments, the only areas of significant road building in the district since the 2003 Updating & Screening Assessment are associated with the developments at:

- Thorington Hall, Ipswich
- Aldham Mill Hill and Red Hill, Hadleigh
- Waldingfield Road, Chilton, Sudbury

Traffic data obtained from the Highways Agency and Suffolk County Council confirms that there are no new roads in the district meeting the 10,000 vehicles per day threshold. The only existing roads previously identified as falling within Category (b) above are Cross Street and Ballingdon Street, Sudbury, the A12 and the A14. However, none of these existing roads would be *significantly* affected by traffic from the areas of new road building. **No further assessment is therefore necessary at this time.**

### **Proposed Roads Impacting on Existing Roads**

A number of new developments have been proposed since the 2003 Updating & Screening Assessment, which will have an associated road infrastructure that could impact on air quality adjacent to existing roads in the district. These are discussed below.

#### Chilton, Sudbury

The review of the Babergh Local Plan is in progress, with final adoption of the Local Plan alteration No. 2 being scheduled to take place by mid-2006. The revised plan includes proposals for a major mixed land-use development for the Chilton and Woodhall area north of Sudbury. An approved Master Plan will be required, and at the appropriate time, the planning application will have to be accompanied by an Environmental Statement. The Council is liaising with the developer to ensure that the assessment will address the impact on air quality from increased traffic arising from the development on the Sudbury road network. **The outcome of this assessment will be reported in future Updating & Screening Assessments.**

#### Former HMS Ganges, Shotley

An application has been made to Babergh District Council for the redevelopment of the former HMS Ganges site at Shotley comprising 325 residential properties and associated facilities. The application will be determined by the Planning Inspector following a Public Inquiry. An Environmental Statement incorporating an air quality impact assessment has been submitted in support of the application. The Environmental Statement confirms the levels of traffic generation that would occur on the local highway network and along the B1456 as a result of the development would not cause the Air Quality Objectives to be exceeded. **No further assessment is therefore necessary at this time.**

#### SnOasis, Great Blakenham

An application has been lodged with Mid Suffolk District Council (MSDC) for a winter sports and entertainment complex (SnOasis), in the parish of Great Blakenham. The application has been referred to GO-East, to determine whether the application will be called-in, and subject to a public inquiry. Currently, the advice of MSDC, following a meeting of the Planning Referrals Committee, is that they are minded-to approve the application.

This is a major development, including an indoor ski slope, indoor ice arena, 350-bed hotel, 350 holiday chalets, nine-hole golf course, cinema, nightclub, retail outlets and a 'holiday village'. However, whilst it could impact significantly upon the local transport infrastructure, it is anticipated that the vast majority of traffic will arrive via the A14 and A12 carriageways.

The Highways Agency and Suffolk County Council are satisfied that there is sufficient capacity to absorb the anticipated increase in vehicle numbers. A railway station in Great Blakenham also forms part of the overall proposal, and is included as a means of mitigation against increased road traffic. The development cannot proceed without the prior development of the railway station.

As part of the Environmental Statement the applicant provided an air quality assessment carried out by Casella Stanger. The conclusion of this assessment, which used the Design Manual for Roads and Bridges (DMRB) model to look at 10 sensitive receptors in the immediate vicinity (and the effect of 10 different links on these receptors), was that the Air Quality Objectives for nitrogen dioxide would not be exceeded at any of these locations, with a predicted maximum annual mean of 27.8 µg/m<sup>3</sup>. This assessment was carried out for the study year (2004) and also, (anticipating the opening year to be 2008) for 2008 and 2023.

A more detailed assessment of vehicle numbers has also been provided for three sensitive locations: the B1113 North of Sproughton Village; Bramford Road, Great Blakenham; and the A14 by the B1113 junction. Of these three locations, the only one forecast to suffer a significant daily increase in traffic is Bramford Road, Great Blakenham (which is outside the Babergh district). The percentage increases on a 'worst case scenario' in the opening year 2008, peak day (Friday), peak month (February) are as follows: Bramford Road (53%); Sproughton village (6.3%); and A14 (6.0%). These figures are much as expected, as the site access is off Bramford Road, and this will be subject to a significant increase in vehicle numbers. The increase in vehicle numbers on the A14 will not be significant compared to existing numbers, and it is anticipated that few vehicles will access the site via the B1113 in Sproughton.

Existing nitrogen dioxide concentrations along the A14 corridor are well below the Air Quality Objectives. Therefore the only change that MSDC will be undertaking to nitrogen dioxide monitoring will be to re-locate a passive sampler in Bramford Road as of April 2006. It should be noted however, that the Air Quality Assessment within the Environmental Statement considered this location, and concluded that the Air Quality Objectives would not be exceeded.

In light of the findings of the Environmental Statement that the Air Quality Objectives will not be exceeded as a result of the development, it is concluded that **no further assessment is necessary at this time**. However, if a public inquiry is held into the application and further evidence is presented, this conclusion will be reviewed.

#### **7.2.8 Roads with Significantly Changed Traffic Flows or New Relevant Exposure**

TG(03) advises that there is the potential for the Air Quality Objectives to be exceeded alongside roads with significantly changed traffic flows or new relevant exposure since the last Updating & Screening Assessment. TG(03) requires local authorities to:

- Identify any roads with more than 10,000 vehicles per day that have experienced ‘large’ increases in traffic. A ‘large’ increase can be taken to be more than 25% increase in traffic flow.
- Determine whether these roads had previously been identified as being ‘at risk’ of exceeding the Air Quality Objectives. A road ‘at risk’ is defined as one previously identified with an annual mean above 36 µg/m<sup>3</sup> at a relevant location.

Traffic data for the more heavily trafficked roads in the district are presented in Appendix II. The data confirms that there are no roads with more than 10,000 vehicles per day that have experienced ‘large’ increases in traffic.

During the previous Updating & Screening Assessment no roads were identified as being ‘at risk’ of exceeding the Air Quality Objectives under this section. There is no new relevant exposure closer to the roads concerned.

**No further assessment is therefore necessary at this time.**

### 7.2.9 Bus Stations

TG(03) advises that there is the potential for NO<sub>x</sub> emissions arising from bus stations to cause an exceedance of the 1-hour objective if the flow of vehicles is greater than 1000 bus movements per day. A survey was conducted of the largest bus stations in the district, the results of which are shown in Table 5.

<b>Table 5: Summary of Bus/Coach Traffic at Large Stations and Depots in the Babergh District, April 2006</b>	
<b>Bus Station/Coach Depot</b>	<b>Maximum number of buses per day</b>
Sudbury Bus Station, Hamilton Road, Sudbury	340
Hedingham Omnibus Ltd, Meekings Road, Sudbury	56
Hadleigh Bus Station, Magdalen Road, Hadleigh	102
Beestons Bus Depot, Wolves Wood, Hadleigh	350
H.C. Chambers & Sons Ltd, Church Square, Bures	40

The survey confirms that the highest daily flow through the stations is significantly less than 1000. **No further assessment is therefore necessary at this time.**

### 7.2.10 New Industrial Sources and Existing Industrial Sources with Substantially Increased Emissions or New Relevant Exposure

TG(03) provides a list of industrial processes regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 which have the potential to emit significant quantities of nitrogen dioxide. New and existing industries in the Babergh and neighbouring districts have been compared against this list and only the following sites have been identified as potentially significant sources of nitrogen dioxide:

- Petrochem Carless Ltd, Harwich Refinery, Refinery Road, Parkeston, Essex CO12 4SS. Process type: Part A(1) Refinery. Grid reference: 622850 232125.
- Cerro Manganese Bronze Ltd, 22 Handford Works, Hadleigh Road Industrial Estate, Ipswich, Suffolk, IP2 0EG. Process type: Part A(1) Non-ferrous metal process. Grid reference: 614800 244830.

- Ipswich Hospital NHS Trust, Heath Road, Ipswich, Suffolk, IP4 5PD. Process type: Part A(1) Clinical Waste Incinerator. Grid reference: 619400 244900.

In respect of existing industrial sources, TG(03) advises that local authorities need only consider those processes which have ‘substantially’ increased emissions since the last round of review and assessment. A ‘substantial’ increase is defined as one greater than 30%.

Petrochem Carless Ltd is a refinery located within the Tendring District Council area and regulated by the Environment Agency. The local Environment Agency office has confirmed that the principal sources of nitrogen dioxide emissions are four chimneys serving boiler plant at the refinery. Data provided by the Environment Agency confirm that aggregate emissions of nitrogen dioxide from the boilers have fallen significantly since the first round of review and assessments, as detailed in Table 6. **No further assessment of this potential source is therefore necessary at this time.**

<b>Table 6: Petrochem Carless Ltd, NO<sub>x</sub> Emissions 1999-2004 (Kg, Nitrogen Dioxide Equivalent) from Boiler Plant</b>		
<b>Year</b>	<b>1999</b>	<b>2004</b>
Emissions	101,069	25,529

The Environment Agency regulates emissions from the processes at Cerro Manganese Bronze Ltd and Ipswich Hospital. The local Environment Agency office has confirmed that there has been no increase in nitrogen dioxide emissions from either process since the last round of review and assessment. **No further assessment of these potential sources is therefore necessary at this time.**

### **7.2.11 Aircraft**

TG(03) advises that nitrogen dioxide emissions from aircraft will have negligible impact once they are above about 200m or beyond 1000m from the airport boundary and that only large airports with a predicted total passenger or equivalent freight throughput of more than 5 million per annum have the potential to cause an exceedance of the Air Quality Objectives. TG(03) requires local authorities to consider aircraft emissions at airports only if they were not assessed during the 2003 Updating & Screening Assessment, or if there is new relevant exposure. The Wattisham military airbase was discounted as a significant source in the 2003 Updating & Screening Assessment because the number of flights (approximately 40,000 flights per annum) falls well below the thresholds in the screening criteria for commercial airports specified above. There is no new relevant exposure significantly nearer the airbase and so **no further assessment is necessary at this time.**

### **7.3 Conclusion for Nitrogen Dioxide**

The Updating & Screening Assessment confirms that there are no sources of nitrogen dioxide either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objectives. **No further assessment of nitrogen dioxide is therefore required at this time.**

## 8. PARTICULATES (PM<sub>10</sub>)

### 8.1 Introduction

In general terms, PM<sub>10</sub> are particles with a diameter of less than 10 µm (10 millionths of a metre). The Government's Air Quality Objectives for PM<sub>10</sub> are:

- An annual mean concentration of 40 µg/m<sup>3</sup>, to be achieved by the end of 2004;
- A fixed 24-hour mean of 50 µg/m<sup>3</sup>, not to be exceeded more than 35 days per year, to be achieved by the end of 2004.

A significant proportion of current annual mean PM<sub>10</sub> is derived from regional background sources. Typical regional annual mean background contributions are currently within the range of about 14-20 µg/m<sup>3</sup> and are outside the control of local authorities. Concentrations of PM<sub>10</sub> measured at the national monitoring sites are generally well below the 2004 annual mean objective. However, the 24-hour objective can be exceeded at sites close to busy roads at industrial activities. Local authorities are therefore required to complete the review and assessment for PM<sub>10</sub>. This authority's 2003 Updating & Screening Assessment concluded that there were unlikely to be any exceedances of the Air Quality Objectives for PM<sub>10</sub>.

### 8.2 Updating & Screening Assessment

#### 8.2.1 Monitoring data – Within and Outside an AQMA

The Council has not designated any AQMAs with respect to PM<sub>10</sub> and it has not conducted any monitoring campaigns of PM<sub>10</sub> concentrations in the district. The Council is not aware of any monitoring campaigns having been carried out by other agencies. **Accordingly, there is no data to review under this category.**

#### 8.2.2 Junctions

TG(03) advises that concentrations of PM<sub>10</sub> are often higher close to busy junctions, but states that assessment of such locations is only required if they were not specifically considered during previous Updating & Screening Assessments.

The following junctions were considered during the 2003 Updating & Screening Assessment:

Ballington St – Middleton Rd – Bulmer Rd, Sudbury  
Cross St – Church St, Sudbury  
Stour St – Gainsborough St – Gregory St, Sudbury  
Melford Rd – York Rd, Sudbury  
Melford Rd – Woodhall Rd, Sudbury  
Girling St – East St, Sudbury  
Newton Rd – Girling St – King St, Sudbury  
King St – Market Hill, Sudbury  
Market Hill – Gainsborough St – Friars St, Sudbury  
Cornard Rd - Cats Lane, Sudbury  
Bramford Rd – High St – Lower St – Burstall Lane, Sproughton

Since no exceedances of the Air Quality Objectives were found at these junctions, they do not strictly require reassessment. Nevertheless, the predicted traffic data upon

which the 2003 Assessment was based has been reviewed. Traffic flows at these junctions were predicted for 2004 in the 2003-Updating & Screening Assessment. These predictions have been updated based on subsequent traffic counts by Suffolk County Council and the results are shown in Appendix II.

The traffic data currently available for Sudbury is not as detailed as during the 2003 Updating & Screening Assessment because the County Council had commissioned a comprehensive traffic study of the town at that time. Nevertheless, data from the County Council's long-term monitoring sites on the main routes into the town have been examined, which confirms that the predicted traffic flows used in the 2003 Updating & Screening Assessment were valid.

A comparison of the available traffic data for the Bramford Rd – High St – Lower St – Burstall Lane in Sproughton also confirms that the predicted 2004 traffic flows used in the 2003 Updating & Screening Assessment were valid.

There is no new relevant exposure closer to the roads concerned, and since 2003 no 'new' junctions have been identified as falling within this category. **No further assessment is therefore necessary at this time.**

### **8.2.3 Roads with High Flow of Buses and/or HGVs**

TG(03) advises that roads with an 'unusually high proportion' of heavy duty vehicles (HDVs) could potentially lead to exceedances of the Air Quality Objectives. TG(03) advises that exceedances could result if:

- The HDV percentage exceeds 20%; and
- The flow of HDVs is greater than 2000 vehicles per day; and
- There is relevant exposure within 10m of the road.

Traffic data obtained from the Highways Agency and Suffolk County Council confirms that the only road in the district falling within Categories (a) or (b) above is the A14:

A14, Orwell Bridge	20.9% HDV
A14, Sproughton	26.3% HDV

However, there are no relevant receptor locations within 10m of the A14 in the Babergh district. **No further assessment is therefore necessary at this time.**

### **8.2.4 New Roads Constructed or Proposed since the Previous Updating & Screening Assessment**

#### **New Roads**

New roads will require an assessment to determine whether there is a risk of exceedances of the Air Quality Objectives alongside the new road, or existing roads with a significant change in flows. TG(03) requires local authorities to identify any roads where:

- (a) The traffic flow on the new road is greater than 10,000 vehicles per day; or
- (b) Where the new road has increased traffic flows on existing roads previously identified as having more than 30, 24-hour exceedances of  $50 \mu\text{g}/\text{m}^3$  per year; and
- (c) There are relevant receptor locations within 10m of the road.

Excluding minor road improvement schemes and developments, the only areas of significant road building in the district since the 2003 Updating & Screening Assessment are associated with the developments at:

- Thorington Hall, Ipswich
- Aldham Mill Hill and Red Hill, Hadleigh
- Waldingfield Road, Chilton, Sudbury

Traffic data obtained from the Highways Agency and Suffolk County Council confirms that there are no new roads in the district meeting the 10,000 vehicles per day threshold. There are no existing roads previously identified as falling within Category (b) above. **No further assessment is therefore necessary at this time.**

### **Proposed Roads Impacting on Existing Roads**

A number of new developments have been proposed since the 2003 Updating & Screening Assessment, which will have an associated road infrastructure that could impact on air quality adjacent to existing roads in the district. These are discussed below.

#### Chilton, Sudbury

The review of the Babergh Local Plan is in progress, with final adoption of the Local Plan alteration No. 2 being scheduled to take place by mid-2006. The revised plan includes proposals for a major mixed land-use development for the Chilton and Woodhall area north of Sudbury. An approved Master Plan will be required, and at the appropriate time, the planning application will have to be accompanied by an Environmental Statement. The Council is liaising with the developer to ensure that the assessment will address the impact on air quality from increased traffic arising from the development on the Sudbury road network. **The outcome of this assessment will be reported in future Updating & Screening Assessments.**

#### Former HMS Ganges, Shotley

An application has been made to Babergh District Council for the redevelopment of the former HMS Ganges site at Shotley comprising 325 residential properties and associated facilities. The application will be determined by the Planning Inspector following a Public Inquiry. An Environmental Statement incorporating an air quality impact assessment has been submitted in support of the application. The Environmental Statement confirms the levels of traffic generation that would occur on the local highway network and along the B1456 as a result of the development would not cause the Air Quality Objectives to be exceeded. **No further assessment is therefore necessary at this time.**

#### SnOasis, Great Blakenham

An application has been lodged with Mid Suffolk District Council (MSDC) for a winter sports and entertainment complex (SnOasis), in the parish of Great Blakenham. The application has been referred to GO-East, to determine whether the application will be called-in, and subject to a public inquiry. Currently, the advice of MSDC, following a meeting of the Planning Referrals Committee, is that they are minded to approve the application.

This is a major development, including an indoor ski slope, indoor ice arena, 350-bed hotel, 350 holiday chalets, nine-hole golf course, cinema, nightclub, retail outlets and a 'holiday village'. However, whilst it could impact significantly upon the local transport infrastructure, it is anticipated that the vast majority of traffic will arrive via the A14 and A12 carriageways.

The Highways Agency and Suffolk County Council are satisfied that there is sufficient capacity to absorb the anticipated increase in vehicle numbers. A railway station in Great Blakenham also forms part of the overall proposal, and is included as a means of mitigation against increased road traffic. The development cannot proceed without the prior development of the railway station.

Existing PM<sub>10</sub> concentrations along the A14 corridor are well below the Air Quality Objectives, but as part of the Environmental Statement the applicant provided an air quality assessment carried out by Casella Stanger. The conclusion of this assessment, which used the DMRB model to look at 10 sensitive receptors in the immediate vicinity (and the effect of 10 different links on these receptors), was that the Air Quality Objectives for PM<sub>10</sub> would not be exceeded at any of these locations, with a predicted maximum annual mean of 22.3 µg/m<sup>3</sup>. This assessment was carried out for the study year (2004) and also, (anticipating the opening year to be 2008) for 2008 and 2023.

A more detailed assessment of vehicle numbers has also been provided for three sensitive locations: the B1113 North of Sproughton Village; Bramford Road, Great Blakenham; and the A14 by the B1113 junction. Of these three locations, the only one forecast to suffer a significant daily increase in traffic is Bramford Road, Great Blakenham (which is outside the Babergh district). The percentage increases on a 'worst case scenario' in the opening year 2008, peak day (Friday), peak month (February) are as follows: Bramford Road (53%); Sproughton village (6.3%); and A14 (6.0%). These figures are much as expected, as the site access is off Bramford Road, and this will be subject to a significant increase in vehicle numbers. The increase in vehicle numbers on the A14 will not be significant compared to existing numbers, and it is anticipated that few vehicles will access the site via the B1113 in Sproughton.

In light of the findings of the Environmental Statement that the Air Quality Objectives will not be exceeded as a result of the development, it is concluded that **no further assessment is necessary at this time**. However, if a public inquiry is held into the application and further evidence is presented, this conclusion will be reviewed.

### **8.2.5 Roads with Significantly Changed Traffic Flows or New Relevant Exposure**

TG(03) advises that there is the potential for the Air Quality Objectives to be exceeded alongside roads with significantly changed traffic flows or new relevant exposure since the last Updating & Screening Assessment. TG(03) requires local authorities to:

- Identify any roads with more than 10,000 vehicles per day that have experienced 'large' increases in traffic. A 'large' increase can be taken to be more than 25% increase in traffic flow.
- Determine whether these roads had previously been identified as being 'at risk' of exceeding the Air Quality Objectives. A road 'at risk' is defined as one previously identified with more than 30, 24-hour concentrations above 50 µg/m<sup>3</sup> at a relevant location, or a 90<sup>th</sup> percentile above 45 µg/m<sup>3</sup>.

Traffic data for the more heavily trafficked roads in the district are presented in Appendix II. The data confirms that there are no roads with more than 10,000 vehicles per day that have experienced 'large' increases in traffic.

During the previous Updating & Screening Assessment no roads were identified as being 'at risk' of exceeding the Air Quality Objectives under this section. There is no new relevant exposure closer to the roads concerned.

**No further assessment is therefore necessary at this time.**

#### **8.2.6 Roads Close to the Objective during the Previous Updating & Screening Assessment**

This section addresses the changes to the background PM<sub>10</sub> maps on the UK National Air Quality Information Archive, which have been revised to a 2004 base year. In some areas, background PM<sub>10</sub> concentrations are higher than previously estimated. TG(03) therefore requires local authorities to review the mapped background concentration at roads which previously identified as being close to the 24-hour objective i.e. any roads where between 25 and 35 days exceedance of the 24-hour objective were previously predicted at relevant locations. No such roads were identified during the 2003 Updating & Screening Assessment and so **no further assessment is necessary at this time.**

#### **8.2.7 New Industrial Sources and Existing Industrial Sources with Substantially Increased Emissions**

TG(03) provides a list of industrial processes regulated under the Pollution Prevention and Control (England and Wales) Regulations 2000 which have the potential to emit significant quantities of PM<sub>10</sub>. New and existing industries in the Babergh and neighbouring districts have been compared against this list and only the following sites have been identified as potentially significant sources of PM<sub>10</sub>:

- Petrochem Carless Ltd, Harwich Refinery, Refinery Road, Parkeston, Essex CO12 4SS. Process type: Part A(1) Refinery. Grid reference: 623500 232300.
- Cerro Manganese Bronze Ltd, 22 Handford Works, Hadleigh Road Industrial Estate, Ipswich, Suffolk, IP2 0EG. Process type: Part A(1) Non-ferrous metal process. Grid reference: 614800 244830.
- Ipswich Hospital NHS Trust, Heath Road, Ipswich, Suffolk, IP4 5PD. Process type: Part A(1) Clinical Waste Incinerator. Grid reference: 619400 244900.
- Tarmac Quarry Products (Southern) Ltd, Ipswich Works, South West Quay, The Docks, Ipswich, Suffolk IP3 0BH. Process type: Part B Roadstone coating. Grid reference 616891 243445.

In respect of existing industrial sources, TG(03) advises that local authorities need only consider those processes which have 'substantially' increased emissions since the last round of review and assessment. A 'substantial' increase is defined as one greater than 30%.

Petrochem Carless Ltd is a refinery located within the Tendring District Council area and regulated by the Environment Agency. The local Environment Agency office has confirmed that the principal sources of PM<sub>10</sub> emissions are from four chimneys serving boiler plant at the refinery. Data provided by the Environment Agency confirm that aggregate emissions of particulates from the boilers have fallen significantly since the first round of review and assessments, as detailed in Table 7. **No further assessment of this potential source is therefore necessary at this time.**

<b>Table 7: Petrochem Carless Ltd, Emissions of Particulates, 1999-2004 (kg)</b>		
<b>Year</b>	<b>1999</b>	<b>2004</b>
Emissions	7,452	849

The Environment Agency regulates emissions from the processes at Cerro Manganese Bronze Ltd and Ipswich Hospital. The local Environment Agency office has confirmed that there has been no increase in PM<sub>10</sub> emissions from either process since the last round of review and assessment. **No further assessment of these potential sources is therefore necessary at this time.**

Tarmac Quarry Products (Southern) Ltd, Ipswich is a roadstone coating process regulated by Ipswich Borough Council. It is approximately 1.73km from the nearest relevant receptor location in the Babergh district. This process was discounted as a significant source during the last round of review and assessment using the screening guidance for industrial sources in TG(03). Ipswich Borough Council has confirmed that there has not been a ‘substantial’ increase in PM<sub>10</sub> emissions from the process since the last round of review and assessment. **No further assessment of this potential source is therefore necessary at this time.**

### **8.2.8 Areas of Domestic Solid Fuel Burning**

Domestic coal burning can be a ‘significant’ source of PM<sub>10</sub>. TG(03) requires local authorities to identify areas where significant coal burning still takes place which were not covered by previous reviews and assessments, or where there is new relevant exposure. ‘Significant’ is defined as any area of about 0.25 km<sup>2</sup> where there may be more than 50 houses burning solid fuel as their primary source of heating.

A survey of local coal merchants for the 2003 Updating & Screening Assessment confirmed that the highest density of houses in towns or villages in Babergh that still burn solid fuel as their primary source of heating was approximately 20 houses per 0.25 km<sup>2</sup> i.e. below the screening criteria in TG(03). The Southern England Regional Co-ordinator of the Approved Coal Merchants Scheme has also confirmed that since 2003, “two merchants have ceased trading, two others no longer offer a delivery service and none have increased their tonnage band, and .... the overall burn of solid fuel in domestic appliances in Suffolk has reduced”. **No further assessment is therefore necessary at this time.**

### **8.2.9 Quarries, Landfill Sites, Open-cast Coal, handling of Dusty Cargoes at Ports etc**

These various sources may be significant in terms of fugitive dust emissions, but TG(03) only requires local authorities to consider these sources if they were not assessed during the 2003 Updating & Screening Assessment, or if there is new relevant exposure.

Shotley Holdings, Tattingstone (landfill and quarrying activities) and Brett Aggregates Ltd, Layham (quarrying activities) were considered and discounted at the last review and assessment and there is no new relevant exposure significantly closer to these sites.

The ports at Felixstowe and Harwich were also considered and discounted. However since 2003, applications for the Felixstowe South Reconfiguration and the Bathside Bay Container Terminal at Harwich have been given planning approval. An application for residential development on the former HMS Ganges site at Shotley is also being considered by the Planning Inspectorate and if approved, would bring new relevant exposure closer to Felixstowe port.

Air quality assessments were completed as part of the applications for both the Felixstowe South Reconfiguration and Bathside Bay Container Terminal. The Planning Inspector has accepted the conclusions of these assessments that potential fugitive dust emissions from either development would not cause the Air Quality Objectives to be exceeded in Shotley.

With regard to the proposed HMS Ganges development, TG(03) requires local authorities to establish whether there would be relevant receptor locations 'near' to the sources of dust emission. 'Near' is defined in TG(03) according to the prevailing PM<sub>10</sub> background concentration, with distances being measured from the source rather than the site boundary:

- Within 1000m if the estimated 2004 annual mean background is greater than or equal to 27 µg/m<sup>3</sup>;
- Within 400m if the estimated 2004 annual mean background is greater than or equal to 26 µg/m<sup>3</sup>;
- Within 200m if the estimated 2004 annual mean background is less than 26 µg/m<sup>3</sup>.

Estimated annual mean background concentrations for 2004 have been mapped for the UK and have been accessed from the Internet at the following address ([www.airquality.co.uk/archive/laqm/tools.php](http://www.airquality.co.uk/archive/laqm/tools.php)). The 2004 annual mean background concentration at Shotley is 20.1 µg/m<sup>3</sup> and so 'near' is defined as within 200m. However, the boundary of the proposed residential development at HMS Ganges will be over 800m from the Port of Felixstowe (Trinity III terminal) and so **no further assessment is necessary at this time.**

#### **8.2.10 Aircraft**

TG(03) advises that PM<sub>10</sub> emissions from aircraft will have negligible impact once they are above about 200m or beyond 500m from the airport boundary and that only large airports with a predicted total passenger or equivalent freight throughput of more than 10 million per annum have the potential to cause an exceedence of the Air Quality Objectives. TG(03) requires local authorities to consider aircraft emissions at airports only if they were not assessed during the 2003 Updating & Screening Assessment, or if there is new relevant exposure. The Wattisham military airbase was discounted as a significant source in the 2003 Updating & Screening Assessment because the number of flights (approximately 40,000 flights per annum) falls well below the thresholds in the screening criteria for commercial airports specified above. There is no new relevant exposure significantly nearer the airbase and so **no further assessment is necessary at this time.**

### **8.3 Conclusion for PM<sub>10</sub>**

The Updating & Screening Assessment confirms that there are no sources of PM<sub>10</sub> either within the Babergh district or in neighbouring areas which will cause an exceedance of the Air Quality Objectives. **No further assessment of PM<sub>10</sub> is therefore required at this time.**

## 9. SUMMARY AND CONCLUSIONS

The Updating & Screening Assessment of air quality has considered potential sources of the seven prescribed pollutants: carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide, nitrogen dioxide and particulate matter (PM<sub>10</sub>). The assessment has followed the technical guidance issued by DEFRA and builds on the work already carried out in previous rounds of air quality review and assessment.

**The Updating & Screening Assessment has concluded that at the present moment in time, the Air Quality Objectives for each of the prescribed pollutants are likely to be met in the Babergh district. It will not be necessary to proceed beyond this assessment to a Detailed Assessment.**

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**ADVICE FROM DEFRA TECHNICAL GUIDANCE, TG(03)  
DEFINITION OF ‘PUBLIC EXPOSURE’ FOR THE PURPOSES OF REVIEW  
AND ASSESSMENT**

TG(03) makes it clear that likely exceedances of the Air Quality Objectives should be assessed in relation to “the quality of the air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present”. Reviews and assessments should thus be focussed on those locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Authorities should not consider exceedances of the objectives at any location where relevant public exposure would not be realistic. Several factors have been taken into account when developing the guidance on locations considered relevant.

The Air Quality Regulations refer to locations where members of the public are regularly present. This does not imply that it must be the same persons regularly present at that location. This is important for an understanding of relevant exposure where a short-term objective allows a number of exceedances of the standard. The standard is the basis for a potential risk to health, thus a single exposure of an individual above the standard is to be avoided. The objective allows a number of exceedances of the standard because of considerations of feasibility and practicability. Thus for sulphur dioxide, where there is a 15-minute standard, a relevant receptor location would be anywhere where a member of the public might be exposed for a single 15-minute period, as long as members of the public are regularly present at that location. The allowance of up to 35 exceedances before the objective is breached determines the need to control concentrations at that location, not whether that location is relevant in terms of exposure.

The long-term objectives apply where members of the public are likely to be exposed over the averaging period of the objective. As with the discussion of short-term objectives, this does not require the same individual to be present for a full year at a particular location, but the location must be one where people are likely to be regularly present for long periods. For instance, in the case of the 24-hour objectives, a relevant receptor location would be one where members of the public may be exposed for 8 hours or more in a day, while for the annual mean objectives this might be where people are exposed for a cumulative period of 6 months in a year. There is a link between pollutant concentrations measured both inside and outside of a building. For this reason it is considered appropriate to measure at the building façade to represent relevant exposure. Thus for exposure alongside a busy road, it is considered reasonable to select the façade of residential properties closest to the road as a representative location to assess exposure for pollutants with a 24-hour or annual mean objective.

For the purpose of assisting local authorities, some examples of where the objectives should, and should not apply, are summarised in the table below. However it should be borne in mind that it is not possible to be prescriptive in this matter, and authorities should bear local circumstances in mind when considering the application of the objectives. The examples given in the table are not intended to be a comprehensive list, and it is expected that local judgement will often be required.

<b>Examples of where the Air Quality Objectives should/should not apply</b>		
<b>Averaging Period</b>	<b>Objectives should apply at:</b>	<b>Objectives should generally not apply at:</b>
<b>Annual mean</b>	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, libraries etc.	Building facades of offices or other places of work where members of the public do not have regular access. Gardens of residential properties. Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short-term.
<b>24-hour mean and 8-hour mean</b>	All locations where the annual mean objective would apply. Gardens of residential properties*	Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short-term.
<b>1-hour mean</b>	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1 hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1 hour or longer.	Kerbside sites where the public would not be expected to have regular access.
<b>15-min mean</b>	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

\* Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

APPENDIX II

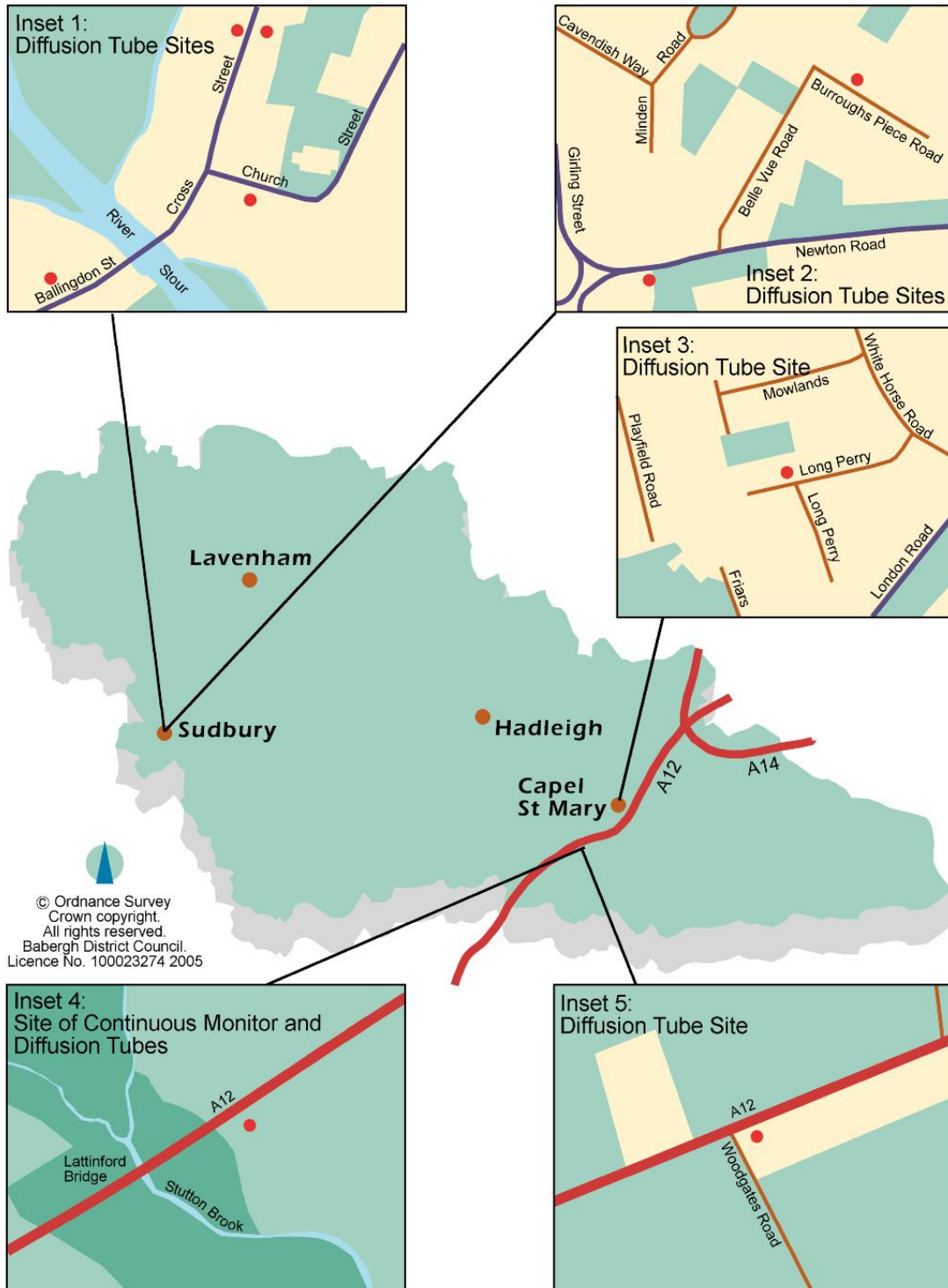
TRAFFIC DATA USED IN UPDATING & SCREENING ASSESSMENT

Road	Site	Site Ref	Easting	Northing	Annual Average Daily Traffic						% HDV	Av Speed (kph)
					2000	2001	2002	2003	2004	2005		
A12	Copdock	30013374 & 30013375	611791	240615	-	-	-	-	49132	47354	17.5	-
A0014	Ipswich Western Bypass	M029	613310	246330	41381	44480	45161	46622	47727	48395	26.3	104.8
A0014	Ipswich Orwell Bridge	M094	618320	241160	45638	49081	50128	52166	54896	55665	20.9	116.2
A0131	Ballingdon Hill, Sudbury	M068	586198	240300	9133	-	8418	9219	9580	9705	9.7	69.5
A0131	Ballingdon Street, Sudbury	Y208	586680	240867	14359	13893	13662	13847	12971	13140	7.8	48.8
A0131	West of Eastern Bypass, Sudbury	Y211	588248	242217	-	-	10480	-	-	10889	-	-
A0131	Northern end of Melford Road, Sudbury	Y213	586350	242970	12320	-	-	10929	-	11213	-	-
A0134	Newton	M007	591439	240916	13194	-	-	13568	13720	13912	7.4	59.9
A0134	Long Melford Bypass	M008	586494	243579	-	7102	-	7397	7706	7806	12.0	77.7
A0134	Alpheton	M009	588170	249930	7490	7543	7748	7865	8132	8246	12.6	74.7
A0134	Nayland – North of C734	Y001	596688	234405	-	8648	-	-	8045	8158	0.1	89.3
A0134	Assington	Y053	594094	238504	-	7746	-	-	-	8188	-	-
A0134	East of Sudbury	Y054	590205	241590	-	-	9808	-	10337	10482	-	72.9
A0134	Eastern Bypass N.W. End, Sudbury	Y209	586600	243100	-	-	12267	7654	-	7853	-	-
A0134	Eastern Bypass S End, Sudbury	Y210	588098	242422	-	19217	-	-	11569	11719	-	49.4
A0137	Tattingstone	M012	612768	237614	8673	-	8158	-	9040	9167	11.6	74.7
A0137	Wherstead Road, Ipswich	Y219	616200	242600	14744	15149	15925	15570	15707	15943	8.9	47.5
A1071	Bower House Tye	M022	598121	240152	5357	5454	-	6161	6248	6335	10.9	87.5
A1071	Wolves Wood	M023	605724	243730	-	7507	7592	8260	8280	8396	9.5	86.7
A1092	Long Melford	Y008	586260	246560	-	-	9095	9298	-	9558	-	-
A1092	Glemsford, between B1065 & B1066	Y067	583350	246560	-	5409	-	5867	-	6031	-	-
A1141	East of Lavenham	M032	592684	248522	1701	-	1896	-	-	1976	5.8	-
A1141	North of Hadleigh, North of C722	M052	601072	244602	-	4045	3689	4512	4417	4479	4.3	61.3
A1141	North of Lavenham	Y011	591360	251750	2024	-	-	2154	-	2244	-	-
A1141	Monks Eleigh Village	Y071	596134	247604	-	3060	-	-	-	3234	-	-
A1141	Between Monks Eleigh & Semer	Y072	598828	246346	-	1449	-	2192	-	2253	-	-

Road	Site	Site Ref	Easting	Northing	Annual Average Daily Traffic						% HDV	Av Speed (kph)
					2000	2001	2002	2003	2004	2005		
B1029	North of Dedham	Y075	605573	234366	-	2085	-	2070	2229	2260	6.5	58.4
B1064	South of Rodbridge	Y206	586030	243570	-	12060	12606	12513	12702	12880	0.1	61.3
B1065	South of Glemsford	Y078	582900	247090	-	2141	-	2087	-	2145	-	-
B1066	South of Stanstead Street	Y015	587520	246880	-	-	977	1109	-	1140	-	-
B1068	Stoke By Nayland	M034	600248	235415	2038	-	2152	2110	2210	2241	4.0	70.5
B1068	Leavenheath	Y079	595810	237761	-	2928	-	2642	3021	3063	6.7	62.1
B1070	South of Raydon	M035	605119	238305	-	3552	-	3811	3749	3801	6.1	51.8
B1070	East of Bergholt, South of A12	Y080	606727	236050	-	4963	-	-	5369	5444	0.1	77.9
B1070	Gallows Hill, Hadleigh	Y146	602125	243287	-	3549	-	3847	3895	3946	7.2	53.3
B1070	Lady Lane, Hadleigh	Y205	603500	243272	4773	-	-	5990	-	6152	-	-
B1071	South of Lavenham	Y019	591220	248400	2472	-	4936	-	-	5143	31.4	-
B1078	West of Nedging Tye	Y023	601750	249880	1556	-	-	922	-	948	-	-
B1080	North of Holbrook	Y050	616850	237440	3340	-	3552	3543	3442	3490	0.1	65.3
B1087	South of Stoke by Nayland	Y084	598534	235105	-	1858	-	1874	1964	1991	6.6	61.8
B1113	North of Sproughton Village	Y154	612138	245915	6811	-	-	8004	-	8228	0.2	-
B1115	Scripps Cross Bridge	M039	594972	246930	1430	1850	1522	2625	-	2699	5.9	-
B1115	North of Semer, South of B1078	Y012	600190	246740	2126	-	2233	2339	-	2404	-	-
B1115	East of Chelsworth	Y034	598520	248200	1135	1790	2146	3345	-	3439	-	-
B1115	North East of Sudbury	Y096	589890	243000	-	-	5490	6583	-	6767	-	-
B1115	Waldingfield	Y097	590300	243255	-	-	7497	9530	-	9797	-	-
B1456	Freston Hill	M006	617343	239383	-	7919	-	8351	8173	8287	5.2	69.7
B1456	North West of Chelmondiston	Y051	619640	237380	3892	-	-	5045	5225	5298	8.6	68.4
B1508	North of Bures	Y052	590159	236226	-	3482	-	3365	-	3459	-	-
C0711	South East of Acton	Y106	290100	244350	-	-	3372	-	-	3514	-	-
C0712	Waldingfield Road, Sudbury	Y220	588156	242147	-	9302	10159	10756	10291	10425	3.2	55.7
C0714	South of Waldingfield	Y107	590300	242700	-	-	2725	3313	-	3406	-	-
C0494	Chantry park, Ipswich	M061	613700	244325	7091	6611	7386	7622	7521	7634	6.2	54.7

Details of Nitrogen Dioxide Monitoring Locations in the Babergh District

Nitrogen Dioxide Monitoring Locations -  
Continuous Monitor and Diffusion Tube Sites



Location	Grid Co-ordinates	Monitoring Method	Site Class*	Distance from Kerbside (m)	Site Description	Purpose of Monitoring
Lattinford Bridge, A12, Stratford St Mary	608011 236914	Continuous Monitor and Triplicate Diffusion Tubes	Roadside	9.0	At same distance from road as closest houses	Monitor worst case relevant exposure
Lattinford Hill, A12, Stratford St Mary	607448 236635	Diffusion Tube	Roadside	9.0	At façade of closest houses to road	Monitor worst case relevant exposure
Long Perry, Capel St Mary	609641 238064	Diffusion Tube	Urban background	N/A	Back of pavement in centre of housing estate	Monitor background conditions
Burroughs Piece Road, Sudbury	587771 241459	Diffusion Tube	Urban background	N/A	Back of pavement	Monitor background conditions
Newton Road, Sudbury	587622 241320	Diffusion Tube	Roadside	2.3	Back of pavement	Monitor relevant exposure - nearest houses 5.9m from kerb
30 Church Street, Sudbury	586822 240945	Diffusion Tube	Roadside	1.3	At façade of closest houses to road	Monitor worst case relevant exposure
21 Cross Street, Sudbury	586831 241069	Diffusion Tube	Roadside	2.2	At façade of closest houses to road	Monitor worst case relevant exposure
58 Cross Street, Sudbury	586798 241010	Diffusion Tube	Roadside	1.7	At façade of closest houses to road	Monitor worst case relevant exposure
70 Cross Street, Sudbury	586817 241068	Diffusion Tube	Roadside	1.5	At façade of closest houses to road	Monitor worst case relevant exposure
99 Ballingdon Street, Sudbury	586681 240877	Diffusion Tube	Roadside	2.9	At façade of closest houses to road	Monitor worst case relevant exposure

\*As defined in DEFRA's Technical Guidance, LAQM.TG(03), as amended

## Continuous Air Quality Monitoring Station Calibration and QA/QC

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### Calibration Summary

The NO<sub>x</sub> monitor measures and analyses by ozone chemiluminescence. Data from the analyser is stored on a data logger as 'raw' or 'uncorrected' data and must therefore be corrected or 'validated'. To validate the data, automatic daily calibration checks are undertaken by Casella Stanger, an equipment support unit in the UK Air Quality Monitoring Network. Fortnightly manual calibrations are also carried out by the Council to enable missing calibration data to be checked and adjusted accordingly. These calibrations verify the response of the monitor to 'zero' and 'span' by introducing a high concentration of nitric oxide gas. The daily calibration check produces an actual zero response and a span response value which are stored in a calibration file on the logger. National Physical Laboratory certified span gases are used.

In rescaling and validating the data from the system both sets of values are used to correct the data to validated figures. Data collection and data ratification is performed by air quality specialists at Casella Stanger, utilising dedicated software.

### QA/QC and Data Capture Summary

DEFRA's Technical Guidance, LAQM.TG(03) states that data capture for chemiluminescence monitors should be greater than 90% during each sampling period for the data to be valid. Data capture for each month was above DEFRA's recommended level of 90% and hence all the data is considered valid.

Data is stored in the data logger by communication between the logger and the analyser. The data capture summary below outlines the percentage of data included in the data set as validated data. Data capture statistics are for all valid data; data excluded from the statistics are periods when the analyser is in auto-calibration, or during calibration visits by local site operatives, service engineers and QA/QC auditors. However, data loss can also occur when data cannot be stored onto the logger for various reasons, including:

- Power cuts to the monitor
- Analyser faults
- Logger faults

Data may also be excluded in periods where the analyser's calibration response is determined as unstable.

Data capture for 2003 was:

Measured Parameter	Nitrogen Oxides (NO <sub>x</sub> )	Nitric Oxide (NO)	Nitrogen Dioxide (NO <sub>2</sub> )
January	100.0%	100.0%	100.0%
February	99.9%	99.9%	99.9%
March	100.0%	100.0%	100.0%
April	99.9%	99.9%	99.9%
May	100.0%	100.0%	100.0%
June	100.0%	100.0%	100.0%
July	61.4%	61.4%	61.4%
August	100.0%	100.0%	100.0%
September	100.0%	100.0%	100.0%
October	100.0%	100.0%	100.0%
November	100.0%	100.0%	100.0%
December	99.5%	99.5%	99.5%

Due to operational problems with the monitor, data capture during the calendar month of July 2003 was only 61.4%. This is below DEFRA's recommended level of 90% and hence the July data is invalid.

Data capture for 2004 was:

Measured Parameter	Nitrogen Oxides (NO <sub>x</sub> )	Nitric Oxide (NO)	Nitrogen Dioxide (NO <sub>2</sub> )
January	100.0%	100.0%	100.0%
February	99.9%	99.9%	99.9%
March	100.0%	100.0%	100.0%
April	99.9%	99.9%	99.9%
May	100.0%	100.0%	100.0%
June	94.2%	94.2%	94.2%
July	97.0%	97.0%	97.0%
August	98.0%	98.0%	97.0%
September	94.0%	94.0%	94.0%
October	100.0%	100.0%	100.0%
November	99.9%	99.9%	99.9%
December	99.2%	99.2%	99.2%

Data capture for each month was above DEFRA's recommended level of 90% and hence all the data is considered valid.

Data capture for 2005 was:

<b>Measured Parameter</b>	<b>Nitrogen Oxides (NO<sub>x</sub>)</b>	<b>Nitric Oxide (NO)</b>	<b>Nitrogen Dioxide (NO<sub>2</sub>)</b>
January	99.3%	99.3%	99.3%
February	100.0%	100.0%	100.0%
March	100.0%	100.0%	100.0%
April	99.2%	99.2%	99.2%
May	100.0%	100.0%	100.0%
June	100.0%	100.0%	100.0%
July	100.0%	100.0%	100.0%
August	99.7%	99.7%	99.7%
September	100.0%	100.0%	100.0%
October	100.0%	100.0%	100.0%
November	100.0%	100.0%	100.0%
December	100.0%	100.0%	100.0%

Data capture for each month was above DEFRA's recommended level of 90% and hence all the data is considered valid.

**APPENDIX V**

**Results of Nitrogen Dioxide Diffusion Tube Monitoring by Babergh District Council, January 2003 – December 2005 ( $\mu\text{g}/\text{m}^3$ )**

Monitoring Location	Grid Reference		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Uncorrected Mean	Bias Corrected Mean
	X	Y														
<b>Year 2003</b>																
Burroughs Piece Rd, Sudbury	587771	241459	32.5	35.5	24.1	21.4	19.5	17.4	16.4	10.5	21.6	26.5	43.4	36.3	25.4	21.1
Newton Rd, Sudbury	587622	241320	40.9	51.8	37.8	29.8	29.0	27.7	26.9	22.7	29.0	34.9	48.4	46.8	35.5	29.5
30 Church Street, Sudbury	586820	240952	51.8	80.4	61.3	60.0	62.5	64.7	31.3	31.7	37.4	36.4	50.2	43.4	50.9	42.2
21 Cross Street, Sudbury	586831	241069	40.3	58.6	39.2	37.6	30.8	26.4	39.2	44.1	43.0	42.9	60.1	54.5	43.0	35.7
58 Cross Street, Sudbury	586798	241010	54.2	62.5	50.8	42.2	49.1	49.9	54.2	50.4	53.5		62.1	64.2	53.9	44.7
70 Cross Street, Sudbury	586817	241068	35.1	56.5	43.9	36.5	36.5	36.7	45.3	52.0	56.3	52.7	59.7	58.7	47.5	39.4
99 Ballingdon Street, Sudbury	586681	240877	49.5	52.7	49.3	36.1	46.6	40.9	37.6	35.9	38.0	38.2	50.2	49.7	43.7	36.3
Long Perry, Capel St Mary	609641	238064	36.1	57.5	34.0	31.9	26.5	21.6	20.6	17.4	25.0	26.9	49.3	45.9	32.7	27.1
Lattinford Hill, A12, Stratford St Mary	607448	236635	60.5	51.8	63.8	55.2	39.2	33.8	34.8	46.8	42.8	52.0	55.1		48.7	40.4
<b>Year 2004</b>																
Burroughs Piece Rd, Sudbury	587771	241459	30.8	27.9	28.7	26.1		11.3	14.8	17.7	17.8	23.0	31.4	33.4	23.9	23.9
Newton Rd, Sudbury	587622	241320	36.2	35.1	37.4	32.8	28.0	17.2	26.3	23.9	25.2	33.9	41.7	40.7	31.5	24.7
30 Church Street, Sudbury	586820	240952	40.2	38.8	43.6	19.9		13.6	26.7	28.9	28.0	36.0	42.6	40.6	32.6	25.6
21 Cross Street, Sudbury	586831	241069		38.0	43.2	43.1	44.0	17.5	30.3	39.8	37.5	48.2	44.7	44.1	39.1	30.7
70 Cross Street, Sudbury	586817	241068	50.3	56.4	58.4	57.6	49.7	25.4	44.3	37.8	47.5	52.3	63.2	45.3	49.0	38.4
99 Ballingdon Street, Sudbury	586681	240877	44.0	37.3	31.7	35.6	35.3	22.1	26.5	27.7	36.6	38.1	47.8	36.5	34.9	27.4
Long Perry, Capel St Mary	609641	238064	31.3	26.7	34.0	30.7	15.2	9.7	20.6	20.3	21.2	29.6	35.1	42.7	26.4	20.7
Lattinford Hill, A12, Stratford St Mary	607448	236635	54.2	65.3	53.7	34.5	54.0	37.5	43.1	34.2	46.0	39.5	68.1	46.7	48.1	37.7
<b>Year 2005</b>																
Burroughs Piece Rd, Sudbury	587771	241459	20.8	18.4	23.4	20.3	15.4	12.7	10.5	17.7	22.9	24.6	32.9	27.6	20.6	16.9
Newton Rd, Sudbury	587622	241320	35.6	35.9	37.2	30.3	23.4	22.4	22.8	28.6	35.5	36.8	41.7	39.1	32.4	26.5
30 Church Street, Sudbury	586820	240952	35.8	41.0	43.5	37.0	27.6	29.7	24.5	31.7	40.4	44.5	45.2	43.5	37.0	30.3
21 Cross Street, Sudbury	586831	241069	38.5	47.9	46.5	32.9	34.0	40.3	35.6	33.3	41.4	60.5	44.2	49.4	42.0	34.4
70 Cross Street, Sudbury	586817	241068	43.1	50.9	55.8	50.9	36.5	49.0	34.0	43.9	56.2	47.0	52.2	55.1	47.9	39.2
99 Ballingdon Street, Sudbury	586681	240877	14.4	46.8	47.5	33.2	23.4	30.3	31.3	36.0	38.5	39.4	43.7	40.3	35.1	28.7
Long Perry, Capel St Mary	609641	238064	30.8	30.0	35.5	27.1	13.8	17.4		21.0	29.9	39.4	36.7	35.9	28.9	23.6
Lattinford Hill, A12, Stratford St Mary	607448	236635	50.5	40.9	56.1	39.8	35.1	42.2	34.4	48.4	56.6	38.8	61.0	60.5	47.0	38.4

## **Diffusion Tube Network QA/QC Summary and Calculation of Laboratory Bias**

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All diffusion tubes were supplied and analysed by Harwell Scientifics Ltd, Didcot, Oxfordshire. The tubes were of the Palmes type, manufactured from polyethylene. The absorbent used was a 50:50 mix of Triethanolamine and acetone. The grids were soaked in the mixture and the excess removed by 'dabbing' the grids on sorbent paper before assembly.

When selecting a laboratory for the supply and analysis of diffusion tubes, it is important to ensure they follow the correct Quality Assurance and Quality Control procedures. In this respect, Harwell Scientifics Ltd participate in inter-laboratory round-robin exercises, including the Workplace Analysis Scheme for Proficiency, Aquacheck and the monthly doping solution test organised by AEA Technology, who co-ordinate the UK National Nitrogen Dioxide Diffusion Tube Survey, which is subjected to scrutiny through Quality Assurance procedures and inter-comparison. Harwell Scientifics Ltd is also formally accredited to UKAS standards for the analytical method.

### **Co-Location Studies - Calculation of Diffusion Tube Bias**

The simultaneous co-exposure of triplicate diffusion tubes alongside a continuous monitor is essential in order to define bias and precision associated with diffusion tube measurements throughout the period of monitoring. In the event of significant bias in diffusion tube measurement data being identified, appropriate scaling factors may be defined from the co-exposure data and applied to the diffusion tube measurement data to correct for any systematic bias. Any such correction factors and the data used to derive them should be reported.

A triplicate set of diffusion tubes was co-located alongside the monitoring head of the continuous NO<sub>x</sub> monitor at Lattinford Bridge on the A12. There can be significant variation in the results obtained from diffusion tubes in the same batch and so the use of triplicate tubes is advised to enable the mean result to be derived. The diffusion tubes were prepared from the same 'batch' as those exposed at the other monitoring locations in the district.

The results of the three 12-month co-location studies are summarised in the tables below. Monthly means were measured over exactly (to the quarter-hour) the same time periods. The measured monthly and annual means from the continuous monitor and the triplicate set of diffusion tubes is shown.

### Co-Location Study, 2003

Due to operational problems with the monitor, data capture between 1 July 2003 and 29 July 2003 was only 57.5%. This is below DEFRA's recommended level of 90% and hence the 'July' data has been excluded from the calculation.

Diffusion Tube Exposure Period*		Diffusion Tube Results $\mu\text{g}/\text{m}^3$				Average Reading $\mu\text{g}/\text{m}^3$	Continuous Monitor Results# $\mu\text{g}/\text{m}^3$
Date On	Date Off	Tube 1	Tube 2	Tube 3			
28/12/02	05/02/03	44.5	43.7	40.5	42.9	28.3	
05/02/03	04/03/03	46.4	44.3	42.0	44.3	34.6	
04/03/03	01/04/03	40.3	37.4	35.5	37.8	34.4	
01/04/03	29/04/03	39.0	32.5	27.3	32.9	31.9	
29/04/03	03/06/03	32.5	29.8	29.4	30.6	25.1	
03/06/03	01/07/03	28.8	28.5	26.6	28.0	24.6	
01/07/03	29/07/03	28.5	26.0	25.6	26.7	INVALID†	
29/07/03	02/09/03	33.0	29.8	27.5	30.1	26.9	
02/09/03	30/09/03	26.7	26.6	25.8	26.4	25.0	
30/09/03	05/11/03	37.5	36.6	29.3	34.5	31.3	
05/11/03	02/12/03	41.8	40.8	40.8	41.1	27.8	
02/12/03	28/12/03	51.1	43.8	27.3	40.7	26.8	
<b>Annual Mean †</b>					<b>34.7</b>	<b>28.8</b>	

\* These periods are fixed by the UK National Diffusion Tube Network, in which Babergh District Council participates.

# Monthly average results correspond to diffusion tube exposure.

† July 2003 results excluded from calculation of annual mean obtained from continuous monitor - see above text.

### Calculation of Bias Adjustment

The diffusion tube bias adjustment factor 'A' is calculated as follows:

$$A = C_m/D_m$$

where

$C_m$  = annual mean concentration from continuous monitor

$D_m$  = annual mean concentration from diffusion tubes

From the above table:  $C_m = 28.8 \mu\text{g}/\text{m}^3$   
 $D_m = 34.7 \mu\text{g}/\text{m}^3$

Bias adjustment factor =  $28.8/34.7 = \mathbf{0.830}$

The diffusion tube bias relative to the continuous monitor is given as:

$$\begin{aligned} \text{Bias} &= (D_m - C_m) / C_m \\ &= (34.7 - 28.8) / 28.8 \\ &= \mathbf{0.205 \text{ which is equivalent to } 20.5\%} \\ &\quad \mathbf{i.e. \text{ the tubes over-read by } 20.5\%} \end{aligned}$$

## Co-Location Study, 2004

Data capture for each month was above DEFRA's recommended level of 90% and hence all the data is considered valid.

Diffusion Tube Exposure Period*		Diffusion Tube Results $\mu\text{g}/\text{m}^3$				Continuous Monitor Results# $\mu\text{g}/\text{m}^3$
		Tube 1	Tube 2	Tube 3	Average Reading $\mu\text{g}/\text{m}^3$	
Date On	Date Off					
28/12/03	03/02/04	38.4	38.4	35.8	37.5	29.2
03/02/04	02/03/04	45.6	41.6	41.5	42.9	31.2
02/03/04	30/03/04	38.9	38.7	38.0	38.5	29.2
30/03/04	04/05/04	34.9	34.1	23.7	30.9	28.3
04/05/04	01/06/04	25.5	25.2	23.6	24.8	22.0
01/06/04	29/06/04	19.6	17.4	14.8	17.3	19.5
29/06/04	03/08/04	24.0	23.6	20.6	22.7	19.2
03/08/04	31/08/04	22.5	20.8	19.9	21.1	13.9
31/08/04	28/09/04	27.8	26.2	25.9	26.6	16.4
28/09/04	02/11/04	28.1	27.1	26.7	27.3	15.9
02/11/04	30/11/04	42.0	39.5	32.3	37.9	28.2
30/11/04	04/01/05	41.0	37.8	37.1	38.6	33.7
<b>Annual Mean</b> †					<b>30.5</b>	<b>23.9</b>

\* These periods are fixed by the UK National Diffusion Tube Network, in which Babergh District Council participates.

# Monthly average results correspond to diffusion tube exposure.

### Calculation of Bias Adjustment

The diffusion tube bias adjustment factor 'A' is calculated as follows:

$$A = C_m/D_m$$

where

$C_m$  = annual mean concentration from continuous monitor

$D_m$  = annual mean concentration from diffusion tubes

From the above table:  $C_m = 23.9 \mu\text{g}/\text{m}^3$

$D_m = 30.5 \mu\text{g}/\text{m}^3$

Bias adjustment factor =  $23.9/30.5 = \mathbf{0.784}$

The diffusion tube bias relative to the continuous monitor is given as:

$$\text{Bias} = (D_m - C_m) / C_m$$

$$= (30.5 - 23.9) / 23.9$$

$$= \mathbf{0.276 \text{ which is equivalent to } 27.6\%}$$

**i.e. the tubes over-read by 27.6%**

## Co-Location Study, 2005

Data capture for each month was above DEFRA's recommended level of 90% and hence all the data is considered valid.

Diffusion Tube Exposure Period*		Diffusion Tube Results $\mu\text{g}/\text{m}^3$				Continuous Monitor Results# $\mu\text{g}/\text{m}^3$
		Tube 1	Tube 2	Tube 3	Average Reading $\mu\text{g}/\text{m}^3$	
Date On	Date Off					
04/01/05	01/02/05	40.3	33.2	32.4	35.3	23.9
01/02/05	01/03/05	39.7	32.9	23.7	32.1	28.1
01/03/05	29/03/05	38.5	33.6	29.8	34.0	28.8
29/03/05	03/05/05	32.5	29.0	23.4	28.3	27.9
03/05/05	31/05/05	21.6	21.1	19.9	20.9	21.2
31/05/05	28/06/05	24.0	22.4	21.7	22.7	19.3
28/06/05	02/08/05	23.7	23.6	21.0	22.8	20.4
02/08/05	30/08/05	27.3	26.9	25.1	26.4	20.6
30/08/05	04/10/05	30.5	29.9	28.7	29.7	26.2
04/10/05	01/11/05	27.8	27.5	26.4	27.2	18.0
01/11/05	29/11/05	38.9	38.9	37.0	38.3	24.3
29/11/05	03/01/06	35.8	34.4	24.7	31.6	26.4
<b>Annual Mean</b> †					<b>29.1</b>	<b>23.8</b>

\* These periods are fixed by the UK National Diffusion Tube Network, in which Babergh District Council participates.

# Monthly average results correspond to diffusion tube exposure.

### Calculation of Bias Adjustment

The diffusion tube bias adjustment factor 'A' is calculated as follows:

$$A = C_m/D_m$$

where

$C_m$  = annual mean concentration from continuous monitor

$D_m$  = annual mean concentration from diffusion tubes

From the above table:  $C_m = 23.8 \mu\text{g}/\text{m}^3$

$D_m = 29.1 \mu\text{g}/\text{m}^3$

Bias adjustment factor =  $23.8/29.1 = \mathbf{0.818}$

The diffusion tube bias relative to the continuous monitor is given as:

$$\text{Bias} = (D_m - C_m) / C_m$$

$$= (29.1 - 23.8) / 23.8$$

$$= \mathbf{0.223 \text{ which is equivalent to } 22.3\%}$$

**i.e. the tubes over-read by 22.3%**

