

**REPORT ON THE FIRST STAGE REVIEW AND
ASSESSMENT OF AIR QUALITY IN SUFFOLK COASTAL**

Written by Denise Bint
Environmental Services

February 1999

Addendum

Please note the following changes to the report:

- Page 18, Section 3.4.5 – delete points 3 and 4 and replace with:-
 3. B T & D Hewlett Packard Limited, Whitehouse Road, Ipswich – within Ipswich Borough (Part A Authorised Process).
 4. Manganese Bronze Limited, Hadleigh Road, Ipswich - within Ipswich Borough (Part B Authorised Process).
- Page 19, Section 3.4.7 – delete point 3 and replace with:-
 3. Hewlett Packard Limited which operates an inorganic chemical process. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of carbon monoxide and **further review and assessment will not be necessary.**
- Page 25, Section 3.5.5 –

Replace: “... There are six processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-“

With: “There are seven processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-“
- Page 25, Section 3.5.5 – delete point 4 and replace with:-
 4. Manganese Bronze Limited, Hadleigh Road, Ipswich - within Ipswich Borough (Part B Authorised Process).
- Page 26, Section 3.5.5 – insert the following as point 7:-
 7. Ancient House Press Limited, Hadleigh Road Industrial Estate, Whittle Road, Ipswich - within Ipswich Borough (Part B Authorised Process).
- Page 26, Section 3.5.7 –

Replace: “... There are six Part 1 Authorised (A & B) Processes within 10km of the Suffolk Coastal District which need to be considered:-“

With: “... There are seven Part 1 Authorised (A & B) Processes within 10km of the Suffolk Coastal District which need to be considered:-“

- Page 27, Section 3.5.7 – delete point 4 and replace with:-
 4. Manganese Bronze Limited which is a copper alloy foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of NO₂ and **further review and assessment will not be necessary.**

- Page 27, Section 3.5.7 – insert the following as point 7:-
 7. Ancient House Press Limited which operates a printworks. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of NO₂ and **further review and assessment will not be necessary.**

- Page 32, Section 3.6.5 –

Replace: “... There are six processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-“

With: : “... There are seven processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-“

- Page 33, Section 3.6.5 – delete point 4 and replace with:-
 4. Manganese Bronze Limited, Hadleigh Road, Ipswich – within Ipswich Borough (Part B Authorised Process).

- Page 33, Section 3.6.5 – insert the following as point 7:-
 7. Cranes Limited, Nacton Road, Ipswich – within Ipswich Borough (Part B Authorised Process).

- Page 34, Section 3.6.7 –

Replace: “There are six Part 1 Authorised (A & B) Processes within 10km of the Suffolk Coastal District which need to be considered:-“

With: “There are seven Part 1 Authorised (A & B) Processes within 10km of the Suffolk Coastal District which need to be considered:-“

- Page 34, Section 3.6.7 – delete point 4 and replace with:-
 4. Manganese Bronze Limited which is a copper alloy foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of SO₂ and **further review and assessment will not be necessary.**

- Page 34, Section 3.6.7 – insert the following as point 7:-
 7. Cranes Limited which is an iron and steel foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of SO₂ and **further review and assessment will not be necessary.**

- Page 39, Section 3.7.5 –

Replace: “There are ten processes in the above category which could impact within the Suffolk Coastal District at relevant locations”.

With: “There are thirteen processes in the above category which could impact within the Suffolk Coastal District at relevant locations”.

- Page 40, Section 3.7.5 – insert the following as points 11, 12 and 13:-

11. B T & D Hewlett Packard Limited. Whitehouse Road, Ipswich – within Ipswich Borough (Part A Authorised Process).

12. Manganese Bronze Limited, Hadleigh Road, Ipswich - within Ipswich Borough (Part B Authorised Process).

13. Redland Limited, Flixton Park, Flixton – within Waveney District (Part B Authorised Process).

- Page 41, Section 3.7.8 –

Replace: “... There are ten Part I Authorised (A & B) Processes within 10km of the Suffolk Coastal District which need to be considered”.

With: “... There are thirteen Part I Authorised (A & B) Processes within 10km of the Suffolk Coastal District which need to be considered”.

- Page 42, Section 3.7.8 – insert the following as points 11, 12 and 13:-

11. Hewlett Packard Limited which operates an inorganic chemical process. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of PM₁₀ and **further review and assessment will not be necessary.**

12. Manganese Bronze Limited which is a copper alloy foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of PM₁₀ and **further review and assessment will not be necessary.**

13. Redland Limited which is a roadstone coating and cement batching plant/site. This process has been investigated by Waveney District Council and found not to be a potential significant source of PM₁₀ and **further review and assessment will not be necessary.**

- Page 45, Section 4.1 – insert the following as point 2 under Carbon Monoxide:-

2. A segment of the A14 trunk road from the junction with the A12 to beyond the Orwell Bridge which has a projected annual average daily traffic flow of greater than 50,000 at the end of the year 2005.

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EXECUTIVE SUMMARY

As part of the requirements of Part IV of the Environment Act 1995 (the Act), the Government has adopted the United Kingdom Air Quality Strategy as a statement of its policies with respect to the assessment and management of quality of air. The Strategy represents a comprehensive approach to maintaining and improving the quality of ambient air in the United Kingdom. It sets health-based air quality standards and air quality objectives, which it is intended should be achieved by the end of 2005, and the process by which those objectives will be achieved.

National policies on air pollution are expected to deliver a significant improvement in air quality throughout the country. The Strategy recognises, however, that there is an important local dimension to air quality. In some locations, air quality problems occur because of local factors such as density of traffic, geography or topography. Such hotspots require a more focused approach to ensure their elimination.

Local authorities are required to carry out periodic reviews of air quality in their areas, and to assess present and likely future quality against the air quality prescribed in the Air Quality Regulations 1997. These Regulations set objectives for seven key pollutants: Benzene, 1,3-Butadiene, Lead, Carbon Monoxide, Nitrogen Dioxide, Sulphur Dioxide and Particulates (PM₁₀). Where the objectives are not likely to be achieved by the end of 2005, an authority is required to designate an Air Quality Management Area (AQMA), and prepare an action plan for improvements in air quality.

For practical purposes, the DETR has recommended a phased approach involving three stages. All local authorities should complete the first stage. The results of the first stage will indicate whether it is necessary to go on to the second stage. Similarly, the results of the second stage will indicate whether it is necessary to go on to the third stage. In general terms, all authorities should carry out an initial screening of industrial, transport and other sources of pollutants which have significant impacts within their boundaries.

In areas where levels of air pollutants are likely to be well below the levels contained in the air quality objectives, and are likely to remain low, it will not be necessary to undertake further, more detailed investigation. It should be noted, however, that subsequent review and assessments, undertaken at some future date, may indicate to the local authority that the second and third stage should be undertaken.

In areas identified by the first stage review and assessment as having the potential to experience elevated levels of pollutants, a second stage review and assessment is required. This further, second, stage should include the estimation, modelling or measurement of levels of pollutants in areas influenced by road transport, industrial, or other significant sources.

Suffolk Coastal District Council has undertaken a first stage review and assessment for all pollutants of concern as set out in the Air Quality Regulations 1997. The authority has compiled and collated information on the existing and proposed significant sources of pollutants of concern within the District. Significant pollutant sources outside the authority's area which could lead to an exceedence of the prescribed air quality objectives within the area have also been included. This document is Suffolk Coastal's report on the first stage review and assessment.

The conclusions of this first stage review and assessment are as follows:-

- ◆ The risk of exceedance of the air quality objective for Benzene and 1,3-Butadiene is negligible and no further action needs to be taken.
- ◆ The risk of exceedance of the air quality objective for Lead, Carbon Monoxide, Nitrogen Dioxide, Sulphur Dioxide and Particulates – PM10 is such that a second stage review and assessment will need to be undertaken to determine the risk more precisely.

For further information concerning this report, please contact:-

Environmental Services (Pollution Control)
Suffolk Coastal District Council
Melton Hill
Woodbridge
Suffolk
IP12 1AU

Telephone: 01394 444306

Fax: 01394 444354

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1. Introduction

1.1 General Background

Part IV of the Environment Act 1995 requires that local authorities periodically review and assess air quality within their area. Consideration must be given to present and likely future quality of air. In March 1997, the Government issued the United Kingdom National Air Quality Strategy and in December the Air Quality Regulations 1997 came into force. These prescribe the air quality objectives for seven key pollutants which it is intended should be achieved by the year 2005, and the process by which this should be achieved. The pollutants are detailed in Table 1 below:-

Table 1

A Summary of air quality objectives to be achieved in the United Kingdom by 2005

POLLUTANT	OBJECTIVE
1,3-butadiene	1 ppb running annual average
Benzene	5 ppb running annual average
Lead (Pb)	0.5 μgm^{-3} annual average
Carbon Monoxide (CO)	10 ppm running 8-hour average
Nitrogen dioxide (NO ₂)	150 ppb 1-hour average * 21 ppb annual average *
Sulphur dioxide (SO ₂)	100 ppb 15 minute average measured as the 99.9 th percentile *
Particulates (PM ₁₀)	50 μgm^{-3} running 24-hour average measured as the 99 th percentile*

* *provisional objectives subject to review in 1999*

When measuring air pollution, there are two common sets of units:

- Mass of pollutant per volume of air (usually micrograms per cubic metre, μgm^{-3}).
- Volume of pollutant per unit volume of air (usually parts per billion, ppb. Parts per million, ppm, are also used at higher concentrations, where 1ppm = 1000ppb).

In some cases, the National Air Quality Strategy uses a percentile compliance approach. This means, for example, that where the PM₁₀ objective is measured as the 99th percentile, the objective can be breached for four days in the year. This is in order to allow for social and cultural events, such as Bonfire Night.

The Strategy is an approach to maintaining and improving air quality levels in the United Kingdom. It is expected that national air pollution policies will reduce the levels of air pollutants in the country. In some cases, however, these policies will not be enough and, in these cases, local authorities have a role to play in achieving the set targets.

Where any objectives are not likely to be reached by 2005, then the local authority must designate an Air Quality Management Area and produce an action plan to improve the air quality.

In the “Framework for the Review and Assessment of Air Quality” (LAQM.G1 (97)) the Government recommends a phased approach to air quality assessments involving three stages, each increasing in scope and detail. All local authorities must complete the first stage, the results from which will indicate whether it is necessary to progress to the second stage and from thence to the third stage.

The review involves other local authorities and agencies and, in order to achieve this, the Suffolk Air Quality Management and Steering Groups have been established. This consists of environmental health, planning, County Council and District Council highway representatives, Environment Agency and Health Authority representatives.

1.2 First Stage Review and Assessment of Air Quality

This document is a report on the completion of Stage 1 of the review and assessment of air quality for Suffolk Coastal District Council.

At the start of this review, 302 individuals and organisations were consulted and invited to put across their general views and any specific locations/areas of interest they would like the local authority to consider. Each response has been given consideration in the review and assessment. A full list of consultees is shown in Appendix A. Twenty-three responses were received from this consultation and are summarised in the Appendix.

At the same time, a joint press release was issued by the Suffolk Borough and District Councils regarding the review and assessment.

The methodology used in compiling this report was in line with the following guidance from the Department of Environment, Transport & Regions:-

LAQM. G1 (97)	Framework for review and assessment of air quality
LAQM. TG1(98)	Monitoring for air quality reviews and assessments
LAQM. TG4 (98)	Pollutant Specific Guidance

For the Suffolk Coastal area, the following information was compiled for completion of the first stage review and assessment:

- Details of industrial sources regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised Processes;
- Details of significant transport-related sources within the local authority’s area, including annual average daily traffic flow (AADT) predictions for any existing or proposed roads at present and for 2005;
- Details of any other existing or proposed sources of pollutants;
- Details of any significant sources in neighbouring areas (within 10km of Suffolk Coastal District Council) to include Part I prescribed processes;
- A list of the largest employers within Suffolk Coastal District;
- Details of any relevant air quality monitoring undertaken by Suffolk Coastal District Council or other bodies;
- Details of any large scale planned developments in the Suffolk Coastal area by 2005. Where any future developments are proposed which could impact on the air quality in the Suffolk Coastal District, an assessment will be made at the time of the planning application as to whether any breaches of air quality objectives will occur.

The information was collated using the following sources –

- Guidance documents, from the Department of Environment, Transport & Regions;
- Registers of Part A and Part B processes authorised under Part I of the Environmental Protection Act 1990, held by Suffolk Coastal District Council;
- Traffic flow data held by the Department of the Environment and Suffolk County Council Environment & Transport Section;
- Neighbouring local authorities;
- The Environment Agency;
- The Planning & Leisure Department, Suffolk Coastal District Council;
- Suffolk Coastal Directory of Businesses;
- The National Air Quality Archive, Department of Environment, Transport and the Regions;
- Traffic Air Quality Monitoring Reports (1998) for five sites (reports held at Environmental Services Department, Suffolk Coastal District Council);
- Suffolk Coastal District Council, Environmental Services Department;
- Pollutant specific information from the Expert Panel on Air Quality Standards, Department of the Environment.

For all existing and proposed activities identified, those which have the potential, singly or together, to emit significant quantities of the pollutants of concern; and which are expected to be in existence or in operation by the end of the year; and for which there is a potential for exposure of individuals in “relevant locations” will need further review and assessment under Stage 2.

2. **Description of the Suffolk Coastal District**

Suffolk Coastal District Council is one of seven local authorities within the administrative County of Suffolk. The district is located on the east coast of Suffolk and is bordered by five local authorities; anti-clockwise from the north, these are – Waveney District Council, Mid-Suffolk District Council, Ipswich Borough Council and Babergh District Council in Suffolk, and Tendring District Council in Essex.

Suffolk Coastal, at present, consists of 117 mostly rural parishes, see Map 1, covering an area of 88,938 hectares and has an estimated population of 118,700.

The district is renowned for its large areas of countryside and coastline. Shingle beaches line the coast from Walberswick in the north to Felixstowe in the south, with the Alde-Ore, Blyth, Deben and Orwell estuaries stretching deep inland, the coastal heathlands contrasting with the farmland to the north and west where the soil is heavier.

The A12 trunk road forms the backbone of the road network, running north-south through the district, with access being provided to the rest of the area by various distributor roads. The A12 and A14 trunk roads are the major links to the rest of the country. With improved road and rail communications and London just over an hour away, the district is rapidly becoming a sought after place in which to live and work and, as such, is still under intense growth pressures.

From the maps in Appendix B, annual average daily traffic flow measurements can be seen. The maps show segments of road within the Suffolk Coastal District with annual average daily traffic flows of over 20,000 (Map B-6), over 25,000 (Map B-8) and over 50,000 vehicles (Map B-5). These maps show the current measurements for 1996 and predicted measurements for the end of the year 2005.

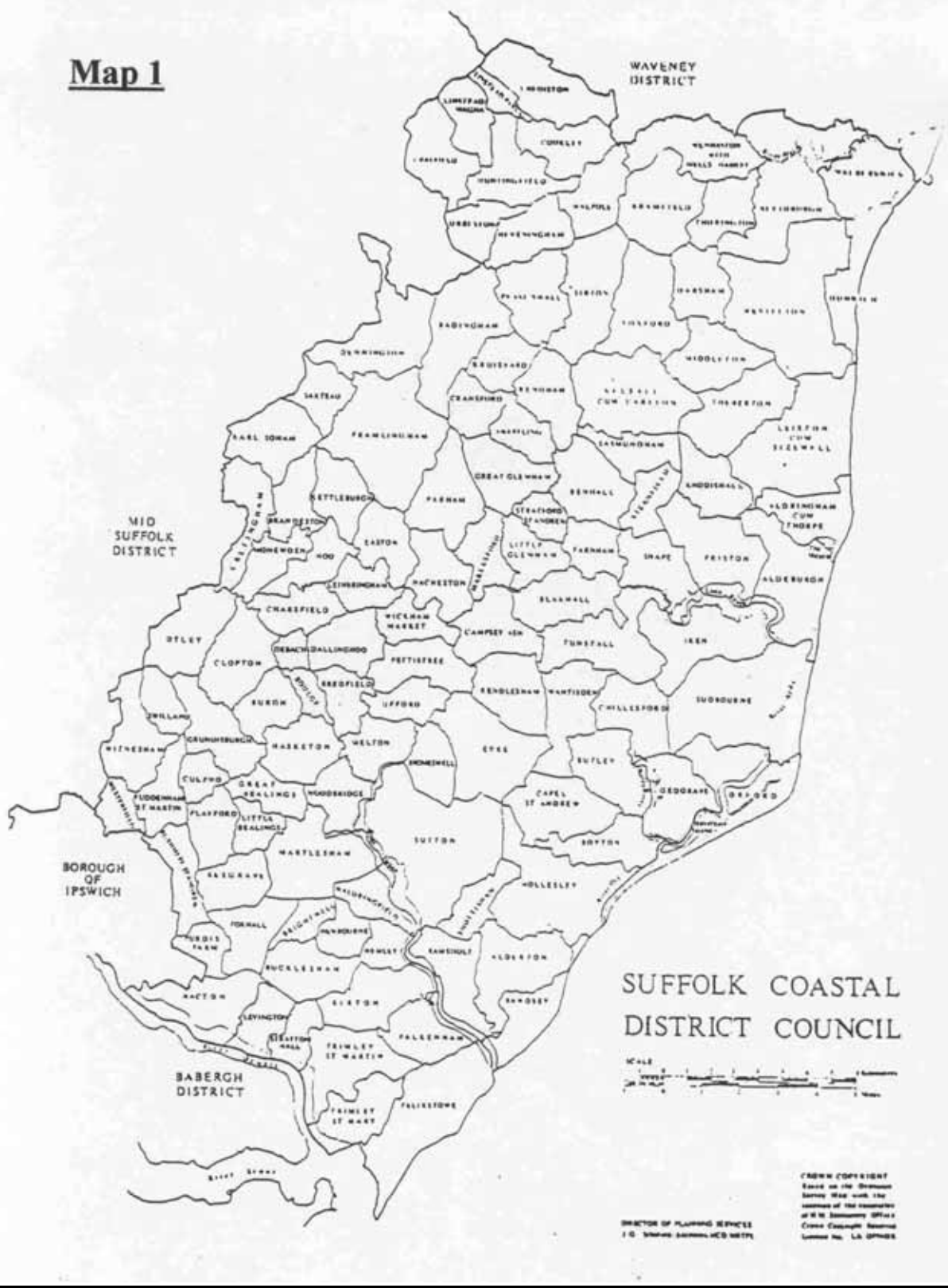
The settlements of the area vary greatly in size, form and character from tiny hamlets in the countryside to the more urban centres and towns. About one third of the population live in parishes of less than 500 people. The towns of the district are identified as: Aldeburgh, Felixstowe, Framlingham, Ipswich fringe (Suffolk Coastal part), Leiston, Saxmundham and Woodbridge (with part of Melton).

Ipswich is the largest town in Suffolk and it functions as a regional centre and County Town. Parts of the built-up area of Ipswich continue into the Suffolk Coastal District and there are substantial housing areas under construction on this urban fringe, such as Grange Farm, Kesgrave and Warren Heath, Purdis Farm.

Employment in the district is widely spread with numerous small firms, companies or “pockets” of employment in villages or the countryside such as redundant airfields. The only concentrations of employment occur in the larger towns of Felixstowe, Woodbridge and Leiston.

Listings and locations of all industrial processes authorised under Part I of the Environmental Protection Act 1990 in and within 10 km of the Suffolk Coastal District can be seen in Appendix B, Map B-1.

Map 1



There are currently two proposals for major development within the Suffolk Coastal District that could affect air quality: a civilian airport, and general industrial development of 67.07 hectares within Felixstowe.

Independent consultants appointed by the Council have advised that, by the year 2005, the proposed airport development will not emit pollutants in such concentrations to exceed the National Air Quality Standards. The General Industrial development has not been assessed for its contribution on the Technical Base to Local Air Quality as specific industrial uses have not been identified and are unknown at this time. It is envisaged that this will be considered in the further reviews of air quality requested by the Environment Act 1995.

Both proposals are not yet at a stage where any review would be appropriate to include in this report. It is anticipated that any approval attached to Planning Consents (if granted) would take account of the impact upon air quality and would, therefore, be conditioned accordingly. Obviously, this impact would be accounted for in future reviews and assessments and form part of the Council's ongoing Air Quality Strategy which must, by necessity, remain dynamic in nature.

3. Review and Assessment of the Pollutants of Concern

3.1 Review and Assessment of Benzene

3.1.1 Sources

The Benzene molecule is made up of 6 atoms of carbon arranged in a ring structure, to each of which is attached an atom of hydrogen. At normal ambient temperatures it is a liquid but it readily evaporates and small amounts are detectable in the atmosphere. Almost all benzene at ground level in the United Kingdom is likely to have resulted from human activities, in particular the use of petrol and oil (of which it is a major constituent). Nationally, the main source is from vehicle exhausts. The actual exhaust gases contain some unburned benzene from the fuel, but it is also formed as a by-product from the combustion of other petrol components. Benzene can also escape into the atmosphere via evaporation at distribution sources, for example – at filling stations. Other sources include cigarette smoking and low concentrations can be found in some foods and water.

Nationally, motor vehicles are the single most important source of benzene. In 1996, it accounted for 64% of the total United Kingdom annual emission of 41 kilotonnes. Most of this was emitted from petrol vehicles. Emissions from industrial sources make up a further 15% of the total.

The World Health Organisation estimate that cigarette smokers smoking twenty cigarettes a day have a greater daily benzene intake from the cigarettes than from urban ambient air, see Table 2 below:-

Table 2

Estimated daily intake of benzene* (expert panel of Air Quality Standards, Department of the Environment 1994)

Source	Benzene intake (μg)	Conversion to ppb ($\div 3.24$)
Ambient air – rural	15	5
Ambient air – urban	400	124
Cigarette smoke – 10 per day	300	93
Cigarette smoke – 20 per day	600	185
Food	100-250	31-77
Water	1-5	0.3-1.5

* Sources; 'ambient air' – Department of the Environment; (based on rural daily mean of 0.5 ppb and urban daily mean of 12.2 ppb at Exhibition Road, London. Intake calculated using the World Health Organisation method)
'smoke, food and water' – World Health Organisation.

3.1.2 Health Effects

Studies on the health effects of benzene have been undertaken on laboratory animals and on workers accidentally exposed to high levels. Accidental exposure of workers to high levels of benzene has been shown to increase the risk of developing certain types of leukaemia.

Studies in laboratory animals have shown similar effects and additionally indicate that benzene damages the genetic structure of cells.

3.1.3 National Perspective, Standards and Objectives

The Government has adopted a running annual average of 5 ppb as an air quality standard for benzene with an objective for the standard to be achieved by the end of 2005. This level should decrease the overall levels of exposure of the population so that, even in non-smokers, the level in ambient air is no longer the main source of an individuals exposure to benzene.

The Government expects existing national policies to deliver the prescribed air quality objective for benzene by the end of 2005. This will include roadside levels even at the most busy or congested roads. Only authorities with major industrial processes which either handle, store or emit benzene and which have the potential, in conjunction with other sources, to give elevated levels in relevant locations will be expected to undertake further review and assessment.

3.1.4 Current Sources and Levels of Benzene within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised, are shown in Appendix B, Map B-1. Those activities, which have a potential to emit significant quantities of benzene, can be seen on Map B-2 in Appendix B. There is one process in the above category within the Suffolk Coastal District, the Calor Gas Limited gasification works at Dock Road, Felixstowe (Part B authorised process).

The Government is currently funding research for the investigation of ambient levels of benzene in the vicinity of petrol stations (categorised under Part I of the Environmental Protection Act 1990 as Part B processes). Until the results of such research are made available, it is policy that petrol stations are not to be included in the current assessment according to the latest pollutant specific guidance (LAQM, TG4 (98)).

Background levels of benzene have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-1. These estimates show the entire Suffolk Coastal District with a background level of below 0.5 ppb benzene.

Air quality monitoring for benzene has been undertaken at a number of roadside sites by Suffolk Coastal District Council since April 1995, using passive diffusion tubes. Locations of these monitoring sites can be seen from Map B-9 in Appendix B. Tubes are exposed for the first two weeks in every month before being analysed for benzene levels. These figures are then used to give a running annual average level of benzene (in ppb). A summary of the running annual average concentrations are shown in Table 3 below. Results of the monthly sampling can be seen in Appendix D, Table D-1.

Table 3

Summary Table showing the Running Annual Average Benzene Concentrations recorded at 4 sites from 1995 to 1998 (figures in ppb Benzene)

SITE	1995	1996	1997	1998
Suffolk Place, Lime Kiln Quay Road, Woodbridge	2.1	2.6	2.6	2.2
Police Station, High Road West, Felixstowe	0.8	0.85	1.0	1.0
Outside 175 Main Road, Kesgrave	-	-	1.8	1.8
Cyds Café, High Street, Leiston	-	-	3.5	2.5

Additional monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of benzene levels at these locations. A summary of the results can be seen in Appendix E, Table E-1.

3.1.5 Current Sources from Neighbouring Areas

Locations of all Part I Authorised industrial processes in neighbouring areas, within 10 km of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of benzene can be seen on Map B-2 in Appendix B. There is one process in the above category, Carless Refining & Marketing Limited at Harwich Refinery, Parkeston, Harwich, within the Tendring District (Part A Authorised process) which could impact within the Suffolk Coastal District at relevant locations.

3.1.6 Planned Future Developments

Concerning planned developments of the above types of industrial processes; there is no information available at this time which indicates that any such sources are planned in the Suffolk Coastal locality.

3.1.7 Assessment of the levels of Benzene within the Suffolk Coastal District

- There is one Part I Authorised process within the Suffolk Coastal District: Calor Gas Limited gasification works at Dock Road, Felixstowe, which had the potential to emit significant quantities of benzene. Investigation into the solvents used in the process (which is to put the “smell” into calor gas) have shown that benzene is not actually used or formed as a by-product in the process. Thus, this activity will not have a significant effect on the air quality levels of benzene in Suffolk Coastal and **further review and assessment will not be necessary.**
- There is one Part I Authorised process within 10km of the Suffolk Coastal District: Carless Refining & Marketing Limited at Harwich Refinery, within the Tendring District. This is a secondary refinery which operates a petroleum process to manufacture industrial solvents, distillate fuels and light lubricating oils. This process has been identified by Tendring District Council as a potential source of benzene and will be investigated further by themselves in a second stage review and assessment. The nearest relevant location within Suffolk Coastal that could be effected by any emissions is the town of Felixstowe which is at a distance of approximately 4 km from this potential source of benzene.

- There are no planned developments of the above at this time.
- The background levels estimated by the National Environment Technology Centre show the whole of the Suffolk Coastal District to have levels below 0.5ppb.
- Results of benzene sampling undertaken between 1995 and 1998 show that, for all sites in each year monitored, levels are within the standard set by the Government (5 ppb as a running annual average).
- Results of one day sampling (for two hour periods) at five sites within Suffolk Coastal District during September 1998 show the levels of benzene to be relatively high at two sites; High Street, Leiston (during the afternoon) and Lime Kiln Quay Road, Woodbridge (during both the morning and afternoon). It should be noted, however, that the standard set by the Government is an annual mean and that no short term standard applies for benzene. Additionally, the benzene diffusion tube surveys (which are an annual mean) at both of these sites do not show an exceedance of the standard. These results, therefore, are indicative of the “worst case” scenario.

3.1.8 Conclusion

The review has identified one neighbouring activity, the Carless refinery in Harwich , as a potential source of benzene exposure to individuals in the Suffolk Coastal District and which is expected to be in existence by the end of the year 2005. Tendring District Council will be investigating benzene emissions from this process in a second stage review and assessment and their findings will be evaluated by Suffolk Coastal District Council.

Measurements taken at the roadside location in Felixstowe, the nearest relevant location at a distance of approximately 4 km, from this neighbouring source, within Suffolk Coastal District show measured levels of below 1.4 ppb benzene as a running annual average, within the standard set by the Government.

Levels of benzene have been estimated and monitored at sites within the Suffolk Coastal District. Background levels estimated by the National Environmental Technology Centre show the whole of Suffolk Coastal District to be below 0.5 ppb benzene and results from our diffusion tube monthly surveys (giving an annual mean) show actual roadside levels of benzene to be well within the standard.

These measured levels, and the fact that national policies are expected to deliver further reductions with regards to road traffic emissions, indicates that **the risk of the air quality objective for benzene being exceeded by the end of the year 2005 in the Suffolk Coastal District is considered negligible**. Accordingly, Suffolk Coastal District Council concludes that there is no need to consider an air quality management area for benzene.

3.2 Review and Assessment of 1,3-Butadiene

3.2.1 Sources

1,3-Butadiene is a chemical compound which, at ambient room temperature, is in the form of a gas. Trace amounts can be found in the atmosphere, all are solely derived from human activity. It is derived mainly from the combustion of petrol, diesel other fossil fuels and in accidental fires. Neither petrol nor diesel fuel actually contains 1,3-Butadiene – it is produced in the combustion process. It is also used in industry, mainly in the production of synthetic rubber for tyres, being handled in bulk at a small number of industrial locations in the United Kingdom. It is also present in cigarette smoke.

Other than in the vicinity of industrial locations handling 1,3-Butadiene in bulk, the main source in the UK atmosphere is the motor vehicle. The UK national atmospheric inventory for 1,3-Butadiene in 1995 showed that 67% of emissions were from petrol vehicles and 13% from industrial processes.

3.2.2 Health Effects

The data on health effects is limited mainly to studies on animals and accidental exposure of workers to relatively high levels of 1,3-Butadiene. From laboratory studies, it has been seen to cause a variety of cancers in rodents and damages the genetic structure of the cell. Workers exposed to high levels have shown, in the short term, irritation to the eyes, nose, throat and skin and a risk of other disorders such as diseases of the blood and nervous system. In the long term, a slightly higher than expected risk of cancers of the lymphoid system and bone marrow, lymphomas and leukaemia have been seen.

These studies, however, show the effects of a short exposure to a high level. The effects of long term, low-level exposure to 1,3-Butadiene on man have not yet been studied.

3.2.3 National Perspective, Standards and Objectives

The Government has adopted a running annual average of 1 ppb as an air quality standard for 1,3-Butadiene with an objective for the standard to be achieved by the end of 2005 in order to keep the atmospheric levels as low as practicable. The national monitoring data summary shows that the air quality standard is not currently exceeded at any urban background sites.

The Government expects existing national policies to deliver the prescribed air quality objective for 1,3-Butadiene by the end of 2005. Roadside levels next to even the most busy or congested roads are expected to be well below the air quality objective. Only authorities with major industrial processes which either handle, store or emit 1,3-Butadiene and which have the potential, in conjunction with other sources, to give elevated levels in relevant locations will be expected to undertake further review and assessment.

3.2.4 Current Sources and Levels of 1,3-Butadiene within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised, are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of 1,3-Butadiene can be seen

on Map B-3 in Appendix B. There are no processes in the above category within the Suffolk Coastal District.

Air quality monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of 1,3-Butadiene levels at these locations. A summary of the results can be seen in Appendix E, Table E-2.

3.2.5 Current sources from neighbouring areas

Locations of all Part 1 Authorised industrial processes in neighbouring areas within 10 km of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of 1,3-Butadiene can be seen on Map B-3 in Appendix B. There are no processes in the above category which could impact at relevant locations within the Suffolk Coastal District.

3.2.6 Planned Future Developments

Concerning planned developments of the above types of industrial processes; there is no information available at this time which indicates that any such sources are planned in the Suffolk Coastal locality.

3.2.7 Assessment of the levels of 1,3-Butadiene within the Suffolk Coastal District

- There are no Part I Authorised industrial processes within the Suffolk Coastal District which have the potential to emit significant quantities of 1,3-Butadiene.
- There are no Part I Authorised processes within 10 km of the Suffolk Coastal District which have the potential to emit significant quantities of 1,3-Butadiene.
- There are no planned developments of the above processes at this time.
- Results of one day air sampling (spot samples) at five sites within the Suffolk Coastal District during September 1998, show that 1,3-Butadiene was not detected. It should be noted, however, that the standard set by the Government is an annual mean and that no short term standard applies for 1,3-Butadiene.

3.2.8 Conclusion

The risk of the air quality objective for 1,3-Butadiene being exceeded by the end of the year 2005 in the Suffolk Coastal District is considered negligible. Accordingly, Suffolk Coastal District Council concludes that there is no need to consider an air quality management area for 1,3-Butadiene.

3.3 Review and Assessment of Lead

3.3.1 Sources

Lead is a naturally occurring metal found in the Earth's crust and is released naturally by such processes as weathering, volcanic activity and uptake and release by plants. It is, however, also released into the atmosphere by human activities through the mining and smelting of its ores; the production, use, recycling and disposal of lead containing products; and through the burning of fossil fuels.

It is one of the most widely used metals and has many industrial applications, both in its elemental form and in alloys and compounds. Some of the largest industrial uses are in the manufacture of batteries, as a pigment in paints and glazes, tank lining and piping, and in alloys, plastics and ammunition. Lead is also widely used in organic compounds, its major use is as a petrol additive. This use is responsible for most of the current UK lead emissions, from petrol-engined motor vehicles, as shown in Table 4.

Petrol-engined motor vehicles are currently the greatest source of atmospheric lead in the United Kingdom, emitting 894 tonnes in 1996, followed by sources from industrial usage. See Table 4.

Direct human exposure to lead occurs not only through inhalation of particulate lead in the air, but also through ingestion of contaminated food, water and dust and from occupational sources. The main source of intake for most people is via food and this can be decreased by thorough washing of food before eating.

Table 4
UK Emissions of Lead in 1996
(review and assessment: pollutant specific guidance, DETR, August 1998)

Source Sector	Emission (tonnes)
Road Transport	894
Non-ferrous metal	191
Iron and steel	65
Waste Treatment & Disposal	45
Public Power (waste)	35
Public Power (coal and oil)	34
Other Combination in Industry	22
Residential Plant	17
Other Transport	17
Glass	14
Sinter Plant	10
Cement	6
Other	7
TOTAL	1357

3.3.2 Health Effects

Lead can be absorbed into the body through the lungs and through the stomach and intestines, therefore, the risk of exposure comes from many sources.

Studies over the centuries on the effects on workers exposed to high levels of lead have shown that it has severe adverse effects on the blood, nervous system and kidneys.

Of greater concern, however, are the more subtle effects seen through long-term exposure to lower levels of lead, as found in drinking water, food and in the ambient air. Once absorbed, lead accumulates, particularly in the bone, teeth, skin and muscle where it is very stable, it is released over months or years into the blood from where it exerts its effects. Studies have shown that lead has adverse effects on the developing brain of children (who seem to be more susceptible than adults) and, thus, on intellectual development leading to lower intelligence quotient (IQ) levels.

3.3.3 National Perspective, Standards and Objectives

The Government has adopted an annual average of $0.5 \mu\text{g}/\text{m}^3$ as an air quality standard for lead with an objective for the standard to be achieved by the end of 2005. This standard is set to protect against the critical health effect on the intelligence of children through long-term lead exposure. This level will also prevent other toxic effects linked with higher lead exposures.

During the 1970s and early 1980s, the lead content of petrol was gradually decreased and in 1986 the maximum permissible lead content of leaded petrol was dropped to 0.15g/l which caused a halving of urban lead levels in air within a few months. This was reinforced by the introduction of unleaded petrol in 1987 and that, since 1993, all new petrol engined cars must have catalytic converters and, therefore, must run on unleaded petrol.

Following the reductions in the lead content of petrol, urban levels have decreased so that the maximum annual average values (highest seen at Cromwell Road, West London) are now in the order of $0.15 \mu\text{g}/\text{m}^3$. Rural values are much lower, ranging from $0.005 \mu\text{g}/\text{m}^3$ to $0.05 \mu\text{g}/\text{m}^3$. Levels are seen to be higher in the vicinity of industrial processes that emit lead, ranging from about 0.1 to $0.4 \mu\text{g}/\text{m}^3$.

The Government expects existing national policies to deliver the prescribed objective for lead at all rural, urban background sites and roadside locations by the year 2005. Only local authorities with significant industrial sources, which have the potential to result in elevated levels of lead in relevant locations, will be expected to undertake further review and assessment.

3.3.4 Current sources and levels of lead within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised, are shown in Appendix B, Map B-1. Those activities which have, the potential to emit significant quantities of lead can be seen on Map B-4 in Appendix B. There is one process in the above category, D J Spall's furnace for the extraction of non-ferrous metals from scrap at Church Farm, Dallinghoo (Part B authorised process).

The existence of industrial or other sites with non-prescribed processes with the potential to emit significant quantities of lead within the Suffolk Coastal District was also considered. Shooting Clubs, container refurbishments, potteries and ship-building yards were investigated.

Background levels of lead have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-2. These estimates show the majority of the Suffolk Coastal District to have a background level of 10-20 ng/m³ (0.01-0.02 µg/m³) with the exception of the corridor along the A14 running down into, and including, Felixstowe where the levels are 20-40 ng/m³ (0.02-0.04 µg/m³).

Air quality monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of lead levels at these locations. A summary of the results can be seen in Appendix E, Table E-3.

3.3.5 Current sources from neighbouring areas

Locations of all Part 1 Authorised industrial processes in neighbouring areas, within 10km, of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of lead can be seen on Map B-4 in Appendix B. For the review and assessment of lead, the pollutant specific guidance from the Department of Environment, Transport & Regions (LAQM. TG4 (98)), states that it is only large Part A processes in neighbouring areas which could impact within the District should be considered as potential significant emitters of lead. There are two processes in the above category which could impact upon the Suffolk Coastal District at relevant locations:-

1. Carless Refining & Marketing Limited at Harwich Refinery, Parkeston, Harwich, within the Tendring District (Part A Authorised process).
2. B T& D, Hewlett Packard Limited, Whitehouse Road, Ipswich, within the Ipswich Borough (Part A Authorised process).

3.3.6 Planned Future Developments

Concerning planned developments of the above types of industrial processes, there is no information available at this time which indicates that any such sources are planned in the Suffolk Coastal locality.

3.3.7 Assessment of the level of lead within the Suffolk Coastal District

- ◆ There is one Part I Authorised process within the Suffolk Coastal District – D J Spalls furnace at Church Road, Dallinghoo. Investigation into the process reveals that they extract aluminium only from scrap metal – lead is not used in this process. Thus, **this activity will not have a significant effect on the air quality levels of lead in Suffolk Coastal and further review and assessment will not be necessary.**
- ◆ All of the non-prescribed processes and other sites with the potential to emit lead are not considered, in our opinion, to be significant emitters of lead in relevant locations **and further review and assessment will not be necessary.**

- ◆ There are two Part I Authorised processes within 10km of the Suffolk Coastal District:-
 1. Carless Refining & Marketing Limited, this is a secondary refinery which operates a petroleum process to manufacture industrial solvents, distillate fuels and light lubricating oils. This process has been identified by Tendring District Council as a potential source of lead and will be investigated further by themselves in a second stage review and assessment. The nearest relevant location within Suffolk Coastal that could be affected by any emissions is the town of Felixstowe, which is at a distance of approximately 4km from this potential source and **further review and assessment will be necessary.**
 2. Hewlett Packard Limited, within the Ipswich Borough, at Whitehouse Road, Ipswich. This is an inorganic chemical process which does not use lead and has, therefore, not been identified by Ipswich Borough Council as a potential source of lead. **Further review and assessment will not be necessary.**
- ◆ There are no planned developments of the above at this time.
- ◆ The background levels estimated by the National Environment Technology Centre show the whole of the Suffolk Coastal District to have levels below 40 ng/m³ (0.04 µg/m³), with the majority actually below 20 ng/m³ (0.02 µg/m³). Results of one day air sampling (for two hour periods) at five sites within Suffolk Coastal District during September 1998 show the levels of lead to be relatively high at all of the sites. It should be noted, however, that the standard set by the Government is an annual mean and that no short term standard applies for lead.

3.3.8 Conclusion

The review has identified one neighbouring activity: the Carless Refinery in Tendring District Council, as a potential source of lead for the Suffolk Coastal District for which there is a potential for exposure to individuals at relevant locations, and which is expected to be in existence by the end of the year 2005. Tendring District Council will be investigating lead emissions from this process in a second stage review and assessment.

Within Suffolk Coastal District, the town of Felixstowe is the nearest relevant location, at a distance of approximately 4km and, as such, will need to be considered when the findings of Tendring District Council are known.

For this activity, with the town of Felixstowe in mind, there is a risk, therefore, of the air quality objective for lead being exceeded by the end of the year 2005 and the Carless Refinery emissions **will be investigated further in a second stage review and assessment** to determine the risk of exceedance of the objection more precisely.

3.4 Review and Assessment of Carbon Monoxide

3.4.1 Sources

Carbon monoxide is a colourless, odourless gas formed during the process of combustion, whether it be in a motor vehicle, domestic heating, cigarettes or forest fires. In the outside environment, the main source of carbon monoxide in the United Kingdom is from road transport, which accounted for 71% of total emissions of 4.6 Megatonnes in 1996. This percentage will be higher in most cities and near busy and congested roads. In the indoor environment, exposure can occur at high levels from gas cookers and fuel burning heaters, especially if they are poorly maintained. Another major source of personal exposure to some people is the smoking of cigarettes.

3.4.2 Health Effects

Of all the pollutant gases, carbon monoxide is one of the most dangerous since it can, and does, cause death. Carbon monoxide will combine with the haemoglobin in the blood, and more readily so than oxygen, therefore, it exerts its effects by reducing the blood's capacity to transport oxygen to the body, and especially the brain. The reaction is reversible and exposure to unpolluted air will remove most of the carbon monoxide from the body, albeit slowly.

Studies have shown that exposure to high levels of carbon monoxide in the air can lead to tiredness, unconsciousness and even death. In some who recover from carbon monoxide poisoning, brain damage can be demonstrated. At lower levels, as seen in the ambient atmosphere, there may be an increased risk of associated problems in individuals with diseases of the coronary arteries, due to the amount of blood reaching the heart muscle being already reduced. In healthy people, carbon monoxide exposure can lead to a reduction in the time it takes to reach maximal exertion, eg – it can decrease performance in athletes.

3.4.3 National Perspective, Standards and Objectives

The Government has adopted an 8-hour running average of 10 ppm as an air quality standard for carbon monoxide with an objective for the standard to be achieved as the maximum 8-hour running average by the end of 2005. The 8-hour running average has been chosen as road transport vehicles constitute the main percentage of total emissions and the 8 hours will cover the peak concentrations at rush hours. This standard will limit the exposure of the population (non-smokers), including those who are particularly susceptible to the effects of carbon monoxide.

The Government expects existing national policies to deliver the national air quality objective by the end of the year 2005, with the possible exception in some years of the near vicinity of heavily trafficked roads or in the vicinity of certain stationary sources. Only those authorities with such sources, which have the potential to result in elevated levels of carbon monoxide in relevant locations, will be expected to undertake further review and assessment.

3.4.4 Current Sources and Levels of Carbon Monoxide within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised, are shown in Appendix B, Map B-1. Those

activities which have the potential to emit significant quantities of carbon monoxide can be seen on Map B-5 in Appendix B. There are no processes in the above category within the Suffolk Coastal District.

For the review and assessment of carbon monoxide, the pollutant specific guidance from the DETR (LAQM. TG4(98)) states that it is only those existing or planned roads within a projected annual average daily traffic flow (AADT) measurements of greater than 50,000 by the end of the year 2005 which should be considered a potential significant source of carbon monoxide. The carbon monoxide specific map in Appendix B, Map B-5, shows those segments of road within the Suffolk Coastal District with current annual average daily traffic flow (AADT) measurements of over 50,000 vehicles and predictions of AADT for the end of 2005.

Background levels of carbon monoxide have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-3. These estimates show the majority of the Suffolk Coastal District to have a background level of below 0.2 ppm, with the exception of an area of the district bordering Ipswich Borough, which has a background level of 0.21-0.3 ppm carbon monoxide.

Air quality monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of carbon monoxide levels at these locations. A summary of the results can be seen from Appendix E, Table E-4.

3.4.5 Current sources from neighbouring areas

Locations of all Part I Authorised industrial processes in neighbouring areas within 10 km of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of carbon monoxide can be seen on Map B-5 in Appendix B. There are four processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-

1. British Sugar plc, Sproughton Road, Ipswich – within the Babergh District (Part A Authorised Process).
2. Ipswich Hospital, Heath Road, Ipswich – within Ipswich Borough (Part A Authorised Process).
3. Delta Manganese, Hadleigh Road, Ipswich – within Ipswich Borough (Part A Authorised Process).
4. Cranes Limited, Nacton Road, Ipswich - within Ipswich Borough (Part B Authorised Process).

3.4.6 Planned Future Developments

Concerning planned developments of the above types of industrial process and those which would increase annual average daily traffic flow rates to above 50,000; there is no information available at this time which indicates that any such sources are planned in the Suffolk Coastal locality.

3.4.7 Assessment of the levels of Carbon Monoxide within the Suffolk Coastal District

- ◆ The pollutant specific guidance from the DETR states that, for the review and assessment of Carbon Monoxide, only 'Part A' Authorised processes with the potential to emit significant quantities of Carbon Monoxide should be considered in the Stage 1 review and assessment.

There are no Part I, 'Part A' Authorised industrial processes within the Suffolk Coastal District which have the potential to emit significant quantities of carbon monoxide.

- ◆ There are four Part I Authorised processes within 10 km of the Suffolk Coastal District, of these four, only three are 'Part A' processes and, therefore, need to be considered, these are:-
 1. British Sugar plc, combustion process. This process has been identified by Babergh District Council as a potential source of carbon monoxide which could impact in relevant locations. Although British Sugar plc is approximately 4 km from the Suffolk Coastal boundary, prevailing wind direction and adverse weather conditions could ground the emission plume from the works within the Suffolk Coastal District at relevant locations and **further review and assessment will be necessary.**
 2. Ipswich Hospital, which runs a clinical waste incinerator. This process has been identified by Ipswich Borough Council as a potential source of carbon monoxide which could impact in relevant locations. As the Ipswich Hospital site is approximately 500m from the Suffolk Coastal boundary, and housing lies approximately 1 km from the site within the Suffolk Coastal District at Rushmere St Andrew, there is a potential for exposure to individuals and **further review and assessment will be necessary.**
 3. Delta Manganese, who operate a copper-alloy foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of carbon monoxide and **further review and assessment will not be necessary.**
- ◆ Suffolk County Council, as Highways Authority, have calculated one segment of road within the Suffolk Coastal District which is predicted to have a growth in traffic to over 50,000 vehicles (annual average daily traffic flow) by the end of the year 2005; the section of the A14 from the junction with the A12 to beyond the Orwell Bridge, see Map B-5 in Appendix B. As residential properties lie close (within 200m) to the A14, there is a potential for exposure to individuals and **further review and assessment will be necessary.**
- ◆ There are no planned future developments for the above types of industrial processes or those which would increase AADT to above 50,000 at this time.
- ◆ The background levels estimated by the National Environment Technology Centre show the whole of the Suffolk Coastal District to have levels of carbon monoxide below 0.3 ppm, with the majority actually below 0.2 ppm.

- ◆ Results of one day air sampling (spot samples only) at five sites with the Suffolk Coastal District during September 1998 show the levels of carbon monoxide to be within the standard set by the Government at all sites. It should be noted, however, that the standard set by the Government is an eight-hour running average and that no short-term standard applies for carbon monoxide.

3.4.8 Conclusion

The review has identified activities which have the potential to emit significant quantities of carbon monoxide which are expected to be in existence by the end of the year 2005 and for which there is a potential for exposure to individuals at relevant locations within the Suffolk Coastal District. These are:-

- ◆ Two sites regulated under Part I of the Environmental Protection Act 1990, Part A Authorised processes within 10km of the Suffolk Coastal District:-
 1. British Sugar plc, Ipswich.
 2. Ipswich Hospital, Ipswich.
- ◆ A segment of the A14 trunk road from the junction with the A12 to beyond the Orwell Bridge which has a projected annual average daily traffic flow of greater than 50,000 at the end of the year 2005.

For these activities, there is a risk, therefore, of the air quality objective for carbon monoxide being exceeded at relevant locations by the end of the year 2005 and they will be investigated further in a second stage review and assessment to determine the risk of exceedance of the objection more precisely.

3.5 Review and Assessment of Nitrogen Dioxide

3.5.1 Sources

Nitrogen Dioxide (NO₂) is a gas produced by the reaction of nitrogen and oxygen in combustion processes in air. The reaction usually takes place in two stages: firstly to form nitrogen oxide (NO) and then over time this is oxidised to give NO₂. NO and NO₂ are always found together and are collectively known as NO_x (oxides of nitrogen). There are many natural sources of NO_x in the atmosphere, including: lightning, forest fires, soil bacterial activity and plant metabolism. However, the largest source is from human activity – the combustion of fossil fuels such as those found in petrol, oil, coal and gas. The main sources of the 2.2 million tonnes of NO_x emitted in the United Kingdom in 1995 were road transport (46%) and power generation (22%), which can be seen in Table 5 below. In urban areas, the proportion of local emissions due to road transport will be larger.

Sources of indoor exposure for individuals to NO_x are gas cooking, paraffin heaters and cigarette smoke.

Table 5
United Kingdom emissions of NO_x in 1995

Source	Emissions in kilotonnes (rounded to nearest kilotonne)	Percentage of total in 1995 (rounded to nearest %)
Road Transport	1062	46
Power Stations	498	22
Domestic	66	3
Commercial/public service	35	2
Refineries	47	2
Iron and steel	48	2
Other industrial combustion	145	6
Non-combustion processes	2	<1
Extraction and distribution of fossil fuels	112	5
Railways	21	1
Civil Aircraft	16	1
Shipping	114	5
Military	41	2
Off-road	81	4
Waste treatment and disposal	5	<1
Agriculture	2	<1
TOTAL	2293	100

Once formed, NO₂ reacts chemically in the atmosphere, contributing to the formation of ozone, photochemical smog, nitric acid and nitrates (both of which can be removed by the scrubbing action of rain, causing acid rain deposition). Nitrates can also remain in the air as

very small particles which disperse widely and contribute to the airborne concentrations of small particles known as PM₁₀ (see later).

3.5.2 Health Effects

Nitrogen oxide (NO) is produced naturally by cells in the lungs and respiratory tract and is not harmful to man when inhaled at the concentration likely to occur in the ambient atmosphere. Nitrogen dioxide (NO₂), however, is an irritant gas which is known to have serious and sometimes fatal effects if inhaled at very high concentrations. Studies from industrial accidental exposure to high levels of NO₂ show that it can cause very severe lung damage and is often fatal. There is now also evidence that NO₂ has more subtle adverse effects on health at the much lower exposure levels which can occur in the ambient atmosphere, both indoors and outdoors. People with healthy lungs show little response to NO₂ at levels well above those in the ambient air, however, people with asthma show airway problems at much lower levels. Thus, ambient air concentrations of NO₂ have been seen to intensify symptoms associated with respiratory illness and possibly increase reactivity to natural allergies.

3.5.3 National Perspective, Standards and Objectives

The Government has adopted a 1-hour average of 150 ppb as an air quality standard for Nitrogen dioxide with an objective for the standard to be achieved as the hourly maximum by the end of 2005. **The Government has also adopted an annual average of 21 ppb as an air quality standard for Nitrogen dioxide** with an objective to achieve this by the end of 2005. The application of these two differing standards is set to protect against both short-term, high-level exposure and long-term exposure to much lower levels of NO₂.

NO₂ is produced by the oxidation of NO in the atmosphere and the relationship between the levels of NO_x and resulting concentrations of NO₂ are very complex. The level will depend on the amount of NO₂ itself actually emitted and the availability of an oxidant (particularly ozone) to change NO to NO₂. With this in mind, exceedances of the 1-hour Government objective will be likely during winter episodes of poor dispersion due to stagnant, cold weather conditions and during summer episodes of abundant oxidants ("low level" ozone needs sunlight for its formation).

The general policy objective for NO₂ is to decrease ambient air levels so that annual average levels are kept continuously low and peak episodes are avoided. It is estimated that emission reductions in the region of 46-62% on 1995 levels (see Table 5) will be needed to achieve these objectives by the end of 2005. Results of analysis set out in the National Air Quality Strategy suggest that, although existing and proposed measures will produce the bulk of the decrease, the air quality objectives will not be met. It is estimated that a further reduction of 5-10% over and above that achieved by national measures will be required.

Local authorities with major roads, or highly congested roads, which have the potential to result in elevated levels of NO₂ in relevant locations will need to progress to the second or third stage review and assessment for this pollutant.

3.5.4 Current sources and levels of nitrogen dioxide within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised, are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of NO₂ can be seen on Map B-6 in Appendix B. There are three processes in the above category within the Suffolk Coastal District:

1. Sizewell A Power Station, Sizewell, Leiston (Part A Authorised process).
2. Sizewell B Power Station, Sizewell, Leiston (Part A Authorised process).
3. Calor Gas Limited, Felixstowe Terminal, Dock Road, Felixstowe (Part B Authorised process).

For the review and assessment of NO₂, the pollutant specific guidance from the DETR (LAQM. TG4(98)) states that it is only those existing or planned roads with a projected AADT of greater than 20,000 by the end of the year 2005 which should be considered a potential significant source of NO₂. The nitrogen dioxide specific map in Appendix B, Map B-6 shows those segments of road within the Suffolk Coastal District with current annual average daily traffic flow (AADT) measurements of over 20,000 vehicles and predictions of AADT for the end of 2005.

Background levels of nitrogen dioxide have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-4. These estimates show the majority of the Suffolk Coastal District to have a background level of 5.1-10 ppb with the exception of the corridor along the A14 running down into, and including, Felixstowe where the levels are 10.1-15 ppb.

Air quality monitoring for NO₂ has been undertaken at a number of sites by Suffolk Coastal District Council since March 1993 using passive diffusion tubes. From March 1993 to April 1997, there was only one set of four monitoring sites at Felixstowe. There are now sites at four towns in the district: Felixstowe, Kesgrave, Woodbridge and Leiston. Locations of all sites can be seen from Map B-9 in Appendix B. At each of these sites there are four detector tubes: one kerbside/roadside tube; one intermediate tube (approximately 20-30m from the kerbside); and two background tubes (50m from a busy road). Requirements for the siting of tubes are supplied by the NO₂ National Survey. The survey includes four sites designated as “kerbside”, “intermediate” and “background” by virtue of their locations.

NO₂ detector tubes are exposed at the beginning of every month, for one month, and are then analysed for NO₂ levels. These figures are used to give an annual average of NO₂ (in ppb). A summary of the annual average concentrations are shown in Table 6 below. Results of the monthly sampling can be seen in Appendix D, Tables D-2 to D-4.

Table 6

Summary Table showing annual average NO₂ concentrations recorded at 16 sites from 1993 to present (figures in ppb NO₂)

SITE	1993	1994	1995	1996	1997	1998
Felixstowe Kerbside – High Road West	20.5	27.0	24.1	24.9	14.7	18.5
Felixstowe Intermediate – High Road West	18.8	21.2	18.8	18.2	13.1	14.9
Felixstowe Background – Princes Gardens	14.6	17.4	14.6	15.0	12.8	16.4
Felixstowe Background – Lynwood Avenue (was Ranelagh Road)	14.9	17.0	15.5	15.1	13.0	15.7
Kesgrave Kerbside – Main Road	-	-	-	-	10.7	15.8
Kesgrave Intermediate – Main Road	-	-	-	-	7.4	12.4
Kesgrave Background – Knights Lane	-	-	-	-	7.2	11.8
Kesgrave Background – Kesgrave High School	-	-	-	-	6.6	11.7
Woodbridge Kerbside – Lime Kiln Quay Road	-	-	-	-	11.9	13.6
Woodbridge Intermediate – Thoroughfare	-	-	-	-	8.3	12.7
Woodbridge Background - Kingston Farm Road	-	-	-	-	7.0	11.6
Woodbridge Background – Farlingaye High School	-	-	-	-	7.1	11.0
Leiston Kerbside – High Street	-	-	-	-	11.7	14.2
Leiston Intermediate – High Street	-	-	-	-	7.5	10.8
Leiston Background – Farrow Close	-	-	-	-	7.4	10.2
Leiston Background – Leiston High School	-	-	-	-	4.8	8.9

Additional monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of NO₂ levels at these locations. The measurements were taken over two hour periods during the morning and afternoon at peak rush hours. A summary of the results can be seen in Table 7 below:-

Table 7

Summary Table showing air quality results for nitrogen dioxide (levels measured over approximately 2 hour periods) taken during September 1998

SITE	DATE	TIME	NO₂ LEVEL (ppb)
High Road West, Felixstowe (Car Park)	22.09.98	0803 – 1003 1550 – 1750	7.99 12.78
High Road West, Felixstowe (Police Station)	22.09.98	0756 – 1956 1545 – 1748	5.66 6.27
Friday Street, Rendlesham (car park)	24.09.98	0758 – 0958 1549 – 1749	11.86 11.98
Friday Street, Rendlesham (lane)	24.09.98	0755 – 0955 1547 – 1747	11.5 13.57
Main Road, Kesgrave (A1214)	28.09.98	0750 – 0950 1444 – 1623	14.5 15.66
Main Road, Kesgrave (school layby)	28.09.98	0753 – 0953 1444 – 1620	11.3 20.6
High Street, Leiston (Sizewell Road)	23.09.98	0803 – 1003 1545 – 1745	14.35 15.39
High Street, Leiston (High Street)	23.09.98	0805 – 1005 1550 – 1750	16.7 20.57
Lime Kiln Quay Road, Woodbridge (traffic lights)	25.09.98	0800 – 1000 1553 – 1753	12.61 14.31
Lime Kiln Quay Road, Woodbridge (Thoroughfare)	25.09.98	0755 – 0955 1552 – 1752	20.88 28.73

3.5.5 Current sources from neighbouring areas

Locations of all Part I Authorised industrial processes in neighbouring areas within 10km of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of nitrogen dioxide can be seen on Map B-6 in Appendix B. There are six processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-

1. Carless Refining & Marketing Limited at Harwich Refinery, Parkeston, Harwich, within the Tendring District. (Part A Authorised process).
2. British Sugar plc, Sproughton Road, Ipswich, within the Babergh District. (Part A Authorised process).
3. Ipswich Hospital, Heath Road, Ipswich, within Ipswich Borough. (Part A Authorised process).
4. Delta Manganese, Hadleigh Road, Ipswich, within Ipswich Borough. (Part A Authorised process).
5. Blue Circle Industries, Claydon, Ipswich, within Mid-Suffolk District. (Part A Authorised process).

6. Fisons plc, Paper Mill Lane, Bramfield, Ipswich, within Mid-Suffolk District. (Part A Authorised process).

3.5.6 Planned Future Developments

Concerning planned future developments of the above types of industrial processes, there is no information available at this time which indicates that any such sources are planned in the Suffolk Coastal locality.

Concerning planned roads or developments which could affect existing roads to increase the annual average daily traffic flow rates to above 20,000 by the end of the year 2005, there is one segment of road that falls into this category – the A12 trunk road from the Woods Lane roundabout, Woodbridge, to the A1094 turn-off to Snape and Aldeburgh, see Map B-6 in Appendix B.

3.5.7 Assessment of the levels of NO₂ within the Suffolk Coastal District

- ◆ There are three Part I Authorised processes within the Suffolk Coastal District which need to be considered:
 1. **and 2.** Sizewell A and B Power Stations, Sizewell, Leiston. These processes involve the incineration of low level radioactive waste and the presence of large standby generators, should there be a power failure. Investigation into the processes reveals that the incinerator does not emit significant quantities of NO₂. The standby generators are not used unless in an emergency, and then not for any significant length of time. Therefore, they do not emit significant quantities of NO₂ into the atmosphere and therefore, this activity will not have a significant effect on the air quality levels of NO₂ in the Suffolk Coastal locality and **further review and assessment will not be necessary.**
 3. Calor Gas Limited, Felixstowe Terminal, Dock Road, Felixstowe. This process uses solvents to put the “smell” into Calor Gas. Investigation shows that the solvents which are used in this process would not cause NO₂ emissions from the premises. Thus, the activity will not have a significant effect on the air quality levels of NO₂ in the Suffolk Coastal District locality and **further review and assessment will not be necessary.**
- ◆ There are six Part I Authorised (A and B) processes within 10km of the Suffolk Coastal District which need to be considered:-
 1. Carless Refining & Marketing Limited at Harwich Refinery. This is a secondary refinery which operates a petroleum process to manufacture industrial solvents, distillate fuels and light lubricating oils. This process has been identified by Tendring District Council as a potential significant source of NO₂ which could impact in relevant locations. Although the nearest relevant location within Suffolk Coastal District is the town of Felixstowe, which is a distance of approximately 4km, prevailing wind direction and sufficient weather conditions could cause NO₂ emissions to reach the Suffolk Coastal District and thus **further review and assessment will be necessary.**

2. British Sugar plc in the operation of the combustion and vegetable drying processes. This process has been identified by Babergh District Council as a potential significant source of NO₂ which could impact in relevant locations. Although British Sugar plc is approximately 4km from the Suffolk Coastal boundary, it is a large premises and prevailing wind direction and sufficient weather conditions could ground the emissions plume from the works within Suffolk Coastal District at relevant locations and thus **further review and assessment will be necessary.**
 3. Ipswich Hospital which runs a clinical waste incinerator. This process has been identified by Ipswich Borough Council as a potential significant source of NO₂ which could impact in relevant locations. As the Ipswich Hospital site is approximately 500m from the Suffolk Coastal boundary and housing lies 1km from the site within the Suffolk Coastal District at Rushmere St Andrew, there is a potential for exposure to individuals and **further review and assessment will be necessary.**
 4. Delta Manganese which is a copper alloy foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of NO₂ and **further review and assessment will not be necessary.**
 5. Blue Circle Industries which is a cement process. This process is due to cease trading in May 1999 and will not be operating by the end of the year 2005 and **further review and assessment will not be necessary.**
 6. Fisons plc which is a process manufacturing chemical fertiliser. This process has been investigated by Mid Suffolk District Council and found not to be a potential significant source of NO₂ and **further review and assessment will not be necessary.**
- ◆ Suffolk County Council, as Highways Authority, have calculated several segments of road within Suffolk Coastal which either currently have an annual average daily traffic flow of over 20,000 or are predicted to do so by the end of the year 2005. These are:-
- the A14 trunk road from Dock Spur roundabout, Felixstowe, to the Ipswich Borough boundary.
 - The A1156 from the junction with the A12/A14 at Nacton to the Ipswich Borough boundary.
 - The A12 trunk road from the junction with the A14 at Nacton through to the Woods Lane (A1152) roundabout at Woodbridge.
 - The A1214 from its junction with the A12 at Kesgrave into Ipswich Borough.

As housing lies close to all of the above stretches of road, there is a potential for exposure to individuals, and **further review and assessment will need to be undertaken on all of the above.**

- ◆ Concerning planned developments, there are no planned Part I Authorised processes at this time. There is, however, one segment of road for which planned future development could increase annual average daily traffic flow to over 20,000; this is the A12 trunk road from the Woods Lane roundabout, Woodbridge, to the A1094 turn-off to Snape and Aldeburgh. The current calculated AADT for this stretch of road is 17-18,000. Investigation into planned housing development from the Suffolk Coastal Local Plan (1994), especially at Framlingham and Saxmundham, indicates that the AADT could be

increased to over 20,000 vehicles by the end of the year 2005. As housing lies close to this stretch of road, at numerous points, there is a potential for exposure to individuals and **further review and assessment will need to be undertaken.**

- ◆ For the review and assessment of NO₂, the pollutant specific guidance from the DETR (LAQM. TG4 (98)) states that any areas of the local authority with an annual mean urban background NO₂ concentration in 1996 of greater than 30 ppb, or any actual NO₂ measurements undertaken by the authority which give readings of greater than 30 ppb, should have a further review and assessment undertaken to investigate sources of NO₂. Background levels of NO₂ estimated by the National Environmental Technology Centre for 1996 show the entire Suffolk Coastal District to be below 15 ppb NO₂. Measurements undertaken by Suffolk Coastal District Council from 1993 to present day of NO₂ using diffusion tubes show all sites, even kerbside, to have an annual mean concentration below 30 ppb. One day measurements undertaken in September 1998 for 2 hour periods at five sites in Suffolk Coastal District also show all sites to be well within the 1-hour average of 150 ppb NO₂. There are, therefore, **no further areas that we are aware of within Suffolk Coastal District Council which would need further review and assessment.**

3.5.8 Conclusion:

The review has identified activities which have the potential to emit significant quantities of NO₂ which are expected to be in existence by the end of the year 2005 and for which there is a potential for exposure to individuals at relevant locations within the Suffolk Coastal District. These are:-

- ◆ Three sites regulated under Part I of the Environmental Protection Act 1990, Part A and B Authorised processes, within 10km of the Suffolk Coastal District –
 1. Carless Refining & Marketing, Harwich.
 2. British Sugar plc, Ipswich.
 3. Ipswich Hospital, Ipswich.
- ◆ Five segments of road within Suffolk Coastal District which have a projected annual average daily traffic flow of greater than 20,000 at the end of the year 2005 –
 1. The A14 trunk road from Dock Spur roundabout, Felixstowe, to the Ipswich Borough boundary.
 2. The A1156 from the junction with the A12/A14 at Nacton to the Ipswich Borough boundary.
 3. The A12 trunk road from the junction with the A14 at Nacton through to the Woods Lane (A1152) roundabout at Woodbridge.
 4. The A1214 from its junction with the A12 at Kesgrave into Ipswich Borough.
 5. The A12 trunk road from the Woods Lane (A1152) roundabout, Woodbridge to the A1094 turn-off to Snape and Aldeburgh.

For these activities **there is a risk, therefore, of the air quality objectives for NO₂ being exceeded at relevant locations by the end of the year 2005** and they will be investigated

further in a second stage review and assessment to determine the risk of exceedance of the objective more precisely.

3.6 Review and Assessment of Sulphur dioxide

3.6.1 Sources

Sulphur dioxide is formed by the combination of one atom of sulphur and two atoms of oxygen. At normal temperature and pressure it is a gas, which is soluble in water forming an acidic solution, as found in acid rain. The major natural sources of SO₂ are from volcanic activity and the oxidation of dimethyl sulphide which is released from marine organisms.

In the United Kingdom, however, the major source of SO₂ is via human activity from the domestic, industrial and commercial burning of sulphur containing fuels, mainly coal and oil. Sources from human activity in the United Kingdom are mainly: power generation (65%); other industry (24%); commercial and domestic heating (6%); and road transport (2%). In 1996, this totalled 2 million tonnes in the United Kingdom.

The prevalence of Sulphur dioxide as an air pollutant has decreased markedly in the past thirty years. This decline is a result of legislation introduced in response to large numbers of excess deaths attributed to inner city smog, particularly in London. The most significant change brought about by the legislation was the move away from the use of coal as a domestic urban fuel source. Energy for domestic and commercial use is now provided mainly by gas and electricity. Generation of this electricity has become localised to large, rural power stations burning fossil fuels. This, in addition to the use of taller chimneys which deposit waste products higher into the atmosphere, has reduced low level urban pollution problems associated with sulphur dioxide. In most of the United Kingdom today, urban levels are reduced with short-term peak concentrations being seen mainly down-wind of power stations and other industry where plumes reach ground level.

Emissions of SO₂ in the United Kingdom in 1993 can be seen from Table 8 below. Road vehicles are a relatively unimportant source of SO₂, contributing to approximately 2% of the total in 1993. Diesel fuel combustion can still, however, contribute to background SO₂ levels in some urban areas.

3.6.2 Health Effects

Sulphur dioxide is an irritant when inhaled due to its acidic nature and has been seen to cause health problems, particularly with regard to the respiratory tract. Studies on exposure to very high concentrations over the short-term have shown irritation of the eyes, nose and throat with acute chemical injury to airway linings. This may cause serious breathing difficulties and even death. Information on longer-term lower-level concentrations of SO₂ shows stimulation of nerves in the lining of the lungs and airways causing coughing, irritation and chest tightness and may lead to a narrowing of the airway.

Recent studies have shown that people suffering from asthma may be especially susceptible to the adverse effects of SO₂ and that it may provoke asthma attacks within the levels seen in pollution episodes. Asthma affects some 4% of the population with a higher percentage amongst children. Some data also suggests that SO₂ in conjunction with NO₂ increases the sensitivity to allergens of some asthma sufferers.

Table 8

United Kingdom emissions of Sulphur dioxide in 1993 (expert panel on Air Quality Standards – Sulphur Dioxide – Department of the Environment 1995)

SOURCE	ESTIMATED EMISSIONS	% OF TOTAL
Power Stations	2089	66
Domestic	113	4
Commercial/Public Service	88	3
Refineries	156	5
Iron and Steel	92	3
Other industrial combustion	509	16
Non-combustion processes	12	-
Extraction and distribution of fossil fuels	2	-
Road Transport	59	2
Railways	2	-
Civil Aircraft	2	-
Shipping	51	2
Waste Treatment and Disposal	4	-
Agriculture	10	-
TOTAL	3188	

3.6.3 National Perspective

The Government has adopted a 15-minute average of 100ppb as an air quality standard for Sulphur dioxide, with an objective for the standard to be achieved as the **99.9th percentile** (that is on all but 35 periods of 15 minutes per year) by the end of 2005.

Measurements at national automatic monitoring network sites show that exceedances of the standard currently occur in the vicinity of industrial processes with insufficient stack heights and in areas where significant quantities of coal are used for heating. SO₂ concentrations are seen to be elevated at the kerbside but do not exceed the standard in the absence of other sources.

Local authorities with high background levels from local domestic fuel burning during the winter, and localised industrial plume grounding from combustion sources using coal and oil, are likely to exceed the standard and need to progress to a second or third stage review and assessment.

3.6.4 Current sources and levels of sulphur dioxide within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of Sulphur dioxide can be seen on Map B-7 in Appendix B. There are three processes in the above category within Suffolk Coastal District:

1. Sizewell A Power Station, Sizewell, Leiston (Part A authorised process).

2. Sizewell B Power Station, Sizewell, Leiston (Part A authorised process).
3. Calor Gas Limited, Dock Road, Felixstowe (Part B authorised process).

Information has been collated in approximate emission densities from domestic combustion and other low-level dispersed sources of SO₂. The DETR pollutant specific guidance (LAQM. TG4 (98)), in relation to domestic combustion sources, states that this can be assumed to approximate to 300 houses burning coal in a 1km x 1km grid square. Local fuel suppliers were contacted for approximate numbers of customers within the densely populated areas of the Suffolk Coastal District.

Other low-level dispersed sources of SO₂ were also investigated, in particular – shipping at Felixstowe Docks. Fuel usage questionnaires were sent to all industries with over 50 employees, enquiring which type of heating fuel was used. Also contacted were: large public and private schools and colleges; leisure centres and sports clubs; prisons; hospitals; large nursing homes/hospices. Information was then collated to provide emission densities for each of the above. A listing of premises which replied to the survey and were considered to be a potential source of low-level dispersed SO₂, together with the total emission level for Suffolk Coastal District, can be seen in Appendix G.

The existence of combustion systems with a thermal power rating greater than 5MW using fuels containing significant quantities of sulphur was also considered. Large industrial premises within the Suffolk Coastal District were investigated.

Total emissions of sulphur dioxide have been estimated by the National Environmental Technology Centre for 1996 on a 1km x 1km grid area basis and can be seen in Appendix F, Map F-1.

Background levels of sulphur dioxide have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-5. These estimates show the majority of the Suffolk Coastal District to have a background level of 2.1-4.0 ppb, with the exception of the corridor along the A14 running down into, and including, Felixstowe where the levels are 4.1-6.0ppb sulphur dioxide.

Air quality monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of SO₂ levels at these locations. A summary of the results can be seen in Appendix E, Table E-6.

3.6.5 Current sources from neighbouring areas

Locations of all Part I Authorised industrial processes in neighbouring areas within 10km of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of sulphur dioxide can be seen on Map B-7 in Appendix B. There are six processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-

1. Carless Refining & Marketing Limited at Harwich Refinery, Parkeston, Harwich, within the Tendring District. (Part A Authorised process).

2. British Sugar plc, Sproughton Road, Ipswich, within the Babergh District. (Part A Authorised process).
3. Ipswich Hospital, Heath Road, Ipswich, within Ipswich Borough. (Part A Authorised process).
4. Delta Manganese, Hadleigh Road, Ipswich, within Ipswich Borough. (Part A Authorised process).
5. Blue Circle Industries, Claydon, within Mid-Suffolk District. (Part A Authorised process).
6. Fisons plc, Paper Mill Lane, Bramfield, within Mid-Suffolk District. (Part A Authorised process).

3.6.6 Planned Future Developments

Concerning planned future developments of all the above mentioned sources of SO₂, there is no information available at this time which indicates that any such sources are planned in the Suffolk Coastal locality.

3.6.7 Assessment of the levels of SO₂ within the Suffolk Coastal District

- ◆ There are three Part I Authorised processes within the Suffolk Coastal District which need to be considered:
 1. **and 2.** Sizewell A and B Power Stations, Sizewell, Leiston. These processes involve the incineration of low level radioactive waste and the presence of large standby generators, should there be a power failure. Investigation into the processes reveals that the incinerator does not emit significant quantities of SO₂. The standby generators are not used unless in an emergency, and then not for any significant length of time and, therefore, they do not emit significant quantities of SO₂ into the atmosphere. Thus, the activity will not have a significant effect on the air quality levels of SO₂ in the Suffolk Coastal locality and **further review and assessment will not be necessary.**
 3. Calor Gas Limited, Felixstowe Terminal, Dock Road, Felixstowe. This process uses solvents to put the “smell” into Calor Gas. Investigation shows that the solvents which are used in this process would not cause SO₂ emissions from the premises. Thus, the activity will not have a significant effect on the air quality levels of SO₂ in the Suffolk Coastal District locality and **further review and assessment will not be necessary.**
- ◆ Emissions from other low level dispersed sources, shipping at Felixstowe Docks, have been investigated. The ships and ferries in the area use oil for fuel and their emission stacks are very low. The National Environmental Technology Centre emissions map for SO₂, 1996 (Map F-1, Appendix F) shows a district line source of high SO₂ emissions, over 50 Tonnes/1km x 1km, in the form of a shipping lane out to sea from the Harwich area. Source from shipping have, therefore, been considered to be a potential significant

source of SO₂ which could impact in the locality of Suffolk Coastal District – in particular the town of Felixstowe and **further review and assessment will be necessary.**

- ◆ Information was collated on approximate emission densities from domestic combustion and other low-level dispersed sources of SO₂. For the review and assessment of SO₂, the DETR pollutant specific guidance (LAQM. TG4 (98)) states that any 1km x 1km grid square area in the Suffolk Coastal locality with maximum emissions greater than 25kg per hour or 40 tonnes per year would need further review and assessment. Appendix G shows the emissions of SO₂ in tonnes per year from industry, schools and other premises over the Suffolk Coastal locality. The emission figure for the entire Suffolk Coastal District is 12.62 Tonnes/year and, therefore, there are no 1km x 1km areas which have emissions over 40 tonnes per year and **further review and assessment will not be necessary.**
- ◆ There are no sites in the Suffolk Coastal area with combustion systems with a thermal power rating greater than 5MW using fuels containing significant quantities of sulphur.
- ◆ Total emissions of sulphur dioxide estimated by the National Environmental Technology Centre for 1996 on a 1km² basis, shown on Map F-1, Appendix F, show the majority of the Suffolk Coastal District to have levels of below 5 Tonnes/year, with the exception of the town of Felixstowe where the emission levels are 5-9.9 Tonnes/year. There are no areas with maximum emissions greater than 40 Tonnes/year per year.
- ◆ There are six Part I Authorised (A and B) processes within 10km of the Suffolk Coastal District which need to be considered:-
 1. Carless Refinery & Marketing Limited at Harwich. This is a secondary refinery, which operates a petroleum process to manufacture industrial solvents, distillate fuels and light lubricating oils. This process has been identified by Tendring District Council as a potential significant source of SO₂ which could impact in relevant locations. Although the nearest relevant location within Suffolk Coastal District is the town of Felixstowe, which is a distance of approximately 4km, prevailing wind direction and sufficient weather conditions could cause SO₂ emissions to reach the Suffolk Coastal District and **further review and assessment will be necessary.**
 2. British Sugar plc in the operation of the combustion, vegetable drying and acid processes. This process has been identified by Babergh District Council as a potential significant source of SO₂ which could impact in relevant locations. Although British Sugar plc is approximately 4km from the Suffolk Coastal boundary, prevailing wind direction and adverse weather conditions could ground the emissions plume from the works within Suffolk Coastal District at relevant locations and **further review and assessment will be necessary.**
 3. Ipswich Hospital which runs a clinical waste incinerator. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of SO₂ and **further review and assessment will not be necessary.**
 4. Delta Manganese which operates a copper alloy factory. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of SO₂ and **further review and assessment will not be necessary.**

5. Blue Circle Industries which is a cement process. This process is due to cease trading in May 1999 and will not be operating by the end of the year 2005 and, thus, **further review and assessment will not be necessary.**

6. Fisons plc which is a process manufacturing chemical fertiliser. This process has been investigated by Mid Suffolk District Council and found not to be a potential significant source of SO₂ and **further review and assessment will not be necessary.**

- ◆ There are no planned developments of any of the above at this time.
- ◆ The background levels estimated by the National Environment Technology Centre show the whole of the Suffolk Coastal District to have levels below 6ppb with the majority actually below 4ppb. Results of one day air sampling (spot samples) at five sites within the Suffolk Coastal District during September 1998 show that SO₂ was not detected. It should be noted, however, that the standard set by the Government is a 15-minute average and that no shorter term standard (spot sample) applies for SO₂.

3.6.8 Conclusion:

The review has identified activities and levels of SO₂ which are expected to be in existence by the end of the year 2005 and for which there is a potential for exposure to individuals in the relevant locations. These are:-

- ◆ Two Part A sites authorised under Part 1 of the Environmental Protection Act 1990 within 10km of the Suffolk Coastal District -
 1. Carless Refining & Marketing, Harwich.
 2. British Sugar plc, Ipswich.
- ◆ Emissions from uncontrolled low-level sources from shipping at Felixstowe Docks.

For these activities, **there is a risk, therefore, of the air quality objectives for SO₂ being exceeded at relevant locations by the end of the year 2005** and they will be investigated further in a second stage review and assessment to determine the risk of exceedance of the objective more precisely.

3.7 Review and Assessment of Particulate Matter (PM₁₀)

3.7.1 Sources

Unlike any of the previous pollutants considered, particulate matter in the atmosphere cannot be classed as a simple, well-defined, chemical substance. Indeed, it is composed of many different constituents depending on its source (both natural and from human activity). It is, therefore, characterised and defined by the mass of that fraction which is most likely to penetrate beyond the larynx and be deposited in the lung. The particles of concern are those which are less than 10 µm in diameter, these are called PM₁₀.

Particulate Matter is comprised of **three** main source types: **primary**, which is emitted directly from the source and mainly arises from combustion sources, especially traffic; **secondary**, which is formed within the atmosphere by chemical processes and mainly comprises of sulphate and nitrate; and **coarse**, for example – sea spray, biological particles and suspended dusts and soils. Total concentrations of PM₁₀ are, therefore, a mixture of natural sources and those derived from human activity.

Meteorology affects the annual amount of PM₁₀ with experiments showing that concentrations of particulate matter were higher in the summer than the winter due to changes in localised wind patterns and a lower level of rainfall.

Of the natural sources, the most important are forest fires, sea spray, erosion of soil and rocks, and biological particles, ie – pollen and fungal spores. Depending on locality, these could account for a large proportion, for example – much of the Suffolk Coastal District is on the coast and, therefore, a high proportion of PM₁₀ particles are likely to be from sea spray.

Particles from human activity arise from a range of sources. National UK emissions in 1996 of primary PM₁₀ have been estimated as totalling 213,000 tonnes. Of this figure, 24% was from road transport, 38% from industrial sources, 16% from power stations and 17% from domestic and other low-power combustion. These figures are, however, less accurate than for the other pollutants due to the wide variety of PM₁₀ sources. The largest single source in urban areas is road traffic with the majority from diesel exhausts followed by lead-rich particles from leaded petrol vehicles.

Sources of secondary particles are harder to determine as they are mainly formed from the oxidation of sulphur and nitrogen oxides to acids. These are then neutralised by ammonia in the air from agricultural sources. Their formation is slow and persistence in the atmosphere is prolonged; they are, therefore, distributed more evenly between urban and rural areas and may drift large distances. For this reason, emissions from mainland Europe do account for secondary particle levels in the United Kingdom. In years with a high proportion of easterly winds, Europe does account for high concentrations, particularly in the south and east of England.

Estimated sources of PM₁₀ from human activity for 1993 can be seen in Table 9 below.

Table 9

Estimated United Kingdom emissions of PM₁₀ by emission source, 1993 (thousand tonnes per year)

Source	Estimated Emissions *	Percentage of Total **
Power Stations (Fossil Fuelled)	40	15
Domestic	37	14
Commercial/public service	5	2
Refineries	7	3
Iron and Steel	20	8
Other Industrial Combustion	18	7
Construction	4	2
Industrial Processes	30	11
Mining & Quarrying	29	11
Extraction and distribution of Fossil Fuels	0	0
Solvent Use	0	0
Road Transport:		
Diesel	49	19
Petrol	13	5
Non-exhaust (tyres and brakes)	4	2
Other Transport	7	3
Waste Treatment and Disposal	0	0
Agriculture	1	0

* *Rounded to nearest thousand tonnes*

** *Rounded to nearest 1%*

3.7.2 Health Effects

Evidence is taken from epidemiological studies of populations as no other studies have been carried out. Most have looked at short-term effects on health relating mortality or periods of hospitalisation to air pollution episodes. Others have been undertaken over longer periods to try and relate health events and routinely recorded concentrations of air pollutants. However, these studies do not have a high level of confidence.

In general, the larger sizes of airborne particles (over 15µm diameter) do not cause as much damage to health as they can be filtered out by the body, not entering the thoracic airways. It is the smaller particles (especially below 4µm diameter) which can penetrate deep into the lungs. This can result in a range of health problems from a runny nose, asthma, bronchitis

and possibly death. The actual mechanism which could cause death is unknown and thought to relate to the chemical composition of the actual particles inhaled. Studies have also been undertaken in the USA on heart problems in relation to PM₁₀ – this is not complete but there does seem to be a link. Those most at risk from this type of pollution are the elderly, children and those who already suffer from a heart/lung complaint.

3.7.3 National Perspective

The Government has adopted a running 24-hour average of 50µgm⁻³ as an air quality standard for PM₁₀ with the objective for the standard to be achieved as the annual 99th percentile of maximum running 24-hour averages (this means no more than 4 days exceeding the standard in a year) by the end of 2005.

The qualification of sources of PM₁₀ in the United Kingdom is still the subject of research and current advice from the DETR at the time of writing was to use the pollutant specific guidance provided as an interim approach to the first stage of review and assessment of PM₁₀.

PM₁₀ data from national monitoring networks show that the standard is currently exceeded at all sites and it is likely that this will be the most difficult of the air quality objectives to achieve. The majority of the monitoring sites are in cities where the main sources are road traffic and domestic combustion, however, there is a high potential for significant impacts from certain types of industry.

The impact of local sources of PM₁₀ will be superimposed on regional background levels. It is recognised by the DETR that many sources are beyond the control of local authorities. The DETR predict that a reduction of 5-10% over and above those achieved by national measures will be needed to achieve the air quality objective everywhere by 2005. It is anticipated that many local authorities will have to proceed to a second or third stage review for PM₁₀.

3.7.4 Current sources and levels of PM₁₀ within the Suffolk Coastal District

Locations of all industrial processes regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised, are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of PM₁₀ can be seen on Map B-8 in Appendix B. There are five processes in the above category within the Suffolk Coastal District:-

1. White Mountain Roadstone Limited, Foxhall (Part B Authorised Process).
2. Roadworks (1952) Limited, Kesgrave (Part B Authorised Process).
3. Sizewell A Power Station, Sizewell, Leiston (Part A Authorised Process).
4. Sizewell B Power Station, Sizewell, Leiston (Part A Authorised Process)
5. Calor Gas Limited, Dock Road, Felixstowe (Part B Authorised Process).

For the review and assessment of PM₁₀ levels, the pollutant specific guidance from the DETR (LAQM. TG4 (98)) states that it is only those existing or planned roads with a projected AADT of greater than 25,000 by the end of the year 2005 which should be considered a

potential significant source of PM₁₀. The PM₁₀ specific map in Appendix B, Map B-8, shows the segments of road within the Suffolk Coastal District with current annual average daily traffic flow AADT measurements of over 25,000 vehicles and predictions of AADT for the end of the year 2005.

As far as other sources of PM₁₀ are concerned, consideration has been given to the low-level dispersed sources (domestic coal burning) and any industrial processes from which uncontrolled or fugitive emissions could occur, in particular – quarry workings and from shipping at Felixstowe Docks.

Background levels of PM₁₀ have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-6. These estimates show the Suffolk Coastal District to have levels between 22.6 and 25 µg/m³.

For the review and assessment of PM₁₀, the pollutant specific guidance from the DETR (LAQM. TG4 (98) asks for background levels of secondary particulates to be included. Background levels of secondary particulates have been estimated by the National Environmental Technology Centre for 1996 and can be seen in Appendix C, Map C-7. These estimates show the Suffolk Coastal District to have a level of over 11 µg/m³.

Total emissions of particulates on a 1 km² basis have been estimated for the Suffolk Coastal District by the National Environmental Technology Centre and can be seen in Appendix F, Map F-2.

Air quality monitoring was undertaken for one day during September 1998 at five sites in the Suffolk Coastal District to give an indication of PM₁₀ levels at these locations. The measurements were taken over 2-hour periods during the morning and afternoon at peak rush hours. A summary of the results can be seen in Appendix E, Table E-7.

3.7.5 Current sources from neighbouring areas

Locations of all Part I Authorised industrial processes in neighbouring areas within 10 km of the Suffolk Coastal District are shown in Appendix B, Map B-1. Those activities which have the potential to emit significant quantities of PM₁₀ can be seen on Map B-8 in Appendix B. There are ten processes in the above category which could impact within the Suffolk Coastal District at relevant locations:-

1. British Sugar plc, Sproughton Road, Ipswich – within the Babergh District (Part A Authorised Process).
2. Ipswich Port Authority, New Cut East, Ipswich – within the Ipswich Borough (Part B Authorised Process).
3. Readimix Concrete Limited (RMC), Portman Walk, Ipswich – within the Ipswich Borough (Part B Authorised Process).
4. Tarmac Topmix Limited, Patteson Road, Ipswich – within Ipswich Borough (Part B Authorised Process).

5. Atlas Aggregates, Cliff Quay, Ipswich – within Ipswich Borough (Part B Authorised Process).
6. Ipswich Hospital, Heath Road, Ipswich – within Ipswich Borough (Part A Authorised Process).
7. Delta Manganese, Hadleigh Road, Ipswich - within Ipswich Borough (Part A Authorised Process).
8. Blue Circle Industries, Claydon, Ipswich – within Mid Suffolk District (Part A Authorised Process).
9. Fisons plc, Paper Mill Lane, Bramfield, Ipswich - within Mid Suffolk District (Part A Authorised Process).
10. Needham Chalks Limited, Needham Market - within Mid Suffolk District (Part B Authorised Process).

3.7.7 Planned Future Developments

Concerning planned future developments which will cause increased traffic flow, there is no information available at this time which indicates that any such developments are planned, or will occur, in the Suffolk Coastal locality.

3.7.8 Assessment of the levels of PM₁₀ within the Suffolk Coastal District

- ◆ There are five Part I Authorised processes within the Suffolk Coastal District which need to be considered:
 1. White Mountain Roadstone Limited, Foxhall Four Quarry, Foxhall, which operates a roadstone coating process, part of which is mobile. Investigation into the process shows that some activity is carried out within the quarry itself. With the presence of housing nearby, this is considered as a potential significant source of PM₁₀ which could impact in relevant locations. As such, **further review and assessment will be necessary.**
 2. Roadworks (1952) Limited, Sinks Pit, Main Road, Kesgrave, which also operates a roadstone coating process, part of which is mobile. Investigation into the process shows that some activity is carried out within the quarry itself. With the presence of housing nearby, this is considered as a potential significant source of PM₁₀ which could impact in relevant locations. As such, **further review and assessment will be necessary.**
 3. **and 4.** Sizewell A and B Power Stations, Sizewell, Leiston. These processes involve the incineration of low level radioactive waste and the presence of large standby generators, should there be a power failure. Investigation into the processes reveals that the incinerator does not emit significant quantities of PM₁₀. The standby generators are not used unless in an emergency, and then not for any significant length of time. Therefore, they do not emit significant quantities of PM₁₀ into the atmosphere. Thus, the activity will not have a significant effect on the air quality

levels of PM₁₀ in the Suffolk Coastal locality and **further review and assessment will not be necessary.**

5. Calor Gas Limited, Felixstowe Terminal, Dock Road, Felixstowe. This process uses solvents to put the “smell” into Calor Gas. Investigation shows that any emissions are through the burning of gases (solvents) themselves and, therefore, emissions of PM₁₀ would be very small, if at all. This activity will, therefore, not have a significant effect on the air quality levels of PM₁₀ in the Suffolk Coastal District locality and **further review and assessment will not be necessary.**
- ◆ Low level sources of PM₁₀ from domestic coal burning have been considered. Local coal merchants have confirmed that the burning of solid fuels and coal in particular, is declining in general and that there are no areas where they have large numbers of customers purchasing solid fuel.
 - ◆ Uncontrolled or fugitive sources from industry have been investigated:
 - a) Emissions from quarries have been considered to be a potential significant source of PM₁₀ which could impact in relevant locations. There are four quarry sites in the Suffolk Coastal District: Sinks Pit, Kesgrave; Foxhall Four Quarry, Foxhall; Brightwell Quarry, Foxhall; Thorington Quarry, Thorington for each of which **further review and assessment will be necessary.**
 - b) Emissions from shipping at Felixstowe Dock have been investigated. The ships and ferries in the area use oil for fuel and their emission stacks are very low. The National Environmental Technology Centre emissions map for PM₁₀, 1996 (Map F-2, Appendix F) shows a line source of high PM₁₀ emissions, 2-9.9 Tonnes per year, in the form of a shipping lane out to sea from the Harwich area. Sources from shipping have, therefore, been considered to be a potential significant source of PM₁₀ which could impact in the locality of Suffolk Coastal District - in particular the town of Felixstowe and **further review and assessment will, therefore, be necessary.**
 - ◆ There are ten Part I Authorised (A and B) processes within 10km of the Suffolk Coastal District which need to be considered:-
 1. British Sugar plc in the operation of the combustion, lime and vegetable drying process. This process has been identified by Babergh District Council as a potential significant source of PM₁₀ which could impact in relevant locations. Although British Sugar plc is approximately 4km from the Suffolk Coastal boundary, prevailing wind direction and sufficient weather conditions could ground the emissions plume from the works within Suffolk Coastal District at relevant locations and **further review and assessment will be necessary.**
 2. Ipswich Port Authority which operates a cement/coal process. This process has been identified by Ipswich Borough Council as a potential significant source of PM₁₀ which could impact in relevant locations. As the process is large in size and only approximately 1-2km from the Suffolk Coastal boundary and the housing within it, **further review and assessment will be necessary.**

3. 4. 5. Readymix Concrete Limited, Tarmac Topmix Limited and Atlas Aggregates, which all operate cement processes. These processes have all been identified by Ipswich Borough Council as a potential significant source of PM₁₀ which could impact in relevant locations. All these processes, however, are relatively small, emissions are low-level and local in character and the premises are approximately 4km, 2-3km and 1.2km respectively from the Suffolk Coastal boundary and housing. These activities are not considered, therefore, to have a significant effect as the air quality levels of PM₁₀ in the Suffolk Coastal locality and **further review and assessment will not be necessary.**
 6. Ipswich Hospital which runs a clinical waste incinerator. This process has been identified by Ipswich Borough Council as a potential significant source of PM₁₀ which could impact in relevant locations. As the Ipswich Hospital site is approximately 500m from the Suffolk Coastal boundary and housing lies 1km from the site within the Suffolk Coastal District at Rushmere St Andrew, there is a potential for exposure to individuals and **further review and assessment will be necessary.**
 7. Delta Manganese which is a copper alloy foundry. This process has been investigated by Ipswich Borough Council and found not to be a potential significant source of PM₁₀ and **further review and assessment will not be necessary.**
 8. Blue Circle Industries which is a cement process. This process is due to cease trading in May 1999 and will not be operating by the end of the year 2005 and, thus, **further review and assessment will not be necessary.**
 9. Fisons plc which is a process manufacturing chemical fertiliser. This process has been investigated by Mid Suffolk District Council and found not to be a potential significant source of PM₁₀ and **further review and assessment will not be necessary.**
 10. Needham Chalks Limited which operates a process for the extraction and drying of chalk. This process has been identified by Mid Suffolk District Council as a potential significant source of PM₁₀ which could impact in relevant locations. Although the premises are approximately 9-10km from the Suffolk Coastal boundary and housing within it, the operation is large-scale and could impact within Suffolk Coastal District over that distance and **further review and assessment will be necessary.**
- ◆ Suffolk County Council, as Highways Authority, have calculated several segments of road within Suffolk Coastal which either currently have an annual average daily traffic flow of over 25,000 or are predicted to do so by the end of the year 2005 (see Map B-8, Appendix B). These are:-
- the A14 trunk road from Dock Spur roundabout, Felixstowe, to beyond the Orwell Bridge.
 - The A1156 from the junction with the A12/A14 at Nacton to Sainsburys, Warren Heath, Ipswich.
 - The A12 trunk road from the Foxhall Road roundabout through to the Woods Lane (A1152) roundabout at Woodbridge.
 - The A1214 from the Dobbs Lane junction into Ipswich Borough.

As residential property lies close (within 200m) to all of the above stretches of road, there is a potential for exposure to individuals and **further review and assessment will need to be undertaken on all of the above.**

- ◆ Concerning planned developments of industry could increase AADT flows to over 25,000 by the end of the year 2005. There are no planned future developments at this time. The planned gravel extraction quarry alongside the A14 at Bucklesham, however, will be a potential significant source of PM₁₀ and, as such, **further review and assessment will be necessary.**
- ◆ Total emissions of PM₁₀ estimated by the National Environmental Technology Centre for 1996 on a 1km² basis are shown on Map F-2, Appendix F, show varying levels across the District. Emission estimates have been specifically investigated for the towns in the Suffolk Coastal District and are as follows –

Aldeburgh	0.18 – 0.42	Tonnes/year
Leiston	0.21 – 0.53	Tonnes/year
Saxmundham	0.22 – 0.54	Tonnes/year
Framlingham	0.17 – 0.42	Tonnes/year
Wickham Market	0.11 – 1.50	Tonnes/year
Woodbridge	0.004 – 1.71	Tonnes/year
Kesgrave	0.19 – 0.65	Tonnes/year
Martlesham Heath	0.13 – 6.39	Tonnes/year
Felixstowe	0.19 – 8.41	Tonnes/year
Port of Felixstowe	> 50	Tonnes/year

For the review and assessment of PM₁₀, the DETR pollutant specific guidance (LAGM. TG4 (98)) states that any emissions from low-level dispersed sources (including road traffic) greater than 10 tonnes in any single 1km² grid square area, or an average of 5 tonnes in several adjacent squares, will need further review and assessment. Investigation into the levels from the National Environmental Technology Centre data shows that, for the town of Felixstowe, particularly the Port of Felixstowe, **further review and assessment will be necessary.**

- ◆ For the review and assessment of PM₁₀, the DETR pollutant specific guidance states that any urban areas for which the annual average regional background due to secondary particles is greater than 8µg/m³ will need further review and assessment. Estimates by the National Environmental Technology Centre, Map C-7 in Appendix C show annual average levels in excess of this figure across the whole of East Anglia in excess of 11µg/m³. **This will, therefore, need consideration in a further review and assessment.**
- ◆ Background levels of PM₁₀ estimated by the National Environmental Technology Centre for 1996 show the entire Suffolk Coastal District to have relatively high levels at 22.6-25 µg/m³. Results from one day air sampling (2 hourly measurements) at five sites show the levels of PM₁₀ to be approaching or over the standard set by the Government. This standard, however, is a 24-hour average and air results are not, therefore, fully applicable and only indicative of levels.

3.7.8 Conclusion:

The review has identified activities and levels of PM₁₀ which are expected to be in existence by the end of the year 2005 and for which there is a potential for exposure to individuals in the relevant locations. These are:-

- ◆ Six Part A and B sites authorised under Part I of the Environmental Protection Act 1990:

Within the Suffolk Coastal District -

1. White Mountain Roadstone Limited, Foxhall
2. Roadworks (1952) Limited, Kesgrave

Within 10km of Suffolk Coastal District –

3. British Sugar plc, Ipswich.
4. Ipswich Port Authority, Ipswich
5. Ipswich Hospital, Ipswich.
6. Needham Chalks Limited, Needham Market.

- ◆ Four segments of road within the Suffolk Coastal District with a projected annual average daily traffic flow of greater than 25,000 at the end of the year 2005 –

1. The A14 trunk road from Dock Spur roundabout, Felixstowe, to the Ipswich Borough border.
2. The A1156 from the junction with the A12/A14 at Nacton to the Ipswich Borough border.
3. The A12 trunk road from the Foxhall Road roundabout to the Woods Lane (A1152) roundabout at Woodbridge.
4. The A1214 from the Dobbs Lane junction into Ipswich Borough.

- ◆ Uncontrolled or fugitive sources from shipping at Felixstowe and the four quarries within the district.

- ◆ Annual average background levels of secondary particulates in excess of 8 µg/m³ over the entire Suffolk Coastal area.

- ◆ High PM₁₀ emission estimates in the town of Felixstowe, particularly at the Port of Felixstowe.

- ◆ The planned development of a gravel-extraction quarry alongside the A14 at Bucklesham.

There is a risk, therefore, of the air quality objectives for PM₁₀ being exceeded at relevant locations by the end of 2005 and this will be investigated further to determine the risk of exceedance of the objective more precisely. At the time of writing, the DETR has not yet issued any guidance to local authorities in respect of Stage 2 or Stage 3 assessments of air quality for PM₁₀.

4. Summary and Recommendations

4.1 Summary

The first stage review and assessment of air quality in the Suffolk Coastal District considers the present and likely future quality of air, to the end of the year 2005, in respect of the standards set in The Air Quality Regulations 1997 for the seven key pollutants; Benzene, 1,3-Butadiene, Lead, Carbon Monoxide, Nitrogen Dioxide, Sulphur Dioxide and Particulates – PM₁₀.

The aim of the first stage is to identify specific areas and activities in the district for which there is a risk of an exceedance of any of the air quality objectives. These areas can then be investigated in greater detail in a second stage review and assessment.

For Suffolk Coastal, the first stage review and assessment has determined that the risk of exceedance of the air quality objectives for Benzene and 1,3-Butadiene is negligible by the end of the year 2005, and no further action needs to be taken for either of these pollutants.

The first stage review and assessment has indicated, however, that for Lead, Carbon Monoxide, Nitrogen Dioxide, Sulphur Dioxide and Particulates - PM₁₀ that the risk of exceedance of the respective air quality objectives is not negligible by the end of the year 2005. For these pollutants, a second stage review and assessment for the following areas and activities will be needed to determine the risk of exceedance more precisely:-

Lead

1. Emissions from the Carless Refinery at Harwich (site regulated under Part I of the Environmental Protection Act 1990, Part A Authorised Process) within the Tendring District, and its impact at Felixstowe in the Suffolk Coastal District.

Carbon Monoxide

1. Two sites regulated under Part I of the Environmental Protection Act 1990, Part A Authorised processes within 10km of the Suffolk Coastal District:
 - ◆ British Sugar plc, Ipswich
 - ◆ Ipswich Hospital, Ipswich

Nitrogen Dioxide

1. Three sites regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised processes, within 10km of the Suffolk Coastal District:
 - ◆ Carless Refining and Marketing, Harwich
 - ◆ British Sugar plc, Ipswich
 - ◆ Ipswich Hospital, Ipswich

2. Road traffic on five segments of road within the Suffolk Coastal District:

- ◆ the A14 trunk road from Dock Spur roundabout, Felixstowe, to the Ipswich Borough boundary.
- ◆ The A1156 from the junction with the A12/A14 at Nacton to the Ipswich Borough boundary.
- ◆ The A12 trunk road from the junction with the A14 at Nacton through to the Woods Lane (A1152) roundabout at Woodbridge.
- ◆ The A1214 from its junction with the A12 at Kesgrave into Ipswich Borough.
- ◆ The A12 trunk road from the Woods Lane (A1152) roundabout, Woodbridge, to the A1094 turn off to Snape and Aldeburgh (projected for the end of 2005).

Sulphur Dioxide

1. Two sites regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised processes, within 10km of the Suffolk Coastal District:-

- ◆ Carless Refining and Marketing, Harwich
- ◆ British Sugar plc, Ipswich

2. Emissions from uncontrolled low-level sources from shipping at Felixstowe.

Particulate Matter (PM₁₀)

1. Two sites regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised processes, within the Suffolk Coastal District:

- ◆ White Mountain Roadstone Limited, Foxhall
- ◆ Roadworks (1952) Limited, Kesgrave

2. Four sites regulated under Part I of the Environmental Protection Act 1990, Part A and Part B Authorised processes, within 10km of the Suffolk Coastal District:-

- ◆ British Sugar plc, Ipswich
- ◆ Ipswich Port Authority, Ipswich
- ◆ Ipswich Hospital, Ipswich
- ◆ Needham Chalks Limited, Needham Market

3. Road traffic on four segments of road within the Suffolk Coastal District:

- ◆ The A14 trunk road from Dock Spur roundabout, Felixstowe, to the Ipswich Borough border.
- ◆ The A1156 from the junction with the A12/A14 at Nacton to the Ipswich Borough border.
- ◆ The A12 trunk road from the Foxhall Road roundabout to the Woods Lane (A1152) roundabout at Woodbridge.
- ◆ The A1214 from the Dobbs Lane junction into Ipswich Borough.

4. Emissions from uncontrolled low-level sources from shipping at Felixstowe, and the four quarries within the district.
5. Annual average background levels of secondary particulates in excess of $8 \mu\text{g}/\text{m}^3$ over the entire Suffolk Coastal area.
6. High PM_{10} emission estimates in the town of Felixstowe, particularly at the Port of Felixstowe.
7. The planned development of a gravel extraction quarry alongside the A14 at Bucklesham.

4.2 Recommendations

It is recommended that a second stage review and assessment of air quality be undertaken for Lead, Carbon Monoxide, Nitrogen Dioxide, Sulphur Dioxide and Particulates - PM_{10} in the Suffolk Coastal District.

5. **References**

1. *The United Kingdom National Air Quality Strategy*
Department of the Environment, Transport and the Regions (DETR).
2. *Framework for Review and Assessment of Air Quality*
LAQM G1 (97) – DETR.
3. *Developing Local Air Quality Strategies and Action Plans: The Principal Considerations*
LAQM G2 (97) – DETR.
4. *Air Quality and Traffic Management*
LEQM G3 (97) – DETR.
5. *Air Quality and Land Use Planning*
LAQM G4 (97) – DETR.
6. *Monitoring for Air Quality Review and Assessments*
LAQM TG1 (98) – DETR.
7. *Preparation and Use of Atmospheric Emission Inventories*
LAQM TG2 (98) – DETR.
8. *Selection and Use of Dispersion Models*
LAQM TG3 (98) – DETR.
9. *Review and Assessment : Pollutant Specific Guidance*
LAQM TG4 (98) – DETR.
10. *Expert Panel on Air Quality Standards (EPAQS) Reports:*
1,3-Butadiene – 1994;
Benzene – 1994;
Particulates – 1995;
Carbon Monoxide – 1994;
Sulphur Dioxide – 1995;
Lead – 1998;
Nitrogen Dioxide – 1996.
11. *The Suffolk Coastal Business Directory 1996*
12. *The Suffolk Coastal Local Plan – 1994-1998*
13. *Suffolk County Council Traffic Data*
14. *The Suffolk Coastal Industrial and Business Land Availability Study – October 1998*
15. *The Suffolk Coastal Land Availability – Housing, Approved and Allocated sites for five or more units – July 1997*
16. *Air Quality Monitoring: Felixstowe, Friday Street, Kesgrave, Leiston and Woodbridge – September 1998 for Suffolk Coastal District Council.*

Appendix A

Individuals and organisations consulted for their views on local air quality and a summary table showing responses received.

Table A-1

Summary Table showing the number and types of response to the consultation (some replies covered more than one subject)

SUBJECT OF RESPONSE	NUMBER OF RESPONSES RECEIVED
Traffic fumes –	9
General	9
A1214, Kesgrave	2
A1120, Earl Soham	3
A12 and A14	2
Melton crossroads	1
Lime Kiln Quay	1
Road crossroads, Woodbridge	1
Agricultural spraying/activity	6
Bentwaters site	7
Bonfires	3
Railway fumes	1
Heating fumes	1
Emissions from batteries	1
Emissions from industry	1

The consultation responses show road transport to be the main area of concern, followed by the proposed activities on the Bentwaters site and agricultural spraying. One reply included concern over industrial emissions in general but there were no responses relating to specific premises.

Some of the subjects of concern, unfortunately, do not come within the scope of this review and assessment. These include: agricultural spraying, bonfires, railway fumes, heating fumes and emissions from batteries.

As a result of the consultation process, consideration has been given to the following areas in the first stage review and assessment of air quality:

Traffic on the A1214, Kesgrave – Consideration has been given to this stretch of road in the review and assessment of Nitrogen Dioxide and PM₁₀. Furthermore, this length of A1214 will be considered in more detail in a Stage 2 review and assessment for both pollutants.

Heavy Goods Vehicles travelling on the A1120, Earl Soham – There were three responses concerning the use of the A1120, especially by heavy goods vehicles and their contribution to air pollution. However, although heavy goods vehicles do make a contribution to air

pollution, the DETR pollutant specific guidance (LAQM. TG4(98) advises that roads where vehicle movements exceed 20,000 per day should be considered as being a significant source of air pollution. Traffic on the A1120 does not exceed this figure and a second stage review and assessment is not required at this time.

Traffic on the A12 and A14 Trunk Roads – Consideration has been given to both these roads in the Suffolk Coastal District review and assessment of Carbon Monoxide, Nitrogen Dioxide and PM₁₀, and certain segments of these roads will be considered in more detail in a Stage 2 review and assessment.

Traffic at the Melton and Lime Kiln Quay Road, Woodbridge crossroads – Concern has been expressed on traffic queuing at both of the above junctions, especially at peak hours. The volume of traffic using these roads does not exceed 20,000 per day and, as such, is not considered to be a significant source of pollutant. Monitoring has been undertaken for Benzene and Nitrogen Dioxide at the Woodbridge crossroads due to buildings close to the road creating a “canyon effect”. All monitoring shows levels well within the limits set by the Government and a second stage review and assessment is not required for either of these sites.

Air Pollution from the activities on the proposed Bentwaters site – Concern has been expressed regarding air pollution from the proposed airport development. The proposal is not yet at a stage where any review would be appropriate to include in this report. Independent consultants appointed by the Council have advised that, by the year 2005, the proposed airport development will not emit pollutants in such concentrations to exceed the National Air Quality Standards. The General Industrial Development on the Technical Base has not been assessed for its contribution to Local Air Quality as specific industrial uses have not been identified and are not known at this time. It is envisaged that this will be considered in the further reviews of air quality required by the Environment Act 1995.

Individuals and organisations contacted in the preliminary consultation for the First Stage Review and Assessment of air quality in the Suffolk Coastal District.

The Secretary of State, Department of the Environment, Transport and The Regions
Rt Hon J S Gummer, MP
Mr M Lord, MP
Mr D Thomas, MEP

District Councillors for the Suffolk Coastal District

Mr T F Archbold
Mr J Bailey
Mr A P Barrett
Mrs C J Bignell
Mrs H J Blackshaw
Mrs C M Block
Mrs J M Bridson
Mr G S Bull
Mr R Burgon
Mr K R Burnett
Mrs B F Caines
Mr J Campbell
Mr D P Carpenter
Mr E O Cavendish
Mr N S Cawthorn
Mr R F Church
Dr B M G Clarke
Mr D A Cooper
Mr H J Dangerfield
Mr M L Deacon
Mrs M J Dixon
Mr R Else
Mr H F Ferguson MBE
Mr R W Green
Mrs J I Girling
Mr D L M Gray
Mrs A C Healey
Mr R J Herring
Mr S C Hewitt
Mr T E Hodgson
Mr P H Howard
Lady Hutchison
Mr I K Jowers
Mr J M Kelso
Mr B W Kerr
Mr G W Laing BSc (Ceng) MICE MIMechE
Mr R H Leighton FBIM
Mr P W Mason
Mrs V G Mason
Mrs J N Metcalfe

Mr M O R Minns
Miss W Moss
Mr J Mullen
Mr A J Pitcher
Mr G Proctor
Mr J G Richardson OBE
Mr R C Rous
Mr D J Rowe
Mrs D M Savage
Mr C D Slemmings
Mr A J A Smith BSc MSc
Mrs M J C Steen
Mr M J Taylor
Mr K J Welton
Mr M A J Wenyon

County Councillors for the Suffolk Coastal District

Councillor C Barrow
Councillor H S C Bestow
Councillor R F Church (also a District Councillor)
Councillor M C Evelegh
Councillor J I Girling (also a District Councillor)
Councillor P H Howard (also a District Councillor)
Councillor C MacGregor
Councillor P D Monk
Councillor C W M Penn
Councillor D F Smith
Councillor C Snow
Councillor R G Stirrat
Councillor R A Ward

Clerks of Parish Councils

Mr A Harris, Clerk of Aldeburgh Town Council
Mr A H Block, Clerk of Alderton Parish Council
Mrs S Tilbrook, Clerk of Aldringham -Cum-Thorpe Parish Council
Mrs H Heelis, Clerk of Badingham Parish Council
Mrs A J I Mawford, Clerk of Bawdsey Parish Council
Mrs D Thorndike, Clerk of Benhall and Sternfield Parish Council
Mrs J M Iszard, Clerk of Blaxhall Parish Council
Mr G Newson, Clerk of Blythburgh Parish Council
Major Cotterell, Clerk of Boulge Parish Council
Mrs R Clarke, Clerk of Boyton Parish Council
Mrs S Hoffman, Clerk of Bramfield and Thorington Parish Council
Mrs A R Hayward, Clerk of Brandeston Parish Council
Mr R E Osbourne, Clerk of Bredfield Parish Council
Mrs J Mittel, Clerk of Brightwell Foxhall and Purdis Farm Parish Council
Mrs J Champion, Clerk of Bruisyard Parish Council
Mrs J Richold, Clerk of Bromeswell Parish Council

Miss J Rixon, Clerk of Bucklesham Parish Council
Mrs J Cutmore, Clerk of Burgh Parish Council
Mrs M Allen, Clerk of Butley, Capel St Andrew & Wantisden Parish Council
Mrs N K Watling, Clerk of Campsea Ashe Parish Council
A J Hale, Clerk of Charsfield Parish Council
Mrs Y P Watts, Clerk of Chediston, Linstead Parva & Linstead Magna Parish Council
Mr A J Massey, Clerk of Chillesford Parish Council
Mr G Newson, Clerk of Clopton Parish Council
Mrs D M Roberts, Clerk of Cookley & Walpole Parish Council
Mr J D Thirkell, Clerk of Cransford Parish Council
Mrs D Frost, Clerk of Cratfield Parish Council
Mrs H M Runacres, Clerk of Cretingham, Hoo & Monewden Parish Council
Mr G P Brown, Clerk of Dallinghoo Parish Council
Mrs S Field, Clerk of Darsham Parish Council
Mrs S Harrington, Clerk of Debach Parish Council
Mrs E J Crossland, Clerk of Dennington Parish Council
Mr C Barnett, Clerk of Dunwich Parish Council
Mrs D Dale, Clerk of Earl Soham Parish Council
Mrs A Gray, Clerk of Easton Parish Council
Mrs J Pooley, Clerk of Eyke Parish Council
Ms M Malhinney, Clerk of Farnham Parish Council
Mrs S Robinson, Clerk of Felixstowe Town Council
T Fuller Esq, Clerk of Framlingham Town Council
Mrs M J Wright, Clerk of Friston Parish Council
Mr J Ager, Clerk of Grundisburgh & Culpho Parish Council
Mrs M Wilson, Clerk of Great Bealings Parish Council
Rt Hon The Earl Of Cranbrook, Clerk of Great Glemham Parish Council
Mrs R Redgrave, Clerk of Hacheston Parish Council
Mr R E Osborne, Clerk of Hasketon Parish Council
Mr P D H Bowden-Smith, Clerk of Hemley Parish Meeting
Mrs C A Barnes, Clerk of Heveningham Parish Council
Mrs K Davies, Clerk of Hollesley Parish Council
Mrs G Richardson, Clerk of Huntingfield Parish Council
Mrs L Lloyd, Clerk of Iken Parish Council
Mr P Lucas, Clerk of Kelsale-cum-Carlton Parish Council
Mrs V R Read, Clerk of Kesgrave Parish Council
Mrs H M Tanner, Clerk of Kettleburgh Parish Council
Mr C Shaw, Clerk of Kirton and Falkenham Parish Council
Mrs G Kimmerling, Clerk of Knodishall Parish Council
Mr D Gooderham, Clerk of Leiston Town Council
Mrs A Young, Clerk of Letheringham Parish Council
Mrs L Hearnden, Clerk of Levington & Stratton Hall Parish Council
Mrs S Chernery, Clerk of Little Bealings Parish Council
Mr R Law, Clerk of Little Glemham Parish Council
Mr P L Taverner, Clerk of Marlesford Parish Council
Mrs L Lodge, Clerk of Martlesham Parish Council
Mr T C D Brown, Clerk of Melton Parish Council
Mrs C Barrier, Clerk of Middleton Parish Council
Mrs A Modder, Clerk of Nacton Parish Council
Mr J Finch, Clerk of Newbourne Parish Council

Mr S Caley, Clerk of Orford & Gedgrave Parish Council
Mrs J Hall, Clerk of Otley Parish Council
Mrs A E Gray, Clerk of Parham Parish Council
Mrs R A Donaldson, Clerk of Peasenhall & Sibton Parish Council
Mrs A F Sayer, Clerk of Pettistree Parish Council
Mrs V A Hinton, Clerk of Playford Parish Council
Mr & Mrs R Simper, Clerk of Ramsholt Parish Meeting
Mrs J Hambling, Clerk of Rendham Parish Council
Mrs G N Knight, Clerk of Rendlesham Parish Council
A T Eaton Esq, Clerk of Rushmere St Andrew Parish Council
Mrs J Wilkinson, Clerk of Saxtead Parish Council
Mrs J Whitehall, Clerk of Saxmundham Town Council
Mrs C Bax, Clerk of Shottisham Parish Council
Mrs M Thurston, Clerk of Snape Parish Council
Ms J Dudley, Clerk of Stratford St Andrew Parish Council
Mr H J Nash, Clerk of Sudbourne Parish Council
Mrs J R King, Clerk of Sutton Parish Council
Mrs J E Hambling, Clerk of Sweffling Parish Council
Mrs M White, Clerk of Theberton Parish Council
G H Harlow Esq, Clerk of Trimley St Martin & Trimley St Mary Parish Council
Mrs E Lopez, Clerk of Tuddenham St Martin Parish Council
Mr R Ledger, Clerk of Tunstall Parish Council
Mrs M A Martin, Clerk of Ubbeston Parish Council
Mrs H Heelis, Clerk of Ufford Parish Council
Mrs V J Hunt, Clerk of Walberswick Parish Council
Miss J Townley, Clerk of Waldringfield Parish Council
Mrs M Plues, Clerk of Wenhaston with Mellis hamlet Parish Council
S Croucher, Clerk of Westerfield Parish Council
Mrs E Eastwood, Clerk of Westleton Parish Council
Mrs C J Caudwell, Clerk of Wickham Market Parish Council
Mrs N Trott, Clerk of Winesham & Swilland Parish Council
Mrs C B Walker, Clerk of Woodbridge Town Council
Mrs R Draper, Clerk of Yoxford Parish Council

Suffolk County Council

Neighbouring County Councils

Essex County Council, County Hall, Chelmsford, CM1 1QH

Norfolk County Council, County Hall, Martineau Lane, Norwich, NR1 2DH

Cambridgeshire County Council, Shire Hall, Castle Hill, Cambridge, CB3 0AP

Neighbouring District and Borough Councils

Waveney District Council

Ipswich Borough Council

Forest Heath District Council

Mid Suffolk District Council

Babergh District Council

St Edmundsbury Borough Council

Tendring District Council

The Environment Agency

Local Businesses

Suffolk Training and Enterprise Council
East of England Investment Agency
Rural Development Commission
Magnox Electric
Nuclear Electric
Farming and Rural Conservation Agency
EAB
Suffolk Chamber of Commerce
CPRE
Ipswich & Suffolk Small Business Association
Federation of Small Businesses
Martlesham Heath Business Management Club
Woodbridge Chamber of Trade & Commerce
Framlingham Business Association
Aldeburgh Business Association
Leiston Business Association
Saxmundham Business Association
Felixstowe Chamber of Trade and Commerce
The National Farmers Union
Felixstowe Dock & Railway Company
Otley College of Agriculture and Horticulture
OOCL (UK) Limited
BT Laboratories
Jackson Group Plc
Notcutts Nurseries Limited
Schlumberger Limited
Country Landowners Association
Confederation of British Industry
Eastern Region Technology Centre
IPSENTA
Government Office for the Eastern Region
English Partnerships
Business Link Suffolk Limited
Heritage Coast Business Partnership
East of England Tourist Board

Coach Operators

Belle Coaches
Boggis & Son
Country Travel
Gilpatrick Coaches
Happy Wanderer Tours Limited
Thompson's Removal & Coach Hire

EPA Processes

Standard Bait Company
Bridge Garage, Charsfield
Aldeburgh Brickworks
RMC Technical Services Limited
Roadworks (1952) Limited
Mr R N Doy, The Paddocks, Hacheston
H M Customs & Excise
J Bibby Agriculture Limited
Meregrove Limited
Tenza Limited
Wilding & Smith Limited
Mr D J Mackenzie
Calor Gas Limited
R E & F M Desborough
D J Spall
Ipswich Body Repair Centre
Linstead Garage
Samkin of Saxmundham Limited

Utilities Companies

Eastern Electricity
Essex & Suffolk Water
Anglian Water
Business Gas

Relevant Community and Environmental Groups

East Anglian Trails
The Ramblers Association
Suffolk Coastal Business Forum
The Aldeburgh Society
The Felixstowe Society
The Woodbridge Society
The River Deben Association and Rambler Association
The Stour and Orwell Management Committee
Royal Society for the Protection of Birds
Minsmere Nature Reserve
SWT (Felixstowe)
North Warren/Aldringham Walks Nature Reserve
Dunwich Heath Nature Reserve
Suffolk ACRE
Landguard Bird Observatory
Forest Enterprise
Suffolk Coast and Heaths Manager
Greenways Project Officer
Suffolk Ornithologists Group
FWAG
CLA
NFU

English nature
Leiston Area Environment Concern
SALC
Environment Education Centre
Suffolk Health Authority
2000 Trees Project
The WADD Project
Burgh Conservation Area Project
Nursery Walk Project
Martlesham Conservative Group
Sutton and Hollesley Commons
Wenhaston Commons Group
Westerfield Parish Hall Pond Project
Westleton Common
Royal Society for the Protection of Birds
Whitehouse Farm
Aylesford Newsprint
Waste Recycling
Bolton Brothers
Alde and Ore Society
Woodland Trust
Friends of the Earth
South East Federation of Womens Institutes
Mr J perry
OFTEC Limited
Plastoplan Limited
NFU Office
SCVYS
Ms D Oliver
Mr Lanyon
Guy Ackers
Peter Smith
Colneis County Links
East Anglian Safe Energy Alliance
Suffolk Wildlife Trust
Stepping Stones Gardening Project
Mrs A Gray

Appendix B

Maps showing locations of all prescribed processes, sources of the seven key pollutants and air quality monitoring points within and adjacent to Suffolk Coastal District Council.

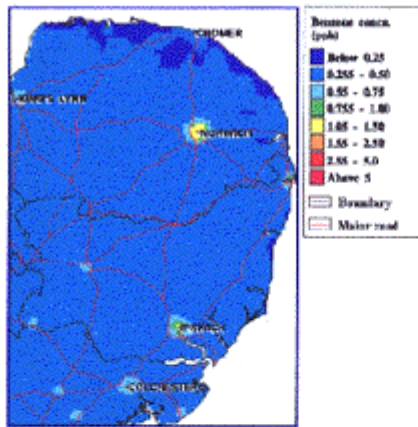
Due to technical difficulties we are unable to display the maps which comprise this Appendix. Should you wish to view a copy of these maps they are available at our Melton Hill offices in Woodbridge, our Undercliff Road West offices in Felixstowe, and at all libraries and Town Council offices in the district.

If you cannot gain access to any of these sources please contact the Environmental Services Department, Environmental Protection on (01394) 444306.

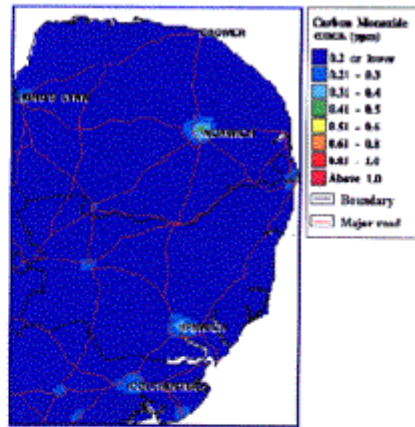
Appendix C

National Environmental Technology Centre Maps estimating background pollutant concentrations in the United Kingdom, 1996, for: Benzene, Lead, Carbon monoxide, Nitrogen dioxide, Sulphur dioxide, Particulates and Secondary Particulates.

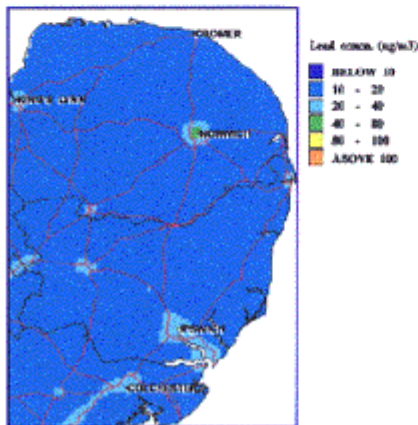
Map C-1 Benzene Background Concentrations in the UK, 1996
 (<http://www.aeat.co.uk/netcon/inequal/ineq/benzene/bben12.htm>)



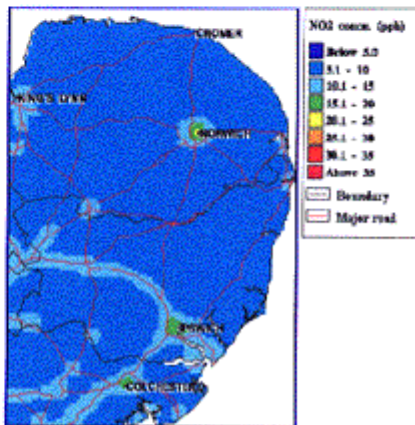
Map C-3 Carbon Monoxide Background Concentrations in the UK, 1996
 (<http://www.aeat.co.uk/netcon/inequal/ineq/co/coben12.htm>)



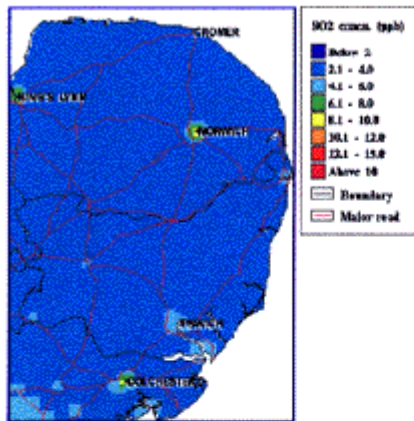
Map C-2 Lead Background Concentrations in the UK, 1996
 (<http://www.aeat.co.uk/netcon/inequal/ineq/lead/lbbs12.htm>)



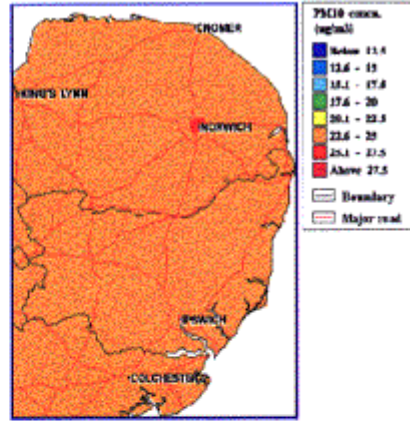
Map C-4 Nitrogen Dioxide Background Concentrations in the UK, 1996
 (<http://www.aeat.co.uk/netcon/inequal/ineq/no2/nbs12.htm>)



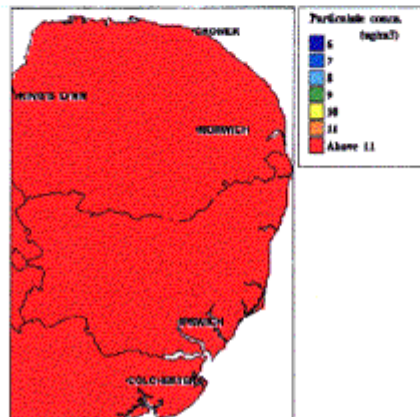
Map C-5 Sulphur Dioxide Background Concentrations in the UK, 1996
 (<http://www.aamt.co.uk/netcen/airqual/laqm/so2/box12.html>)



Map C-6 Particulate Matter Background Concentrations in the UK, 1996
 (<http://www.aamt.co.uk/netcen/airqual/laqm/pm10/pm10/box12.html>)



Map C-7 Secondary Particulate Matter Background Concentrations in the UK, 1996
 (<http://www.aamt.co.uk/netcen/airqual/laqm/pm10/pm10/box12.html>)



Appendix D

Monthly Benzene and Nitrogen dioxide air quality concentrations recorded at four sites in Felixstowe, Kesgrave, Woodbridge and Leiston. (Benzene measurements since 1995 and Nitrogen dioxide measurements since 1993).

TABLE D-1**MONTHLY BENZENE CONCENTRATIONS RECORDED AT SITES IN WOODBRIDGE,
FELIXSTOWE, KESGRAVE AND LEISTON 1995-1998 (FIGURES IN ppb BENZENE)**

YEAR	SITE	TIME IN MONTHS												ANNUAL AVERAGE	RUNNING ANNUAL AVERAGE
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
1995	WOODBRIDGE				2	1		2	1	1	2	2	6	2.1	2.1
	FELIXSTOWE				1	0		1	1	0	1	1	1	0.8	0.8
1996	WOODBRIDGE	4	3	3	9	2	1	1	2	3	2	3	4	3.1	2.6
	FELIXSTOWE	2	0	1	0	0	0	0	1	1	2	2	2	0.9	0.85
1997	WOODBRIDGE	5	2	2	2	2	2.4	1.5	1.3	6.4	2.9	1.9	1.6	2.6	2.6
	FELIXSTOWE	2	1	3	2	1	1.1	0.7	1.4	0.6	1.9	1.4	1.1	1.4	1.0
	KESGRAVE				2	1	1.5	1	3.3	1.7	3.4	1.5	1.2	1.8	1.8
	LEISTON				5	3	3.3	1.9	4.3		4.6	3.1	2.8	3.5	3.5
1998	WOODBRIDGE	1	1.7	0.8	2.1	1.2	0.9	0.7	0.8	1	1.1	1.5	1.2	1.2	2.2
	FELIXSTOWE	0.7	0.5	0.7	0.3	1.8	0.5	0.5	0.5	0.7	1	1	1	0.7	1.0
	KESGRAVE	0.9	2.8	0.9	0.3	0.7	0.6	0.7		0.6	0.6	1	0.7	0.9	1.8
	LEISTON	0.9	2.5	1.2	0.6	2.3	1.1	1.1	1.3	1	1.8	1.8	1.6	1.4	2.5

KEY: Woodbridge site, drainpipe on Suffolk Place, Lime Kiln Quay Road, Woodbridge
Felixstowe site, drainpipe on Police Station, High Road West, Felixstowe
Kesgrave site, kerbside lamppost outside 175 Main Road, Kesgrave (changed from lamppost outside 183 Main Road in May 1998)
Leiston site, drainpipe on Cyds Café, High Street, Leiston

**TABLE D-2 MONTHLY NITROGEN DIOXIDE CONCENTRATIONS RECORDED AT 4 SITES IN FELIXSTOWE 1993 - 1996
(FIGURES IN ppb NITROGEN DIOXIDE)**

YEAR	SITE	TIME IN MONTHS												Annual Average (ppb)
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1993	FLX 1				23.6	21.2	16.9	16.8	18.4	21.4	18.8		27.2	20.5
	FLX 2			23.4	15.6			16.6	17	14.8	12.8	23.9	26	18.8
	FLX 3			19	15.6	10.6	7.4	13.2	13.8	12.3	11.2	20.8	21.9	14.6
	FLX 4			21.4		10.8	8.8	11.9	13.2	12.6	10.8	21.3	23.5	14.9
1994	FLX 1	30.5	31.8	28.1	23.6	23.2	22.5	24.2	20.7	22.3	28.9	31.6	36.9	27.0
	FLX 2	26.7	24.8	23.2	18.1	13.9	16.1	18.2	14.4	19.7	26.3	26.6	26.5	21.2
	FLX 3	24.7	21.8	20	13.6	16.4	13.4	13.3	10.3	13.9	18.3	20.1	22.6	17.4
	FLX 4	23.1	21.7	20.1	15.3	10.2	11.3	12.6	10.7	13.1	21.9	22.2	22	17.0
1995	FLX 1	25.9	27.5	25.7	17.2	22.5	18.2	24.9	23.2	25.7	24.4	28.3	25.9	24.1
	FLX 2	21.9	24.7	22.2		18.9	11.3	16.6	12.1	17.7	21.2	20.3	20.3	18.8
	FLX 3	19	20.2	13.4	10.8	14.4	10.9	13	8.7	14.9	11.3	19.9	18.6	14.6
	FLX 4	19	21.6	16.7	9.9	15	9.1	14.8	9.5	14.5	13.8	21.5	20	15.5
1996	FLX 1		24.2	25.2	27.9	19.2		21.6			29.7	30.7	20.7	24.9
	FLX 2	21.5	17.3	14.4	21.2	14.5		17	16.4	12.3	24.6	24	17.5	18.2
	FLX 3	18.7	16.4	12.8	16.7	11.5	10.2	12.5	12.5	10.3		25.4	18.5	15.0
	FLX 4	17.3	17.3	14.2	18.9	10.6	11	12.4	14.5	11.4	23		15.1	15.1

KEY: FLX 1 Kerbside site, kerbside lampost outside Police Station, High Road West
 FLX 2 Intermediate site, drainpipe on Police Station drainpipe, High Road West
 FLX 3 Background site, lampost outside 14 Princes gardens (changed from hanging basket on 14 Princes Gardens in October 1996)
 FLX 4 Background site, lampost outside 37 Lynwood Avenue (changed from Ranelagh Road Veterinary car park in October 1996)

TABLE D-3 MONTHLY NITROGEN DIOXIDE CONCENTRATIONS RECORDED AT 4 SITES IN FELIXSTOWE, KESGRAVE, WOODBRIDGE AND LEISTON 1997 (FIGURES IN ppb NITROGEN DIOXIDE)

YEAR	SITE	TIME IN MONTHS												Annual Average (ppb)
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1997	FLX 1	31.3	27.8		12.9	5.61	11.05	8.02	10.13	8.1	17.97	16.23	12.77	14.72
	FLX 2	26.8	22.5	21.7	8	5.47	7.74	6.66	7.67	7.67	8.83	18.27	15.38	13.06
	FLX 3	17.9	27.7	22.2	9.9	6.83	7.55	6.41	7.45	8.97	6.51	15.97	16.15	12.80
	FLX 4	29.2	28.1	23.4	8.6	5.67	4.58	5.75	9.46	7.58	7.68	12.32	13.35	12.97
	KSG 1				7.3	8.24	10.04	11.3	10.37	8.95	14.83	11.15	13.8	10.66
	KSG 2				8.5	5.09	6.49	5.87	8.99	6.57		10.02		7.36
	KSG 3				7	4.54	6.37	3.54	7.87	5.72	6.86	10.46	12.53	7.21
	KSG 4					5.48	5.87	6.08	8.11	6.81	7.37			6.62
	WBG 1				16.1	7.25	14.23	13.29	14.25	11.17	10.11	14.45	6.06	11.88
	WBG 2					7.32	3.76	7.7	9.87	8.03	10.19	9.34	10.47	8.34
	WBG 3				6.4	5.03		4.92	6.34	5.53	3.31	15.49	9.24	7.03
	WBG 4					4.53	5.64	6.3	6.25	4.45	7.75	12.36	9.22	7.06
	LEI 1				15.5		12.62	11.34	10.02	12	10.35	10.52	10.83	11.65
	LEI 2				6	7.3	5.51	6.76	5.51		7.61	11.51	9.46	7.46
	LEI 3				6	5.42	5.36		7.8		6.52	10.44	10.45	7.43
	LEI 4				6.3	2.77	5.6	3.73	6.67	4.3	6.81	2.67	3.92	4.75

KEY:

FLX 1 Kerbside site, kerbside lampost outside Police Station, High Road West

FLX 2 Intermediate site, drainpipe on Police Station drainpipe, High Road West

FLX 3 Background site, lampost outside 14 Princes Gardens

FLX 4 Background site, lampost outside 37 Lynwood Avenue

KSG 1 Kerbside site, kerbside lampost outside 183 Main Road

KSG 2 Intermediate site, drainpipe on 181 Main Road (changed from drainpipe of 'Happy Shopper', 179 Main Road in November 1997)

KSG 3 Background site, lampost outside 1 Knights Lane, Grange Farm

KSG 4 Background site, Kesgrave high School, Main Road

WBG 1 Kerbside site, drainpipe on Suffolk Place, Lime Kiln Quay Road

WBG 2 Intermediate site, drainpipe on 97a Thorougfare

WBG 3 Background site, lampost outside 8 Kingston Farm Road (changed from lampost outside 22 Westholme Close in July 1997)

WBG 4 Background site, Farlingaye High School, Ransom Road

LEI 1 Kerbside site, drainpipe on Cyds Cafe, 55 High Street

LEI 2 Intermediate site, garage guttering on The Bread Shop, High Street (changed from drainpipe on The Black Horse PH in July 1997)

LEI 3 Background site, lampost outside 17 Farrow Close (changed from lampost outside 19 Harling Way in October 1997))

LEI 4 Background site, Leiston High School, Seaward Avenue

TABLE D-4 MONTHLY AVERAGE NITROGEN DIOXIDE CONCENTRATIONS RECORDED AT 4 SITES IN FELIXSTOWE, KESGRAVE, WOODBRIDGE AND LEISTON 1998 (FIGURES IN ppb NITROGEN DIOXIDE)

YEAR	SITE	TIME IN MONTHS												Annual Average (ppb)
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1998	FLX 1	12.8	18.7	12.1	15.3			10.39	14.22	19.28	24.6	30.9	26.9	18.52
	FLX 2	13	17.4	11.2	7.3			9.91	11.12	12	18.9	24.9	22.9	14.86
	FLX 3	14.4	19.2	12	13.5			11.8	7.9	11.54	19.2	26.8	27.2	16.35
	FLX 4	14.7	25.9	9.8	9.4			6.11	8.6	15.12	17.2	25.1	24.8	15.67
	KSG 1	18.9	8.9	10.5				8.89		8.47	21.6	26.6	22.2	15.76
	KSG 2	16.3	13.2	11	9			7.82	8.48	11.73	13.5	19.3	13.6	12.39
	KSG 3	11.7	11	9.4	10			5.52	7.8	8.99	13.6	20.9	18.7	11.76
	KSG 4	6.7	16.6	8.2	9.9			5.46	9.21	9.46	14.7	18.6	18.2	11.70
	WBG 1	10.6	10.9	9.8	8.1			10.21	10.15	15.08	16.3	24.2	20.2	13.55
	WBG 2	10.8	13.9	12	12.3			7.15	11.03	4.54	15	21	19.6	12.73
	WBG 3	9.9	12.7	13.5	10.4			5.41	7.56	9.06	11.9	18.4	16.8	11.56
	WBG 4	9.1	12.2	9.2	10.8			4.94	7.88	9.54	12.2	18.1	15.4	10.94
	LEI 1	12.1	12.2	17.5	12.6			8.68	11.39	9.96	16.9	22.2	18.8	14.23
	LEI 2	9.7	13.3	9.1				6.65	8.06	7.11	10.6	18	14.6	10.79
	LEI 3	9.3	11.8	10.8	8.4			6.62	6.47	8.27	9.6	15.7	15.2	10.22
	LEI 4	9	11.7	6.7	9.1			4.57	4.95	8.51	8.8	11.6	14.2	8.91

- KEY:**
- FLX 1 Kerbside site, kerbside lampost outside Police Station, High Road West
 - FLX 2 Intermediate site, drainpipe on Police Station drainpipe, High Road West
 - FLX 3 Background site, lampost outside 14 Princes Gardens
 - FLX 4 Background site, lampost outside 37 Lynwood Avenue
 - KSG 1 Kerbside site, kerbside lampost outside 203 Main Road (changed from 187 Main Road September 1998 and from 183 Main Road May 1998)
 - KSG 2 Intermediate site, drainpipe on 181 Main Road (changed from drainpipe of 'Happy Shopper', 179 Main Road in November 1997)
 - KSG 3 Background site, lampost outside 1 Knights Lane, Grange Farm
 - KSG 4 Background site, Kesgrave high School, Main Road
 - WBG 1 Kerbside site, drainpipe on Suffolk Place, Lime Kiln Quay Road
 - WBG 2 Intermediate site, drainpipe on 97a Thoroughfare
 - WBG 3 Background site, lampost outside 8 Kingston Farm Road (changed from lampost outside 22 Westholme Close in July 1997)
 - WBG 4 Background site, Farlingaye High School, Ransom Road
 - LEI 1 Kerbside site, drainpipe on Cyds Cafe, 55 High Street
 - LEI 2 Intermediate site, garage guttering on The Bread Shop, High Street (changed from drainpipe on The Black Horse PH in July 1997)
 - LEI 3 Background site, lampost outside 17 Farrow Close (changed from lampost outside 19 Harling Way in October 1997)
 - LEI 4 Background site, Leiston High School, Seaward Avenue

N.B. Concentrations for **May and June 1998** are missing due to tubes not being supplied for June and those from May therefore being over-exposed

Appendix E

Summary tables showing one day air quality monitoring results for the seven key pollutants, recorded at five sites in the Suffolk Coastal District during September 1998.

Table E-1**Summary Table showing Air Quality Results for Benzene (levels measured over approximately 2 hour periods) taken during September 1998**

SITE	DATE	TIME	BENZENE LEVEL (ppb)
High Road West, Felixstowe	22.09.98	0800 – 1001	3.9
		1550 – 1750	3.3
Friday Street, Rendlesham	24.09.98	0756 – 0956	0.8
		1545 – 1745	3.7
Main Road, Kesgrave	28.09.98	0750 – 0950	1.5
		1453 – 1753	2.9
High Street, Leiston	23.09.98	0805 – 1005	3.0
		1552 – 1752	6.3
Lime Kiln Quay Road, Woodbridge	25.09.98	0755 – 0955	7.4
		1550 – 1750	5.7

Table E-2**Summary Table showing Air Quality results for 1,3-Butadiene (spot samples only) taken during September 1998**

SITE	DATE	TIME	1,3 Butadiene level (detection level 100 ppb)
High Road West, Felixstowe	22.09.98	0820	Not detected
		1605	Not detected
Friday Street, Rendlesham	24.09.98	0850	Not detected
		1630	Not detected
Main Road, Kesgrave	28.09.98	0815	Not detected
		1550	Not detected
High Street, Leiston	23.09.98	0825	Not detected
		1600	Not detected
Lime Kiln Quay Road, Woodbridge	25.09.98	0820	Not detected
		1640	Not detected

Table E-3**Summary Table showing air quality results for Lead (levels measured over approximately 2 hour periods) taken during September 1998**

SITE	DATE	TIME	LEAD LEVELS ($\mu\text{g}/\text{m}^3$)
High Road West, Felixstowe (car park)	22.09.98	0803 – 1003	<0.08
		1550 – 1750	<0.08
High Road West, Felixstowe (Police Station)	22.09.98	0758 – 0958	0.58
		1545 – 1748	<0.08
Friday Street, Rendlesham (car park)	24.09.98	0759 – 0959	0.58
		1551 – 1751	<0.08
Friday Street, Rendlesham (Lane)	24.09.98	0758 – 0948	<0.09
		1551 – 1751	0.58
Main Road, Kesgrave (A1214)	28.09.98	0752 – 0952	<0.08
		1453 – 1623	1.44
Main Road, Kesgrave (school layby)	28.09.98	0753 – 0953	0.58
		1453 – 1620	0.8
High Street, Leiston (Sizewell Road)	23.09.98	0803 – 1003	1.08
		1547 – 1657	1
High Street Leiston, (High Street)	23.09.98	0807 – 1007	0.58
		1552 – 1752	0.58
Lime Kiln Quay Road, Woodbridge (traffic lights)	25.09.98	0802 – 1002	0.58
		1555 – 1755	1.08
Lime Kiln Quay Road, Woodbridge (Thoroughfare)	25.09.98	0758 – 0958	0.58
		1555 – 1755	0.58

Table E-4**Summary Table showing Air Quality Results for Carbon monoxide (spot samples only) taken during September 1998**

SITE	DATE	TIME	CARBON MONOXIDE LEVEL (ppm)
High Road West, Felixstowe	22.09.98	0812	<1
		0930	1
		1600	<1
		1720	<1
Friday Street, Rendlesham	24.09.98	1840	<1
		0930	<1
		1615	<1
		1740	<1
Main Road, Kesgrave	28.09.98	0810	<1
		0925	<1
		1520	1
		1605	0.5
High Street, Leiston	23.09.98	0820	5
		0850	5
		0930	<1
		1555	<1
		1725	3
Lime Kiln Quay Road Woodbridge	25.09.98	0810	<1
		0835	10
		0930	5
		1625	5
		1725	5

Table E-5

Summary Table showing air quality results for nitrogen dioxide (levels measured over approximately 2 hour periods) taken during September 1998

SITE	DATE	TIME	NO₂ LEVEL (ppb)
High Road West, Felixstowe (Car Park)	22.09.98	0803 – 1003 1550 – 1750	7.99 12.78
High Road West, Felixstowe (Police Station)	22.09.98	0756 – 1956 1545 – 1748	5.66 6.27
Friday Street, Rendlesham (car park)	24.09.98	0758 – 0958 1549 – 1749	11.86 11.98
Friday Street, Rendlesham (lane)	24.09.98	0755 – 0955 1547 – 1747	11.5 13.57
Main Road, Kesgrave (A1214)	28.09.98	0750 – 0950 1444 – 1623	14.5 15.66
Main Road, Kesgrave (school layby)	28.09.98	0753 – 0953 1444 – 1620	11.3 20.6
High Street, Leiston (Sizewell Road)	23.09.98	0803 – 1003 1545 – 1745	14.35 15.39
High Street, Leiston (High Street)	23.09.98	0805 – 1005 1550 – 1750	16.7 20.57
Lime Kiln Quay Road, Woodbridge (traffic lights)	25.09.98	0800 – 1000 1553 – 1753	12.61 14.31
Lime Kiln Quay Road, Woodbridge (Thoroughfare)	25.09.98	0755 – 0955 1552 – 1752	20.88 28.73

Table E-6**Summary table showing air quality results for Sulphur dioxide (spot samples only) taken during September 1998**

SITE	DATE	TIME	SO ₂ LEVEL (detection level 100 ppb)
High Road West, Felixstowe	22.09.98	0825 1615	Not detected
Friday Street, Rendlesham	24.09.98	0855 1635	Not detected
Main Road, Kesgrave	28.09.98	0830 1515	Not detected
High Street, Leiston	23.09.98	0830 1610	Not detected
Lime Kiln Quay Road, Woodbridge	25.09.98	0830 1645	Not detected

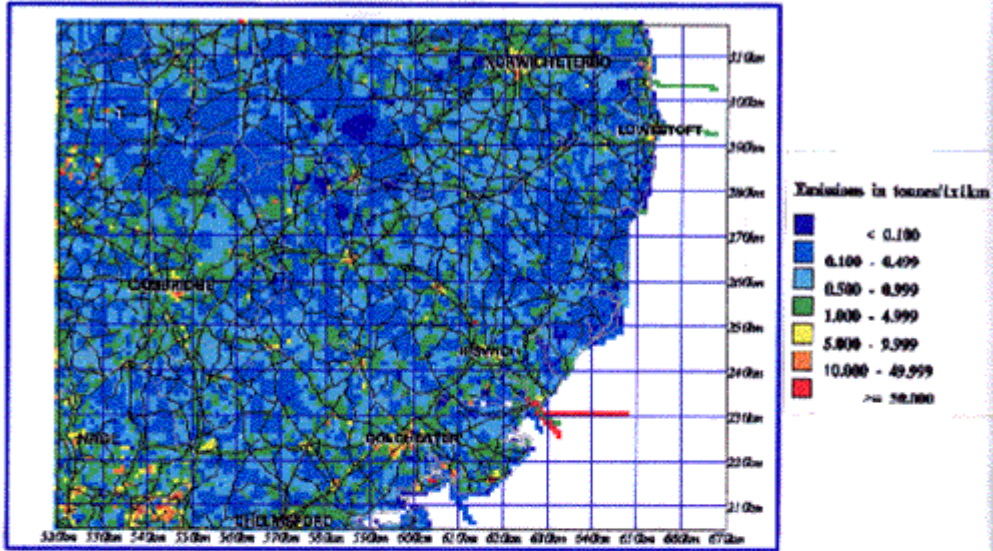
Table E-7**Summary Table showing air quality results for Particulates - PM₁₀ (levels measured over approximately 2-hour periods) taken during September 1998**

SITE	DATE	TIME	PM ₁₀ LEVEL (µg/m ³)
High Road West, Felixstowe	22.09.98	0758-0958 1545-1749	99.8 48.3
Friday Street, Rendlesham	24.09.98	0758-0948 1543-1743	49.9 99.8
Main Road, Kesgrave	28.09.98	0747-0947 1452-1624	49.9 65.09
High Street, Leiston	23.09.98	0802-1002 1545-1745	49.9 99.8
Lime Kiln Quay Road, Woodbridge	25.09.98	0753-0953 1553-1753	49.9 49.9

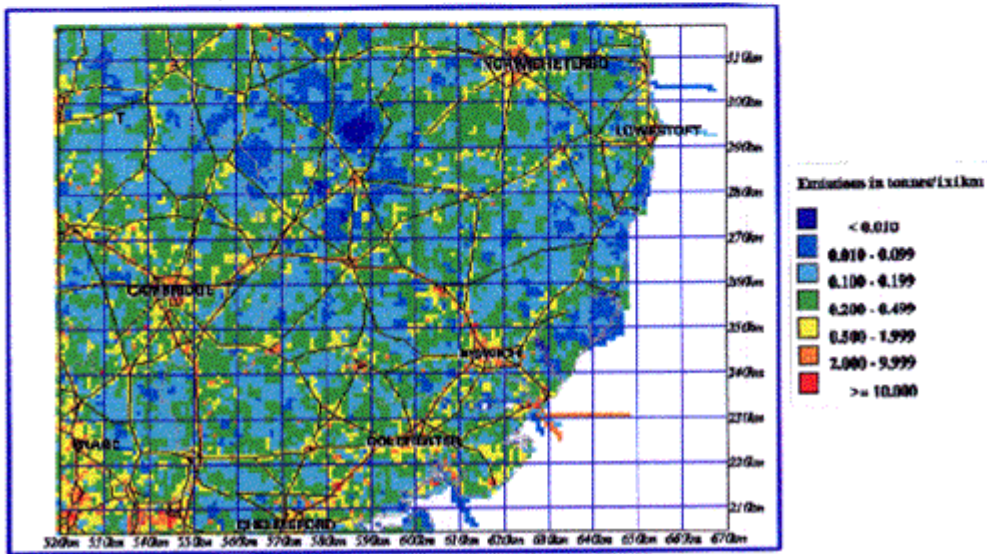
Appendix F

National Environmental Technology Centre maps estimating emission densities for Sulphur dioxide and Particulates (PM₁₀) in the United Kingdom, 1996.

Map F-1 **Total Emissions of Sulphur Dioxide in the UK, 1996**
 (<http://www.aeat.co.uk/cgi-bin/emlev3.pl>)



Map F-2 **Total Emissions of Particles (PM₁₀) in the UK, 1996**
 (<http://www.aeat.co.uk/cgi-bin/emlev3.pl>)



Appendix G

Tables showing fuel oil consumption by industrial premises, schools and other premises within the Suffolk Coastal District per year, and conversion of these values to emissions of Sulphur dioxide in Tonnes per year.

A list showing industrial premises within Suffolk Coastal District who replied to our survey who use fuel oil for their heating systems, together with the total amount of sulphur dioxide they emit (Tonnes/year)

Hubbard Group Services Limited, Otley
Atlas Aggregates Limited, Kesgrave
Port of Felixstowe Limited, Felixstowe
IMM (Bond) Limited, Felixstowe
British Fermentation Products, Felixstowe
Cogent Technology Limited, Felixstowe
Roadways, Felixstowe
Hypoguard Limited, Melton
Cubbitt Theobald Limited, Westerfield
Wilding & Smith Limited, Brightwell
Foxearth Lodge Nursing Home, Saxtead

**TOTAL EMISSIONS OF SULPHUR DIOXIDE BY
INDUSTRIAL PREMISES = 3.32 TONNES/YEAR**

A list showing schools and other premises within the Suffolk Coastal District who replied to our survey who use fuel oil for their heating systems, together with the total amount of sulphur dioxide they emit (Tonnes/year)

Eyke County Primary
Maidstone Infants, Felixstowe
Causton Juniors, Felixstowe
Colneis Juniors, Felixstowe
Kingsfleet, Felixstowe
Deben High School, Felixstowe
Orwell High School, Felixstowe
Thomas Mills High School, Framlingham
Holesley County Primary
Leiston County Primary
Leiston Middle School
Leiston High School
Beacon Hill Primary, Martlesham
Gorseland Primary, Martlesham
Saxmundham Middle School
Wickham Market County Primary
Kyson County Primary, Woodbridge
New Street County Primary, Woodbridge
Farlingaye High School, Woodbridge
Otley Agricultural College
Framlingham College
Brandeston Hall School
Sandlings County Primary, Sutton
Orwell Park School, Nacton
Amberfield School, Nacton
Holesley Bay Colony Prison

**TOTAL EMISSIONS OF SULPHUR DIOXIDE BY
SCHOOLS AND OTHER PREMISES = 9.3 TONNES/YEAR**