CEMEX UK CEMENT LIMITED

SOUTH FERRIBY WORKS
Permit BL1029

Application for a Variation under IPPC to allow burning of a fuel known as CLIMAFUEL.

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1.0 Non-Technical Summary

CEMEX UK Cement Limited (CEMEX) operates two kilns at South Ferriby. Since 2002 it has successfully burned secondary liquid fuel (SLF) on both kilns along with coal and petcoke.

This application for variation is to allow a further substitute fuel, CLIMAFUEL, to be burned, replacing energy now supplied by the other fuels. CLIMAFUEL is a fuel made from packaging waste (paper, cardboard and plastic) and various other sorted waste streams of a similar nature, blended and shredded to the required specification. CLIMAFUEL is a registered trademark.
The CLIMAFUEL would be to a specification that would ensure its suitability for burning in the kiln within the required quality, safety and environmental constraints.

The variation requested from the Environment Agency (EA) is to burn CLIMAFUEL as a partial substitute for up to 30%, approximately up to 2 tonnes an hour, of the heat input required by each kiln. This application is for a demonstration period and subsequently on a permanent basis subject to achievement of agreed critical success factors.

The CLIMAFUEL will be prepared offsite to the agreed specification. Delivery to site will be in enclosed 'walking floor' container vehicles. The CLIMAFUEL will be mechanically extracted from the containers to a weighing system and then blown directly to the kiln burner.

This type of fuel is being burned at one other cement plant in the UK, but more extensively in Europe and across the world, and its use is well established. Two RMC plants in Germany are burning such fuel.

The use of SLF at South Ferriby showed an improvement on local air quality by reducing oxides of nitrogen (NOx) from the kilns, the pollutant of highest overall environmental impact from the process. A significant reduction in sulphur dioxide (SO_2) emissions was also experienced.
The use of CLIMAFUEL is expected, as experienced with SLF to show reduced emissions of NOx and SO2 compared to coal and petcoke. Any further improvement above that experienced with SLF from the use of CLIMAFUEL is expected only to be in the form of slightly reduced emission of NOx, and a trial would establish the extent of any reduction.
A study has shown that no increase in the emission of any pollutant is expected.

There are environmental advantages from the recovery of energy from alternative fuels such as CLIMAFUEL that are more widespread.

- Conservation of fossil fuels
- Reduction in carbon dioxide, a greenhouse gas
- Sustainable management of waste by reducing the volume of waste which has to be disposed of in less environmentally favourable ways such as landfill and increasing the amount of waste which can be used as a source of energy.

The second of the above advantages, a reduction in carbon dioxide released into the atmosphere, is particularly relevant to CEMEX.
Carbon dioxide is a gas formed in a kiln process during the combustion of fuel and from the raw materials. As part of the Government plans to reduce nationally the rate at which carbon dioxide is released, CEMEX has entered a 'Negotiated Agreement' with DEFRA. The agreement puts challenging limits on the energy requirements (and thus carbon dioxide production) from the process, and in return the company is given partial relief on the energy tax payable under the Climate Change Levy. The recovery of energy from waste is one of the options being encouraged by Government, as this is a means of reducing the overall release of carbon dioxide to the atmosphere. The use of alternative fuels such as CLIMAFUEL in effect helps the country to fulfill its carbon dioxide reduction commitments.

In January 2005, European legislation, the Greenhouse Gas Emissions Trading Scheme commenced. Under this scheme the installation has a permit to allow it to emit carbon dioxide, and has been allocated a quantity of carbon dioxide that it may emit each year.

Over several years the EA has developed a strict protocol, the Substitute Fuels Protocol (SFP), that companies must follow if they wish to burn alternative fuels. CEMEX will follow the procedures in the SFP.

The trial procedure proposed is as follows.

- CEMEX has consulted widely with the local community, making known its plans, inviting discussion and considering any issues raised. Consultation details are detailed in appendix 5.
- CEMEX is now submitting its formal application for variation, having considered any relevant issues raised during the local consultation. In line with the SFP this application includes proposed critical success factors, to be achieved during the demonstration period as a prerequisite to CLIMAFUEL being burned on a permanent basis.
- The Environment Agency (EA) as required by law will carry out statutory consultation and any further consultation as it sees fit. The EA will examine the critical success factors and determine the application, requesting further information if necessary.

Assuming the application is approved then:

- CEMEX would commission the CLIMAFUEL plant and carry out trials to compare to baseline data. The rate of CLIMAFUEL burned would be increased steadily during commissioning. When the feed rate of CLIMAFUEL reaches the maximum practical level, the tests required under the SFP will be carried out over a minimum period of 6 weeks or 1000 hours of kiln operation.
- In line with the SFP, CLIMAFUEL will be continued to be burned provided the critical success factors have been met.
- In line with the SFP, a report of the trial that includes evaluation of performance against the critical success factors will be submitted to the EA.

In line with the SFP, CEMEX proposes the following Critical Success factors:

1. The current specified emission limit values will not be exceeded for any reason directly attributable to the use of CLIMAFUEL.

2. There should be no increase in the environmental impact of the process when using CLIMAFUEL. This will be assessed using methodology as used with the SLF trials and will make comparison with the baseline of coal and petcoke.

3. The requirements of this proposal will be built into the sites Environmental management system and will receive third party auditing checks to ensure it meets the requirements of ISO14001.

CEMEX has assessed the design of the process for suitability for burning CLIMAFUEL. The kilns have been used successfully to burn SLF and the use of CLIMAFUEL requires almost identical properties from the process. The kilns are considered suitable due to the high kiln temperatures and excess air ensuring extremely good combustion. Particulates from the kiln are abated by an electrostatic precipitator (ESP), a well-established method. Long-term average particulate emissions are less than 30mg/Nm^3, below the industry norm.

The use of CLIMAFUEL will not increase or result in any other emissions such as noise, odour and waste arising from the South Ferriby cement works.

In summary, the proposed fuel would result in a global environmental benefit and may result in a small local environmental benefit.

2.0 Introduction

CEMEX operates two kilns at South Ferriby. Since 2002 it has successfully burned secondary liquid fuel (SLF) up to a replacement limit of 40% along with coal and petcoke on both kilns.

This application is to request permission for a further substitute fuel, CLIMAFUEL, to be burned, replacing energy now supplied by conventional fuels. CLIMAFUEL is a fuel made from packaging waste (paper, cardboard and plastic) and various other sorted waste streams of a similar nature, blended and shredded to the required specification. CLIMAFUEL is a registered trademark.

Permission is now requested from the Environment Agency (EA) to burn CLIMAFUEL as a partial substitute for up to 30% (approximately up to 2 tonnes an hour of CLIMAFUEL) of the heat input required by each kiln. This application is for a trial to confirm that that there are no adverse effects in terms of emissions from the process or in terms of quality.

The CLIMAFUEL would be to a specification that would ensure its suitability for burning in the kiln within the required quality, safety and environmental constraints.

CEMEX has not so far burned CLIMAFUEL in any of its UK kilns, but it has trial permission at its Barrington Works.

However this type of fuel is being burned at one other cement plant in the UK, but more extensively in Europe and across the world, and its use is well established. Two RMC plants in Germany are burning such fuel.

3.0 Variation Requested

This application for variation to the IPPC permit BL1029 requests,

The use of CLIMAFUEL as a fuel, initially for a trial and then subject to the agreed critical success factors being met, permanent burning.

It is envisaged that this CLIMAFUEL trial period will be completed within six months.

Following completion of the trial and the achievement of the agreed critical success factors then a report will be submitted to the Environment Agency.

In line with the SFP, we will carry on burning CLIMAFUEL subject to the critical success factors being met.

Following completion of the CLIMAFUEL trial and the achievement of the agreed critical success factors, this application for variation hereby requests that the IPPC permit variation permits the permanent use of CLIMAFUEL upto 30% substitution on each kiln and that CLIMAFUEL will be permissible at all substitution rates up to 30% with all combinations of SLF upto 40% and coal and petcoke at normal ratios providing the remaining fuel input.

The proposed variation will not have a significant negative effect on the environment or human beings and therefore it is CEMEX's view that this proposed variation will not entail a substantial change, which is in line with revision 5 of the SFP of February 2005. However, as detailed in section 3.4 and annex 8 of the SFP, a new category of fuel is proposed so it is likely that the EA will conduct statutory consultation.

4.0 Description of Plant

4.1 Unloading and feed system

CLIMAFUEL will be prepared offsite to the agreed specification from packaging waste and various other waste streams of a similar nature.

CLIMAFUEL will be delivered to the site in fully enclosed walking floor container vehicles. Each vehicle will be weighed on arrival at site and proceed to the unloading area where it will 'dock' in the enclosed docking station.
The walking floor unloads the CLIMAFUEL directly into the docking station. The CLIMAFUEL will then be mechanically extracted by an enclosed system to a weighing system, which will be controlled as outlined in the control philosophy and then blown by an air transport system directly to the kiln burner.

A typical flow diagram is attached in appendix 4.

The proposal will take place within the current installation boundary which is covered by a site assessment submitted as part of the IPPC application in August 2001.

4.2 Process Interlocks

Interlocks will be provided to prevent the input of CLIMAFUEL to a kiln if specific kiln operating parameters are unsuitable for its continued use, as follows:

Low kiln inlet oxygen
High CO in the kiln exhaust gas
Exhaust fan tripped
Kiln speed low or kiln drive tripped
Kiln feed below 55 tph
Kiln temperature less than 850^0C at the calcining chamber
High continuous dust reading due to failure or disturbance of ESP

5.0 Specification of Fuel

5.1 Qualitative Description

In general terms the fuel will be prepared from packaging waste and from other waste with the same or broadly similar characteristics.

The constituents of CLIMAFUEL are expected to include materials such as, paper, cardboard, wood, carpet, textiles, plastics (nominally chloride free) and wastes of broadly similar composition such as glass reinforced plastic, rubber, automotive trim, sticky labels and polystyrene.

Materials that will be excluded are, food or waste including food in any form, metal (except where integral e.g small electrical components), green waste, clinical waste, liquid waste and shredded tyres.

5.2 Quantitative requirements

The CLIMAFUEL specification limits are set for the material that will be fed to the kiln as below.

Parameter	Limit	Units
CV (Gross)	> 15 MJ/Kg	MJ/Kg
Sulphur	1.0%	by weight
Chlorine	0.5%	by weight
Fluorine	0.5 %	by weight
Bromine	0.25 %	by weight
Iodine	0.25 %	by weight
Mercury	10	mg/kg
Cadmium	20	mg/kg
Thallium	20	mg/kg
Total Group II metals	30	mg/kg
Antimony	150	mg/kg
Arsenic	100	mg/kg
Chromium	150	mg/kg
Cobalt	75	mg/kg
Copper	500	mg/kg
Lead	200	mg/kg
Manganese	150	mg/kg
Nickel	150	mg/kg
Tin	50	mg/kg
Vanadium	100	mg/kg
Total of above 10 elements not to exceed	800	mg/kg

Materials to be included in the fuel shall not contain PCB's at a concentration greater than 10 mg/kg. Pharmaceutical products, pesticide products, biocide products and iodine compounds are not included in any fuel formulation except as a constituent of another material and at levels which are minimised as far is reasonably practicable. Medical, clinical wastes and radioactive substances are excluded.

6.0 Monitoring of fuel

Strict procedures and monitoring arrangements will be established to ensure that the fuel specification is met. These are outlined below.

6.1 Quality Control at the Suppliers

Pre-selection of waste streams will be one of the key factors to avoiding contamination of the fuel and having non-compliant components in the fuel. Typical waste streams will be those of paper and cardboard packaging waste, non-chlorinated plastic, material offcuts, etc from various sources.

The supplier will pre-select suitable waste streams from their customer base that will contribute towards the overall CV. The supplier will ensure that the waste streams being used support the 'waste hierarchy' as the best option for dealing with the waste. Where individual waste streams prove to be suitable for use in the fuel then these can be blended with other suitable pre-selected waste streams to form a blend of streams.

Initially every batch of blended CLIMAFUEL will be sampled and analysed to ensure compliance with the specification and to provide CV, carbon content for the calculation of the carbon dioxide emission factor and determination of the biomass content to meet the requirements of the EU Emissions Trading Scheme (EUETS). Testing will be conducted by a certified and suitably qualified laboratory to the appropriate standards. The analysis will be 'signed off' with CEMEX before delivery to the site.
Blends not meeting the specification will not be delivered to the site.

The batch size may be reviewed depending on the consistency of the fuel over the course of the trial period.

The batch samples will be retained for 6 months.

6.2 Quality Control at site

Sample Testing

CEMEX will sample the fuel by contractual agreement with the supplier. Random spot samples of CLIMAFUEL will be taken on a weekly basis to form a monthly composite so that compliance to the specification can be demonstrated. Testing will be conducted by a certified and suitably qualified third party laboratory.

Product Specification Non-Compliance

In the event that the analyses or visual inspection reveal a non-compliance at site there shall be a procedure that allows for one or more of the following to happen:

1. Immediately cease use of non-compliant material and quarantine
2. Inform supplier so that removal of the material from site can occur and one of the following actions will be taken;

    (a) Blend in other waste streams at the end of the fuel production process that have a diluting effect on the non-compliant element or elements to bring the fuel into a compliant specification
    (b) Recycle the fuel into the front end of the processing system to be re-processed.
    (c) Dispose of the fuel in another way. E.g. to registered landfill

3. The supplier shall resume supplies when it can demonstrate to the satisfaction of CEMEX that the non-compliant element of the specification is now within specification and that clear documented actions are in place to prevent recurrence of the event.

Auditing

CEMEX will audit the fuel supplier chain annually throughout the supply contract, and at more frequent intervals in the event of regular non-compliance with supply specifications.

CEMEX will audit the complete supply chain prior to the first deliveries commencing.

7.0 Suitability of Kiln

CEMEX considers that the kilns are entirely suitable to burn the CLIMAFUEL proposed.

Each kiln has a flame temperature of 1800 to 2000^{o}C, which is normal for cement kilns. The temperature of the feed in the burning zone is around 1450^{o}C, a requirement of the cement making process. The kilns are operated with excess air of around 10-20%. All fuel (including waste fuel) has first to pass through this part of the kiln. These very high temperatures combined with the high degree of turbulence generated by the high velocity jet of air coming from the firing pipe ensure extremely good combustion of the fuel.
Additional air enters the system at the boundary between the kiln and Lepol grate, and this helps to ensure complete combustion occurs.

Data from the continuous emission monitors (CEM's) which measure NO_x, SO_2, CO, particulates, HCl and TOC in the exhaust gas are monitored and the data stored on a data-logger. The software averages the data as half-hourly, hourly and daily averages to demonstrate compliance with permitted emission limits. A schedule of this instrumentation is given in Appendix 3.

A large number of process variables are monitored. Several process variables are monitored more closely, these include,

- Calcining chamber temperature
- Kiln inlet oxygen
- Kiln inlet carbon monoxide levels
- Exhaust gas oxygen levels
- Exhaust gas temperature
- Fuel feed rate
- Meal feed rate
- Exhaust fan speed.

All of the above parameters are taken into account when operating the plant. It is important that any variation in these parameters occurs only slowly. Changes to the values of these parameters indicate possible perturbations in the process.

The main control variables for the kiln are the fuel feed rates, the meal feed rate and the exhaust fan speed. The settings for these variables are determined by taking account of an overall combination of the parameters listed above as well as those from the continuous emissions monitors. No single parameter is of overriding importance for the operation of the plant in terms of the production rate, quality or potential effect on emissions.

The use of an alternative fuel in place of traditional fossil fuels cannot be allowed to compromise the prime function of the process, which is the manufacture of high quality cement clinker. The clinker manufacture process requires stable temperatures, feed rates and smooth process change. The use of CLIMAFUEL will have no effect on these parameters.

8.0 Potential Emissions and their Environmental impact

8.1 The effect of main pollutants on ambient air

The main emissions from the process are particulates, SO_2, NO_x, and CO. An extensive study on the dispersion of these pollutants has been carried out. This predicted that the emissions would be dispersed sufficiently so that their ground level concentrations would be low compared with the objectives of the National Air Quality Strategy (NAQS). The results are presented in Appendix 1.
The proposal to use CLIMAFUEL will not change the dispersion of emissions, thus the impacts on air quality, human health and habitat directive sites will be unchanged.

8.2 Emissions

Sulphur dioxide

The front part of the Lepol Grate acts as a scrubber for SO_2. The bed of nodules contains calcium carbonate and calcium oxide. The gas from the kiln passes through this bed in the presence of a large quantity of excess air, thus capturing SO_2 and forming the stable compound calcium sulphate. This process is very similar in principle to that of flue gas de-sulphurisation (FGD) in the power generation industry.

Industry experience over several years has indicated that a significant proportion of the SO_2 in the exhaust gas from semi-dry process cement kilns is formed almost wholly from pyritic sulphur in the raw materials.

The sulphur content of the solid fuels now fed to the kiln may be up to 2.3 % for coal, 7 % for petcoke and 2% for SLF. The CLIMAFUEL proposed would have a sulphur content of up to 1.0%. The total rate at which sulphur enters the kiln with the fuel would thus decrease. The SLF trials showed a decrease in overall SO_2 emissions. It is expected that CLIMAFUEL will also show a reduction in SO_2 compared to a baseline of coal and petcoke.

Oxides of Nitrogen

Oxides of nitrogen (NOx) consist almost wholly of nitric oxide (NO).

The use of alternative fuels is considered as a BAT method for NOx reduction. Compared to the use of coal and petcoke reductions in NOx will be observed. Any changes from that observed when burning SLF with coal and petcoke is expected to be only slight in comparison.

Castle Cement at Ketton have found during their trials with processed fuels (Profuel) as stated in their IPPC application, (CCL/Ketton/2.3/BAT/0801 – section 3.27.1) that '*the trial results indicate that there is no change to emissions with the exception of NOx, which has been significantly reduced'.*

The trials will quantify the level of change in NOx emissions.

Carbon Monoxide

Carbon monoxide comes almost wholly from the organic material in the raw materials. The use of CLIMAFUEL is therefore not expected to have any effect on the emissions of CO. Excess air is introduced into the system at the kiln seal. This, along with the very hot bed of meal in the calcining chamber, leads to a very low level of carbon monoxide in the exhaust gases.

Particulates

The kilns are fitted with electrostatic precipitators (ESP's) that give a very good performance. The use of CLIMAFUEL as a fuel should not increase overall particulate emissions.

Carbon Dioxide

This emission is considered in view of its global warming potential. Around half of the carbon dioxide released comes from the decomposition of the calcium carbonate in the feed materials, and nothing can be done to reduce this as it is an inherent part of the process. The remainder comes from the fuels. As part of Governments initiatives to reduce the rate at which carbon dioxide is released into the atmosphere CEMEX recently entered a Negotiated Agreement with the DEFRA. The agreement puts challenging limits on the energy requirements (and thus carbon dioxide production) from the process. The limits reduce in stages over the next ten years. The recovery of energy from wastes that would otherwise be just incinerated is one of the options encouraged by Government. Part of the purpose of this application is to take one step towards achieving the targets agreed as part of the Negotiated Agreement. This helps the country to fulfil is Kyoto commitments and at the same time helps CEMEX by being given partial relief on the energy tax payable under the Climate Change Levy.

Dioxins and Furans

There is no increase in any potential pollutant that could affect the levels of these releases from the installation. The use of CLIMAFUEL is not expected to increase emissions of dioxins and furans.

Hydrogen Chloride and Hydrogen Fluoride

The levels of chlorine and fluorine in the CLIMAFUEL will be extremely low and therefore no increase of these releases is expected. The strong scrubbing action of the calcium oxide in the process as described above with regards to Sulphur Dioxide, is expected to remove any such elements.

Hydrocarbons

The raw materials for making cement contain small quantities of organic carbon and this gives rise to some organic compounds (TOC). The coal and petcoke now used as fuels contain hydrocarbons. These burn to form almost wholly carbon dioxide and water vapour. A very small quantity of carbon monoxide (CO) is also produced along with a low level of methane and traces of other organic compounds (TOC). The CLIMAFUEL would be injected at the same point as the coal and petcoke and so would also be burnt to the same compounds. There is no reason to believe why there should be any change in the concentration of TOC when burning CLIMAFUEL.

Metals

CLIMAFUEL has a maximum metal content of 500 ppm compared with typical metals content in the coal/petcoke mix of around 600 to 700 ppm and a concentration of up to 1800 ppm in the SLF. The input of metals in the fuels is therefore expected to decrease. However, almost all the particulates in the exhaust gas come from the raw materials and hence the use of CLIMAFUEL is not expected to show any detectable change (increase or decrease) in the overall emission of metals.

Release to water

CLIMAFUEL will be transported in enclosed containers and the docking station area built on a concrete surface. The unloading is through an enclosed mechanical system and blown direct to the kiln burner.

The use of CLIMAFUEL will not result in any changes in releases to surface water and groundwater.

Waste and its recovery and disposal.

The quality control of CLIMAFUEL before it is dispatched to the site will ensure its suitability for the kilns and as such no waste arising will occur on site.
Small quantities of waste arisings will occur from routine maintenance of the proposed system such as oils. These will be recovered an/or disposed of as per current systems on site as detailed in the IPPC application, dated August 2001.

Energy Efficiency

An objective of this proposal is to enable CEMEX to achieve its commitment to energy saving. CEMEX has entered a legal agreement, a 'Negotiated Agreement' with DEFRA. This agreement puts challenging limits on the energy requirements and thus carbon dioxide production from the process. The main way in which the cement making process is to reduce its carbon dioxide releases is to burn wastes which are counted as carbon dioxide neutral for this agreement.

Accidents and their consequences

The CLIMAFUEL storage and handling system will be covered by a comprehensive risk assessment in order to identify the potential for incidents, which could have a negative impact on the environment.
The risk assessment will form part of the significant aspect identification for the Environmental Management System which is currently certified and verified to ISO14001 and EMAS.

The kiln blowing system will be fitted with a flame cut off valve to protect the system in the event of an unexpected kiln stop.

Noise

The unloading system will be a new but very minor source of noise. The use of CLIMAFUEL would mean that the relatively noisy coal and petcoke milling plant operations would be reduced. There is unlikely to be any measurable difference in noise at the installation boundary.

Odour

CLIMAFUEL will not give rise to odorous emissions.

9.0 ‘Best Available Techniques’ (BAT) assessment

CEMEX has considered the use of Best Available Techniques (BAT) for the plant as a whole in the main body of the application for a permit under IPPC in August 2001. This is still considered applicable for this installation.
The review of BAT in this section is restricted to the proposal to burn CLIMAFUEL.

The use of an alternative fuel such as CLIMAFUEL is considered BAT by the reduction in reliance of traditional fossil fuels and the potential for reduction in oxides of nitrogen.

The proposed system for handling CLIMAFUEL is fully enclosed as far as practicable and is therefore considered BAT.

The proposal does not give rise to any increase in emissions to air, water, land, noise or odour.

By using CLIMAFUEL as a fuel, there will be an increase in recovery of the various waste streams which would otherwise most likely end up being landfilled.

CEMEX is of the opinion that this proposal as demonstrated throughout this application for variation is BAT.

10.0 Demonstration Programme

10.1 General Procedure

The general procedures proposed follow those laid down in the EA's Substitute Fuels protocol (SFP). In line with the SFP the full demonstration programme trial will be conducted on one kiln. The other kiln is comparable on the basis of raw materials, process techniques, emissions data, operating regime and management controls. Following a successful trial on one kiln agreement will be sought with the EA on the monitoring requirement of the second kiln.

10.2 Baseline Tests

CEMEX undertook baseline tests prior to the formal SLF trial following the schedule of monitoring given in detail in appendix 2, which is still applicable.
CEMEX propose that the baseline test for the CLIMAFUEL trial will be data from the baseline taken before the formal SLF trial was undertaken.
Since these trials, kiln conditions have been maintained and no process changes have been made which will impact on the process emissions and hence make these previous tests inappropriate at this time

1.0 Commissioning and Optimisation Procedure

The plant will be initially commissioned as fully as possible without CLIMAFUEL feed to the kiln. This will include calibration of the dosing and weighing system, provisional set up of the control loops and running equipment long enough to ensure thorough checking.

Before CLIMAFUEL feed is first fed to the kiln the relevant operators and staff will be given comprehensive written instruction on the operation of the new plant with CLIMAFUEL. They will be fully trained and this will be recorded. The procedures/instructions and training records will be built into the site's environmental management system.

When using any new fuel or raw material it is of paramount importance that the quality of the cement produced from the site is maintained. It will therefore be necessary to start the trial with a low feed rate of CLIMAFUEL for a period and to assess the effect on the product. It may be necessary to make minor adjustments to the raw material feed chemistry and to repeat the quality trial. This procedure will then be repeated at increasing CLIMAFUEL rates.

This period of the trial will also be used to ensure that the mechanical equipment is working properly, to check that the weigher is operating properly and to tune the feedback control loop of the CLIMAFUEL feed system. It may be necessary to make modifications to the mechanical handling plant to ensure a steady, trouble-free supply of CLIMAFUEL to the feed point.

The formal Climafuel trial will take place with Climafuel at a rate established during commissioning in conjunction with conventional fuels.
A short period of CEM's monitoring will take place with conventional fuels,
Climafuel and SLF for comparison.
This will provide assurance that CLIMAFUEL, SLF, coal and petcoke can all be burnt together in various combinations with no negative environmental impact compared to just coal and petcoke.
It is envisaged that the trial period will take up to six months.
These commissioning trials will be suspended if at any time it seems likely that the emission limits may be exceeded for any reason directly attributable to the use of CLIMAFUEL.

2.0 Formal monitoring

A series of formal monitoring will be carried out when the initial commissioning and optimisation described above has been completed. For the tests the CLIMAFUEL feed rate will be set to the maximum achievable rate within the level applied for. The schedule of monitoring will be a repeat of the tests carried out to determine the baseline performance as detailed in appendix 2. They will be carried out over a minimum period of 6 weeks (1000 hours minimum) operation. Monitoring will be carried out under stable kiln operating conditions.

This monitoring will enable comparisons to be drawn between the environmental performance at baseline and when burning CLIMAFUEL.

3.0 Report on demonstration programme

Following completion of the demonstration programme on one kiln a report will be prepared which will include as a minimum a non technical summary, comparative data for both baseline and the formal monitoring period with CLIMAFUEL and evaluation of performance against the agreed critical success factors.

10. 6 Critical Success Factors

Critical success factors (CSF's) will be developed as part of the consultation period. CEMEX proposes the following CSF's to be achieved.

1. The current specified emission limit values will not be exceeded for any reason directly attributable to the use of CLIMAFUEL.

2. There should be no increase in the environmental impact of the process when using CLIMAFUEL. This will be assessed using methodology as used with the SLF trials and will make comparison with the baseline of coal and petcoke.

3. The requirements of this proposal will be built into the sites Environmental management system and will receive third party auditing checks to ensure it meets the requirements of ISO14001.

11.0 Management Arrangements

CEMEX is committed through its Environmental Policy to achieving and maintaining high environmental standards. This is reflected in that the works has attained ISO14001 accreditation and EMAS certification. A key part of this system identifies how the company will achieve continuous improvement in environmental performance.

The site's EMS is certified to both ISO 14001 and EMAS standards. Certification to ISO 14001 was achieved at South Ferriby Works in February 1998 to assist in managing and controlling the works' significant issues, ensuring compliance with all relevant environmental legislation and further improving the sites environmental performance. This was followed in October 1999 with certification to the EMAS regulation. Re-certification to both standards was achieved in February 2001.

The site's EMS is externally certified to both environmental standards and is subjected to surveillance visits from the certifying body to assess compliance to the requirements of the environmental standards.

The Works operates a mature EMS externally-accredited to both the EMAS and ISO 14001 standards, It is considered that the following description of the management systems in place at South Ferriby Works provides sufficient evidence to demonstrate that BAT considerations have been adequately addressed in the management of the installation.

The Environmental Management System is composed of the following parts:

iii) Environmental Policy Statement - detailing CEMEX's commitment to environmental issues.

iv) Environmental Manual – this signposts how the EMS meets the requirements of the environmental standards including organisational responsibilities, descriptions of the site's environmental procedures and other applicable documentation.

v) Environmental aspects register – detailing the environmental aspects of the site's operations and associated activities.

vi) Environmental Procedures – detailed documentation of how the site's EMS meets the requirements of the individual clauses of each standard and references applicable environmental work instructions.

vii) Environmental Work Instructions – detailed instructions for the on site control of significant impacts, applicable environmental legislation and compliance with individual clauses of the environmental standards.

viii) EMAS statements – these are produced annually by the site and verified by the EMS's certification body.

ix) Register of information and legislation – this outlines all legislation applicable to the site

The environmental management system addresses the requirements of the standards as follows: -

Identification of key environmental impacts – Environmental impacts are recorded in the site aspects register utilising a scoring system which addresses probability/likelihood of occurrence against impact on the surrounding environment. The scoring then identifies those aspects of operations that may have a significant impact on the environment and as such need management techniques or action to minimise or remove environmental impact as part of the environmental management programme of the site.

Objectives and measurable goals for improvement performance – CEMEX's environmental policy is translated into environmental objectives by the site. These are then turned into individual actions or activities known as targets. Each target is set as part of the sites environmental management programme such that they are specific, measurable and achievable in a realistic time period. Each month, the sites environmental management programme is reviewed to ensure that each target has sufficient resources to achieve its aim.

Monitoring of the installation's overall environmental performance – as part of the site's EMS a review of the site's environmental performance is conducted at least annually by senior management personnel. The agenda for the review meeting includes all of the requirements for the environmental standards. For example reviews of the site's significant aspects, the site's environmental management programme, training needs of personnel and results from any audits conducted (both internal and external). Findings from the review meeting can bring about changes to the site's management programme through the creation or amendment of existing targets.

Internal and external audits – External audits are conducted as part of the surveillance and certification process by the certification body. A programme of internal audits exists which schedules audits for the entire management system. All of the components of the system are audited at least once within a three year period to meet the requirements of the EMAS regulation.

Reporting of environmental performance – Environmental performance of the site is reported to the public through the publication of an annual environmental statement which is a requirement of the EMAS regulation. Environmental performance is also discussed at liaison meetings between company representatives and other interested parties consisting of representatives from local parish councils, local government and the Environment Agency.

The site's EMS will define personnel's responsibilities for environmental performance under the IPPC permit. This will include the provision for the production of any environmental reports for submission to the Environment Agency.

Monitoring and control systems – procedures are established for monitoring and controlling plant performance. These include documented procedures for actions to be taken in the event of abnormal plant operation or releases from the process. Other systems used by maintenance personnel include the use of computerised maintenance planning systems, proactive maintenance activities to detect forthcoming failure of plant and analysis of plant performance to trigger preventative maintenance. Any incident of change to plant performance is assessed and corrective actions taken to prevent recurrence. Records of planned maintenance are held on the maintenance planning system computer.

Training of staff - Training is undertaken for all relevant employees and long term contract personnel. Any training received is recorded and copies of certificates held. General awareness training involves an overview of the permit requirements, environmental impacts of the process and action to be taken in the likelihood of an accidental release. More specific training is given to the appropriate site personnel to ensure other legal requirements are met, e.g. control of emissions.

Dealing with environmental complaints – all communications of an environmental nature such as complaints are recorded on forms which form part of the site's EMS. There are systems in place for reporting complaints, dealing with environmental incidents e.g. spillages and for recording any communication of an environmental nature both from an internal or external source. Complaint and incident forms once completed, have a corrective actions report filed which details the findings of the investigation into the complaint or incident and actions taken to prevent recurrence of the incident or complaint.

The management system in practice applies to all operational issue activities of the installation as detailed in the relevant section of this application.

APPENDIX 1

Air Quality Assessment relative to the National air Quality Strategy

1. Introduction

Dispersion modelling has been undertaken to determine ground level concentrations from the installation for sulphur dioxide, nitrogen dioxide, particulate matter and carbon monoxide.

The modelling has included the effect of wind direction, wind speed, atmospheric stability, terrain, surface roughness and building downwash.

A 41 by 41 grid with receptor spacing of 150m was used for the modelling.
The actual output as hourly averages of the continuous emission monitors for each substance was used as an input in the dispersion modelling. Meteorological data from Waddington, Lincolnshire was used in the assessment. Other inputs to the model were stack height of 92 meters, stack diameter of 2.7 meters and surface roughness length of 0.25 meters.

To illustrate the effect of the predicted ground level concentrations from the installation over the local area and the closest Sites of Special Scientific Interest and Ramsar Sites, the modelled isopleths were overlaid onto ordnance survey maps (see figures 2.1 – 2.4).

2. Results

Table 1 – Maximum Predicted Ground Level Concentrations of Nitrogen Dioxide ($NO_2 \mu gm^3$) see also figures 2.1 & 2.3.

	99.8^{th} Percentile of Hourly Averages	**Annual Average**
Maximum Predicted Contribution from Works	25.4	2.0
Ambient Air Quality	96	23 - 30
Assessment Criteria (Human Health)	**200**	**40**
Assessment Criteria (Eco Systems)	**-**	**30 (a)**
(a)Oxides of nitrogen (NO_x).		

The maximum predicted contribution to ambient concentrations of nitrogen dioxide is small compared to concentrations in the absence of the works. It is considered unlikely that they would lead to exceedences of the Air Quality Strategy objectives.

The predicted concentrations suggest that in the region of the works, the annual average objective of 30 $\mu g\ m^{-3}$ for the protection of ecosystems may be exceeded. This is due to the existing ambient air quality being high, however the works contribution is only 2.0 $\mu g\ m^{-3}$. It should however be noted that this objective has not been included in the regulations for air quality management as the EC Daughter Directive states that locations within 5 km of a major emission source are excluded. At a distance of 5 km from the works the maximum predicted contribution to annual average concentrations of the oxides of nitrogen is about less than 0.5 $\mu g\ m^{-3}$. This is very small compared to the objective of 30 $\mu g\ m^{-3}$ (which is set for the oxides of nitrogen unlike the human health objective set in terms of nitrogen dioxide)

Table 2 – Maximum Predicted Ground Level Concentrations of Sulphur Dioxide ($SO_2 \mu gm^3$) see also figures 2.2 & 2.4.

	99.9th Percentile of Hourly Averages	**99.7th Percentile of Hourly Averages**	**99.2th Percentile of 24 Hour Averages)**	**Annual Average**
Maximum Predicted Contribution	35.5	27.9	8.7	1.0
Ambient Air Quality	-	<350	<125	10 to 15
Assessment Criteria (Human Health)	**200 (a)**	**350**	**125**	**-**
Assessment Criteria (Eco Systems)	**-**	**-**	**-**	**20**
(b) The shortest time period that the model selected for use in this assessment (AERMOD) is able to predict is 1 hour. DETR Guidance suggests that the ratio between 15 minute averages and hourly average is approximately 1.34 (close to a tall stack this could increase to a factor of 2). For this assessment, the objective of 266 μg m^{-3} for the 99.9th percentile of 15 minutes has been equated to an objective of 200 μg m^{-3} as the 99.9th percentile of hourly averages.				

The maximum predicted contribution to ambient concentrations of sulphur dioxide are small compared to ambient air quality and the assessment criteria. The predictions suggest that there is little possibility that the Air Quality Strategy Objectives for 2005 are being exceeded.

Table 3 – Maximum Predicted Ground Level Concentrations of Particulate matter ($PM_{10} \mu gm^3$)

	90.4th Percentile of 24 Hourly Averages	**Annual Average**
Maximum Predicted Contribution from Works	0.16	0.05
Ambient Air Quality	36 - 40	20 – 22
Assessment Criteria (Human Health)	**50**	**40**

The maximum predicted contribution to ambient concentrations of fine particulate matter is insignificant in terms of both the ambient air quality and the assessment criteria.

Table 4 – Maximum Predicted Ground Level Concentrations of Carbon Monoxide (CO μgm^3)

	Maximum 8 Hour Average
Maximum Predicted Contribution from Works	0.01
Ambient Air Quality	< 2.0
Assessment Criteria (Human Health)	**11.6**

The maximum predicted contribution to ambient concentrations of carbon monoxide is insignificant in terms of both the ambient air quality and the assessment criteria.

0. Conclusion

Effects on Ground Level Concentrations

The predicted concentrations from the dispersion model presented in this summary, show that the contribution to ground level concentrations from emissions to atmosphere for the oxides of nitrogen and sulphur dioxide are small, both in terms of the existing ambient air quality and assessment criteria. The predictions suggest that it is unlikely that the Air Quality Strategy objectives are exceeded.

It is not reasonable to sum the percentile averages predicted and measured concentrations as these peak values are likely to occur under different meteorological conditions. The combined percentile averages are likely to be the same or not significantly higher than the ambient measurements. Care must be taken when adding annual average contributions from the works to ambient concentrations as there may be an element of double counting. The measured ambient concentrations already include the contribution from the works.

The predictions show that the ground level concentrations of fine particulate matter and carbon monoxide due to emissions from the works are insignificant in terms of both the existing ambient concentrations and the assessment criteria. The effects on vegetation and eco systems are also predicted to be insignificant because the contribution from the works is small.

Effects on ecosystems and vegetation

The effect of emissions to atmosphere from the installation on ecosystems and vegetation have been assessed by comparing the predicted annual average concentrations of the oxides of nitrogen and sulphur dioxide with the objectives set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland and incorporated into law via the Air Quality (England) Regulations 2000 and the Air Quality Limit Values Regulations 2001.

A study was undertaken through English Nature to identify the location of Habitat Directive sites within 15 km of the installation. This identified the following:

There is one statutory site of importance, The Humber Estuary SSSI, Special Protection Area, Special Area of Conservation and Ramsar site.

There are also two geological sites of Special Scientific Interest, South Ferriby Cliffs and South Ferriby Chalk Pits.
There are two further sites at Risby Warren and Melton Bottom Chalk Pits.

Figure 2.1 illustrates the maximum predicted annual average ground level concentration of oxides of nitrogen in close proximity, whilst figure 2.3 illustrates concentrations over the complete Humber estuary statutory site. Figures 2.2 and 2.4 are the equivalent for sulphur dioxide.

The figures show that the maximum predicted impact is on the Humber Estuary SSSI, Special Protection Area, Special Area of Conservation and Ramsar site. The predicted contribution to air quality is however small compared to the assessment criteria for the protection of eco systems and vegetation and small compared to existing air quality and the peak predicted concentrations are confined to a small area.

The impact from the installation on this statutory site is therefore not considered significant due to the low installation contributions compared to the existing ambient air quality.
The impact on other sites identified would also therefore not be considered significant.

APPENDIX 2

PROPOSED SCHEDULE OF MONITORING

The monitoring arrangements proposed will be in accordance with the EA's Substitute Fuels Protocol. Details are given below.

1. Continuous Emissions Monitors

The following determinands will be monitored using continuous emissions monitors.

Particulate matter
Oxides of nitrogen (as nitrogen dioxide)
Sulphur dioxide
Hydrogen chloride
Carbon monoxide
Oxygen,
Moisture,
Temperature
Pressure
Total organic carbon (TOC)

Data will be recorded as one-minute means and will be calculated as half-hourly, hourly and daily averages. The logging system will also be capable of providing data for comparison with ambient air quality standards. In addition, maxima, minima, means, and standard deviations are to be reported for the appropriate averaging periods.

Continuous emission monitoring systems for gases will be calibrated immediately before and after each trial and at three monthly intervals if trials continue beyond this period of time. Calibration for gas monitors will follow CEN or British/international standards.

2. Periodic extractive sampling

a) Checks on CEMs

To give greater confidence in the results from CEMs periodic extractive sampling will be undertaken. The determinands to be sampled and the minimum sampling periods are given below.

Determinand	Minimum sampling period per sample
Oxides of nitrogen (as NO_2)	Continuously for at least 12 hours
Sulphur dioxide	Continuously for at least 12 hours
Carbon monoxide	Continuously for at least 12 hours
Oxygen	Continuously for at least 12 hours
Hydrogen chloride	Continuously for at least 12 hours
Total Organic Carbon	Continuously for at least 12 hours
Stack gas flow rate and temperature	In accordance with approved standard

The continuous tests shown above have been carried out during one test day during the baseline tests and will be over one day during the trials when CLIMAFUEL is being burned.

b) Monitoring of substances not measured by CEMs

Tests for some substances will not be measured using CEMs. These are,

Determinand	*Minimum sampling period per test*
HF	2 consecutive tests of at least 1 hour each on 6 test days
Particulate matter and PM10	2 consecutive tests in accordance with approved standard but likely to be around 1 hour per sample on 6 test days
Heavy metals (1)	2 consecutive tests of at least 1 hour on 6 test days
Dioxins and furans	2 consecutive tests (time period to be agreed) on 6 test days
Polychlorinated biphenyls (PCBs)(2)	2 consecutive tests of at least 6 hours on 1 test day

Field blanks will be taken where appropriate.

Note (1) Arsenic, lead, chromium, copper, cobalt, vanadium, tin, mercury, cadmium, thallium, nickel, manganese, antimony, zinc and silver.

Note (2) In the absence of a recognised sampling standard, determination of PCB concentration should be undertaken in accordance with the principles and procedures in BS EN1948

Periodic manual testing for each determinand given above will be spread out evenly over each of the baseline and maximum CLIMAFUEL feed rate trial periods.

The above periodic manual sampling will be undertaken during steady state operation of the kiln.

Calibration of CEM's used for periodic testing

Where periodic extractive instrumental monitoring systems are employed, these will be fully calibrated or verified immediately before and after each trial. Also these systems will be spanned and zeroed immediately before and after each sample period using certified standard gas mixtures.

3. Testing of Inputs, Products and Material Collected in Abatement Equipment

Testing of feeds, all fuels, material collected in abatement equipment and products is required under baseline and substitution conditions. The collected samples must be analysed for parameters in the table below.

Representative samples will be taken once per hour on days when metals emission monitoring is being conducted and accumulated to provide a bulk aggregated sample. Where practicable, sample increments should be taken from falling or flowing streams. For solids, any material above 5 cm in size in the bulk aggregate sample should be crushed, then the sample should be mixed and progressively sub-divided (e.g. by cone and quartering) to provide a single representative sub-sample (around 5 kg) for each test period.

Testing of Inputs, Products and Material Collected in Abatement Equipment

Parameter	Feeds (a)	Fuels (a)(b)	CKD (a)	Clinker (a)	Climafuel (a)
Heavy metals (c)	✓	✓	✓	✓	✓
Total of each S,F,Cl,Br, I	✓	✓	✓	✓	✓
Dioxins and Furans			✓	✓	
Flow (kg/hr)	✓	✓	✓	✓	✓
Calorific value (gross)		✓			✓
Free lime content, alkalinity and pH of leachate			✓		
PCB's content			✓	✓	✓
Water content					✓
Ash content					✓

NOTES

✓ Denotes that a parameter is to be periodically monitored

(a) At least two samples to be taken over each trial period and analysed. (Trial period is the 6 week or equivalent baseline or formal monitoring period.)

(b) Each fuel to be tested separately

(c) Arsenic, lead, chromium, copper, cobalt, vanadium, tin, mercury, cadmium, thallium, nickel, manganese, antimony and zinc

4. Recording of Process Parameters

Plant process conditions will be recorded during the baseline and CLIMAFUEL burning periods of all trials, and will be included in all monitoring reports. Readings of the following parameters will be given as daily averages.

- kiln exit temperatures;
- kiln throughput;
- fuel input rates (including CLIMAFUEL when being burned);
- kiln exit carbon monoxide and oxygen concentrations;

APPENDIX 3

Details of Continuous Monitoring Equipment

The exhaust gases from each kiln will be monitored by the instruments listed below, with manufacturer, operating principle and range. The instrument heads will be located in the ducts between each main ESP outlet and the common chimney.

SO_2 and NOx
Erwin Sick GM31
FTUV
0 - 3000 mg/Nm^3

Particulates
Erwin Sick RM 210
Back scatter
0 - 100 mg/Nm^3

CO
ABB
FTIR
0 - 150 mg/Nm^3

HCl
ABB
FTIR
0 - 100 mg/ Nm^3

TOC
ABB
Flame Ionisation Detector
0 - 100 mg/ Nm^3 (as carbon)

O2
ABB
Zirconia
0 – 25% (by volume)

H2O
ABB
FTIR
0 - 25 % (by volume)

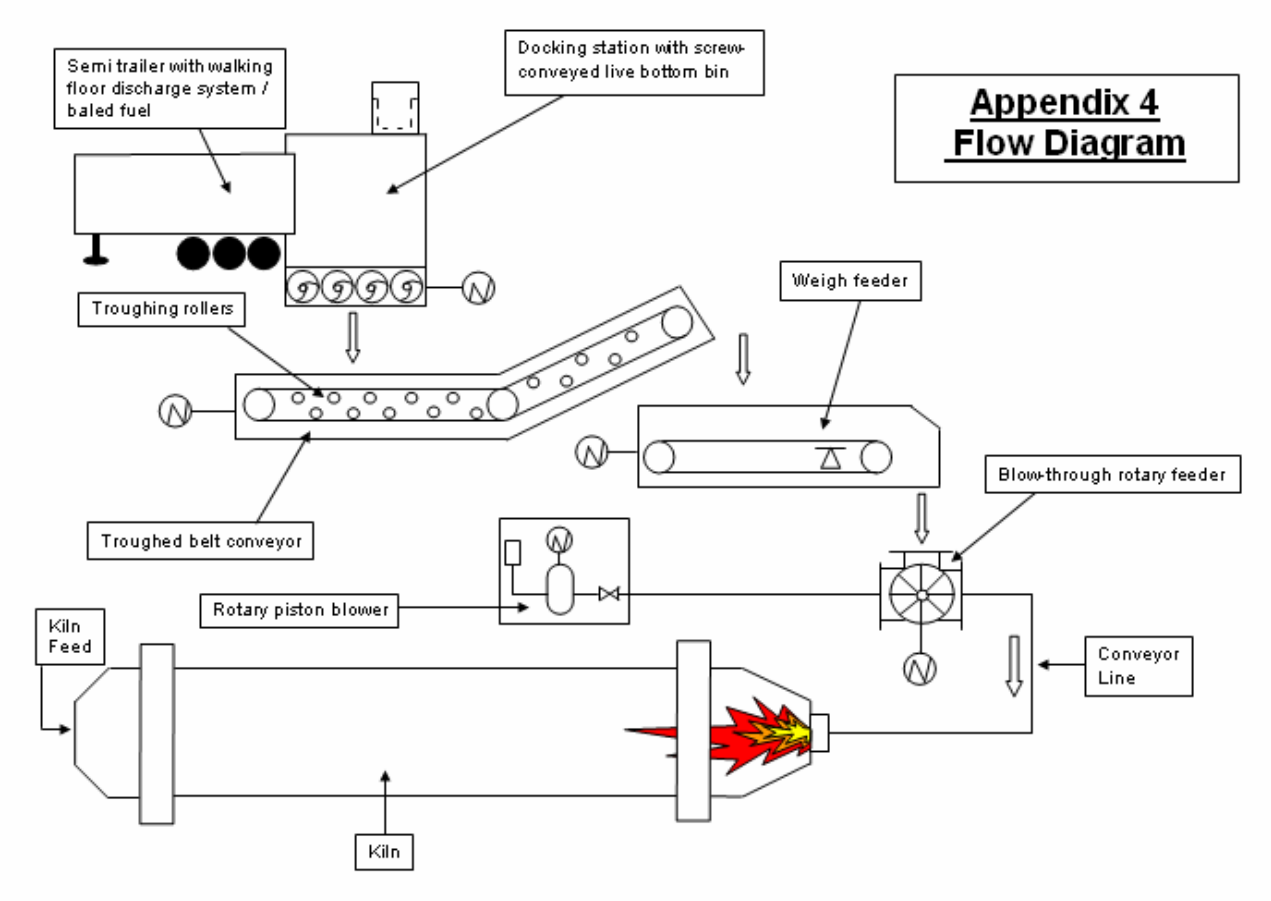
Temperature

Temperature will be measured by thermocouple.

All the above analysers link into the centralised control system and the emissions data storage system. Corrections for oxygen, moisture and temperature are carried out within both these systems along with the calculation and display of half hourly, hourly and daily averages. The results from the monitors will be retained for a minimum of four years.
The results are corrected for temperature 273K, oxygen 10% and dry flue gas. Data is also stored with no correction for moisture and oxygen.

APPENDIX 4

Flow Diagram



APPENDIX 5

Consultation

CEMEX has a policy of open communications to ensure that all stakeholders are kept informed of our proposals.

CEMEX has consulted widely with the local community, making known its plans, inviting discussion and considering any issues raised as summarised below:

1. Liaison meeting held on 15/10/04 first introduced CEMEX's plans for a second substitute fuel.
1. Liaison meeting held on 22nd July commenced consultation on the use of CLIMAFUEL. This meeting was attended by local councillors from Winteringham, South Ferriby. North Lincolnshire Council and the EA.
3. CLIMAFUEL special meeting held on 24th September 2005. This was attended by councillors from Worlaby, Barton, South Ferriby, Winterton, North Lincolnshire Council and the EA.
2. An article was published in the Scunthorpe Evening telegraph on 18th October 2005. This paper has a circulation of 23,000 and a readership of 59,000. This article titled ' Green Investment aids cement plant' outlined investment to reduce cost and to meet future environmental demands. The article provided contact details for anyone wanting further information.

Any issues that were raised were already addressed in this application.

Figure 2.1 Maximum Predicted Annual Average Ground Level Concentration of the Oxides of Nitrogen, May 1999 to April 2000 Met Data (NO_x, $\mu g\ m^{-3}$)

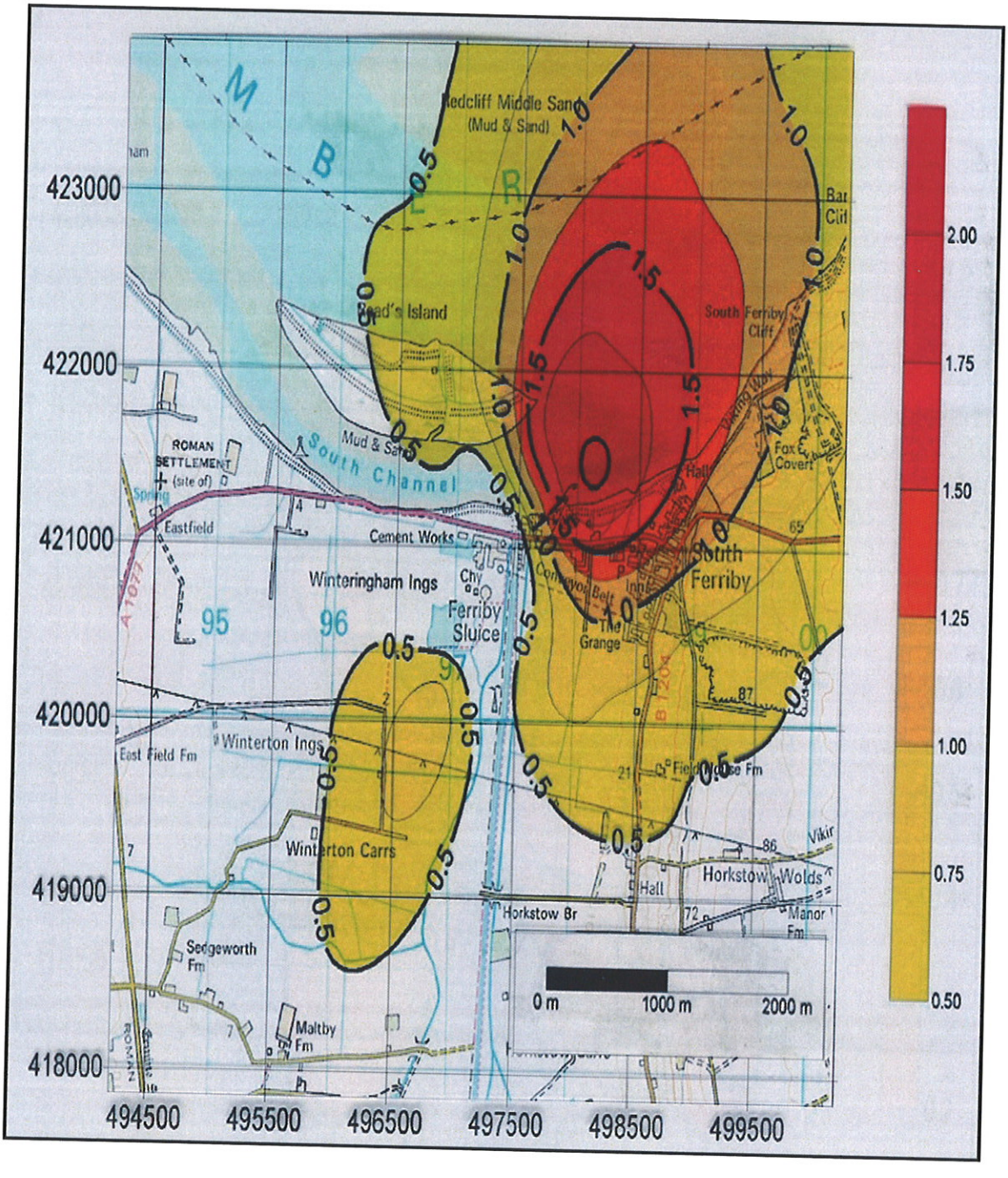


Figure 2.2 Maximum Predicted Annual Average Ground Level Concentration of Sulphur Dioxide, May 1999 to April 2000 Met Data (SO_2, µg m^{-3})