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CRAIGAVON BOROUGH COUNCIL

STAGE 2 & 3 REVIEW AND ASSESSMENT OF AIR QUALITY

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EXECUTIVE SUMMARY

This report presents the results of a Stage 2 and Stage 3 Review and Assessment of Local Air Quality within Craigavon, carried out on behalf of Craigavon Borough Council. A Stage 3 was carried out where more detailed assessment was required. This Review and Assessment represents the second and third steps in the management of local air quality, as required by Part IV of the Environment Act 1995.

The aim of the Stage 2 Review and Assessment is to provide a further screening of pollutant concentrations identified in the Stage 1 Review and Assessment as needing further investigation, prior to a detailed Stage 3 assessment of any necessary issues, which are assessed here or recommended for future actions.

The Stage 1 Review and Assessment concluded that the following pollutants required further assessment:

- Nitrogen dioxide;
- Sulphur dioxide.

The air quality impact of the following sources has been assessed in this second and third stage review:

- Road Traffic;
- Craigavon Area Hospital;
- Huthamaki Van Leer (now Boxmore Ltd), Dollingstown;
- Riverside Textiles, Lurgan;
- Ulster Carpet Mills, Portadown;
- Emissions from domestic fuel burning;
- Small-scale combustion units.

A variety of tools have been employed including measurements, dispersion models and screening model techniques.

The study concluded that emissions from the sources listed above will not lead to exceedences of air quality objectives at their target dates within Craigavon. Based on the information currently available, it is therefore recommended that these sources do not require further consideration under the review and assessment process.

1. INTRODUCTION

1.1 Background to Local Air Quality Management

Part III of the Environment Order (NI) 2002, SI 2002 No. 3153 (N.I. 7) sets out the legal framework, policies and mechanisms for the assessment and management of ambient air quality in Northern Ireland. Part III of the Order came into operation on the 17 January 2003. The Air Quality Strategy (AQS) for England, Wales and Northern Ireland (Ref. 2) sets out prescribed air quality objectives for target pollutants. The Air Quality Objective Values Regulations (Northern Ireland) 2002, Statutory Rule 2002 No. 94 is the statutory instrument which sets out AQ objective values.

Under the Northern Ireland legislation District Councils are required to carry out reviews and assessments of air quality within their areas (Ref. 4). The District Councils are then required to draw up action plans, where applicable, which will include input from prescribed relevant authorities. The Department of the Environment in Northern Ireland (DOENI) has recently issued a consultation document on proposed legislation, which will list the relevant authorities referred to in the Order. It also proposes to consult in the near future on proposed legislation, which will be similar to the Air Quality Regulations 2000 and the Air Quality Amendment Regulations 2002.

The duties imposed on local authorities through N.I. legislation are similar to those for GB local authorities and can be summarised as follows:-

- Regularly assess air quality in the area.
- Publish the results of the assessments.
- If air quality objectives are not likely to be met by the specified date, declare an Air Quality Management Area.
- Agree, publish and implement plans for addressing problems identified.

A copy of the Technical Guidance LAQM.TG(03) (Ref 10) was sent to all district councils and relevant authorities in Northern Ireland who were advised that under the Environment (NI) Order 2002 they must have regard to the guidance when carrying out their LAQM duties.

In keeping with the Technical Guidance LAQM.TG(03) (Ref 10), a phased approach to the assessment of air quality has been adopted in the AQS with the purpose of using simple screening techniques to identify whether certain areas and specific pollutant levels warrant further investigation. In general terms, the three stages of assessment are:

- Stage 1: Screening review of air quality based on information collated on transport and industrial sources influencing local air quality and background pollutant concentrations.
- Stage 2: If a risk of exceedence of the national objectives for any pollutant is identified in Stage 1, more detailed estimation, screening model studies or measurement of pollutant levels in areas of concern is carried out.

- Stage 3: Should Stage 2 identify the potential for objective exceedences, a more detailed review of air quality based on inventories, modelling and accurate measurement should be carried out.

Where the potential for exceedences of any of the Air Quality Objectives is predicted following a Stage 3 assessment, the area affected must be designated as an Air Quality Management Area (AQMA). The local authority must then establish an action plan to ensure compliance with the Air Quality Objectives.

In accordance with published guidance, this Stage 2 / Stage 3 air quality review has considered the existing concentration of pollutants for which AQS objectives have been set and has estimated their likely future levels in the target year for each pollutant objective.

1.2 Air Quality Strategy Objectives and Objectives

Stage 1 of the Local Air Quality Review and Assessment for Craigavon Borough Council (Ref. 3) was based on AQS objectives, objectives and guidance current at that time (March 1997). Since then, air quality objectives and objectives along with accompanying guidance have been reviewed by the Government and devolved administrations and have been modified accordingly. Current AQS objectives (Ref. 2) for the purposes of Local Air Quality Management are listed in **Table 1**.

Revisions to the previously stated AQS objectives and objectives following the review are:

Carbon monoxide : Target date brought forward two years to 2003

Nitrogen dioxide : Objective for 1 hour mean reduced from 286µg/m^3 to 200µg/m^3, with 18 permitted exceedences per year.

Sulphur dioxide : New 1 hour and 24 hour mean objectives introduced.

PM_{10}[1] : Number of exceedences allowed per year increased from 4 to 25; target date brought forward one year to 2004.

New annual mean objective introduced.

Lead : New objective of 0.25 µg/m^3 introduced (to be achieved by 21/12/2008); target date for existing objective of 0.5µg/m^3 brought forward one year to 2004

Benzene : Target date brought forward two years to 2003

1,3-Butadiene : Target date brought forward two years to 2003

1 PM_{10}: particulate matter with an aerodynamic diameter less than 10 microns

Table 1 Air Quality Strategy Objectives

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration[1]	Measured as	
Benzene	16.25 μg/m^3 (5 ppb)	Running annual mean	31.12.2003
	3.25 μg/m^3	Running annual mean	31.12.2010[a]
1,3 Butadiene	2.25 μg/m^3 (1 ppb)	Running annual mean	31.12.2003
Carbon monoxide[a]	10 mg/m^3	Maximum daily running 8-hour mean	31.12.2003
Lead	0.5 μg/m^3	Annual mean	31.12.2004
	0.25 μg/m^3	Annual mean	31.12.2008
Nitrogen dioxide[2]	200 μg/m^3 (105 ppb) not to be exceeded more than 18 times a year (99.8th %ile)	1 hour mean	31.12.2005
	40 μg/m^3 (21 ppb)	Annual mean	31.12.2005
Particles (PM_{10})[3]	50 μg/m^3 (gravimetric) not to be exceeded more than 35 times a year (90.4th %ile)	24 hour mean	31.12.2004
	40 μg/m^3 (gravimetric)	annual mean	31.12.2004
Sulphur dioxide	350 μg/m^3 (132 ppb) not to be exceeded more than 24 times a year (99.7th %ile)	1 hour mean	31.12.2004
	125 μg/m^3 (47 ppb) not to be exceeded more than 3 times a year (99.2th %ile)	24 hour mean	31.12.2004
	266 μg/m^3 (100 ppb) not to be exceeded more than 35 times a year (99.9th %ile)	15 minute mean	31.12.2005

Notes :

a: In Northern Ireland the Air Quality Objective Values Regulations (Northern Ireland) 2002, Statutory Rule 2002 No. 94 is the statutory instrument which sets out Air Quality objective values.

1: ppm = parts per million; ppb = parts per billion
2: μg/m^3 = micrograms per cubic metre
3: Conversions of ppb and ppm to μg/m^3 at 20^o C and 1013mb

1.3 Scope of Report

The Stage 1 Review and Assessment of local air quality (Ref. 3) concluded that it was unlikely that the objectives in the National Air Quality Strategy for PM_{10}, carbon monoxide, lead, benzene and 1,3-butadiene were currently being exceeded or were likely to be in the future. It is therefore not necessary to undertake a further review and assessment for these pollutants. However, new equipment was installed for the continuous monitoring of PM_{10}. As PM_{10} is a key pollutant with regards to traffic emissions, it has been considered within the assessment of air quality impacts from road traffic for completeness.

The possibility of air quality objectives for nitrogen dioxide and sulphur dioxide being exceeded could not be eliminated at Stage 1. This Stage 2 / Stage 3 assessment, therefore, further assesses concentrations of nitrogen dioxide and sulphur dioxide arising from sources within Craigavon, as follows:

Table 2 Sources of nitrogen dioxide and sulphur dioxide from Stage 1 Assessment

Source	Pollutant requiring assessment	
	Nitrogen dioxide	Sulphur dioxide
Road Traffic	× *(PM_{10} also assessed)*	
Craigavon Area Hospital (Incinerator)	×	×
Other Combustion Units of >5MW comprising: Riverside Textiles Boxmore Ltd Ulster Carpets		×
Small-scale commercial combustion units of <5MW		× *(PM_{10} also assessed)*
Domestic Fuel Burning		× *(PM_{10} also assessed)*

Chapter 2 addresses road traffic emissions. Emissions from Craigavon Area Hospital (Incinerator) are considered in Chapter 3 covering Part A/B sources. Emissions from Part C sources are considered in Chapter 4. Chapter 5 addresses the impact of domestic fuel burning and small-scale commercial combustion. Conclusions and References are presented in Chapters 6 and 7 respectively.

2. ROAD TRAFFIC

2.1 Conclusions of the Stage 1 Review and Assessment

The Stage 1 review and assessment (Ref. 3) noted that the main highway routes within and through Craigavon are:

- The M1 Junction 10 (Lough Road) – Junction 11 (Ballynacorr)
- The M12
- The Northway, Portadown (A3)
- Lake Road, Craigavon (A3)
- Magheralin, Moira (A3)
- Lough Road, Lurgan (A76)
- Armagh Road, Portadown (A3)

The area of Craigavon and the surrounding road network is illustrated in **Figure 1.**

Automatic traffic count statistics supplied by Craigavon Borough Council indicate that annual average daily traffic flows (AADT) on these roads were between 8000 and 27100 in 1997. The projected annual average daily traffic flows (7-day week) were given for each of the above roads for 2003, 2004 and 2005 (Ref. 11). Traffic flows are expected to rise by up to 25% along some routes. The Stage 1 review and assessment identified the M1 as the most significant highway route within the Craigavon Borough in terms of the contribution to NO_x.

Two complementary approaches have been pursued in assessing concentrations of nitrogen dioxide and particulates arising from road traffic: analysis of monitoring data and use of a screening model of road traffic emissions.

2.2 Monitoring Data

Monitoring for the key air pollutants associated with traffic has taken place in Lurgan and Portadown. Table 3 shows the monitoring that currently takes place for the key air pollutants.

Table 3 Description of Monitoring in Craigavon

Pollutant	Equipment	Location	Data Collected	Grid ref.		Site Ref.
				Eastings	Northings	
PM_{10}	TEOM series 1400a	Lord Lurgan Park	Continuous measurements	307980	359301	82880
SO_2	Fluorescent Real-time Analyser Model 100A	Lord Lurgan Park	Continuous measurements	307980	359301	82880
SO_2	Diffusion Tubes	Lord Lurgan Park	Approximate monthly means	n/a	n/a	n/a
SO_2	The 8 port bubbler method	Town Hall, Edward Street in Portadown	24 hour mean measurements	n/a	n/a	n/a
NO_x and NO_2	Chemilumin-escence Real-time Analyser Model 200A	Castle Lane, Lurgan	Continuous measurements	308230	358450	82886
NO_2	Nitrogen Dioxide Network of diffusion tubes managed by AEA Technology	Craigavon 5N, Town Hall, Union Street, Lurgan, Craigavon BT66 8YD	Approximate monthly means	308260	358250	82760 K
		Craigavon 9N, Castle Hardware, 7 Market Street, Portadown, Craigavon BT62 3JY	Approximate monthly means	301040	353760	82979 K
		Craigavon 7N, 36 Ardboe Drive, Lurgan, Craigavon, BT66 8HP	Approximate monthly means	308130	357830	82762 B
		Craigavon 8N, 27 Ballyhannon Road, Portadown, Craigavon, BT63 5SE	Approximate monthly means	303170	354260	82763 B
NO_2	Diffusion tube measurements	4 Cluandara, Derrymacash, Craigavon	Approximate monthly means (closest exposure location to the M1)	304402	359301	82767

Following recommendations from the Stage 1 AQ R&A, since April 2002, Craigavon Borough Council has undertaken continuous monitoring of nitrogen dioxide, sulphur dioxide and particulates at two key locations within the Craigavon area. Continuous monitoring instruments were located at Lord Lurgan Memorial Park for sulphur dioxide and PM_{10} and Castle Lane in Lurgan for nitrogen oxide. Ratified data for the period 27 October 2003 – 30 October 2004 were provided by Craigavon Borough Council.

The Stage 1 report also recommended that further assessment of NO_2 levels at locations where members of the public are regularly present be carried out. In particular, the report referred to housing development in one location along the specified road, the M1. Therefore, Craigavon Borough council installed nitrogen dioxide diffusion tubes at 4 Cluandara, Derrymacash, Craigavon, which is the closest exposure location to the M1, and data from these diffusion tubes are presented below.

The monitoring locations were selected by Craigavon Borough Council because they represent areas where impacts from traffic are likely to be highest, and/or where the members of public are likely to be exposed to pollution for the relevant averaging period. Lord Lurgan Park and Castle Lane are town centre locations which are likely to be representative of the highest public exposure to levels of nitrogen dioxide, sulphur dioxide and PM_{10} emitted from traffic, commercial and domestic sources in Lurgan. No. 4, Cluandra, Derrymacash is likely to be representative of the highest public exposure to levels of nitrogen dioxide emitted from the M1. The diffusion tube locations are likely to be representative of the highest public exposure to levels of nitrogen dioxide emitted from slow-moving traffic in the town centre.

2.2.1 Nitrogen Dioxide Measurements

Nitrogen dioxide was monitored using a continuous chemiluminescence real-time analyser model 200A instrument at Castle Lane, Lurgan. The instrument has been in operation since April 2002. Concentrations measured between 28 October 2003 and 30 October 2004 have been ratified and are shown in **Table 4**.

Table 4 Continuous nitrogen dioxide measurements : Castle Lane, Lurgan, October 2003 to October 2004

	Measured value	AQS Objective value	Measured concentration / AQS objective
99.8th percentile of 1 hour mean concentrations	73 µg/m^3	200 µg/m^3	37%
Number of exceedances of 1 hour mean objective value	0	18	n/a
Annual mean concentration	20 µg/m^3	40 µg/m^3	49%

Diffusion tube measurements of nitrogen dioxide have been made at four locations in Lurgan and Portadown as part of the national monitoring network. **Table 5** lists values recorded at each location between January 2001 and December 2001, and March 2002 to December 2002. **Figures 3** and **4** show the locations of the measuring points.

Table 5 Nitrogen dioxide diffusion tube measurements: Lurgan and Portadown

Location	Annual mean concentration 2001 (µg/m^3)	Annual mean concentration 2002 (µg/m^3) (part year)	AQS Objective	Highest measured concentration / AQS objective
Craigavon 5N, Town Hall, Lurgan	17	24	40	60%
Craigavon 9N, Market Street, Portadown	24	32	40	80%
Craigavon 7N, Ardboe Drive, Lurgan	13	18	40	45%
Craigavon 8N, Ballyhannon Rd, Portadown	12	15	40	38%

Note: The Air Quality Strategy Objectives apply to concentrations measured over a calendar year. The data for 2002 is not a full calendar year, but has nevertheless been included in the assessment against the AQS Objective.

Diffusion tube measurements have also been taken at a location close to the M1 is the diffusion tube sampling that has taken place at 4 Cluandara, Derrymacash, Craigavon (see **Figure 2**).

Table 6 Nitrogen dioxide diffusion tube measurements: Derrymacash (near M1)

Period	Long-term mean concentration (µg/m^3)	AQS Objective	Measured concentration / AQS objective
2003	18	40	45%
2004	15	40	38%

There is evidence of systematic over or under reading by diffusion tubes by up to 30% (Refs 5, 6, 7). An accuracy of ±8% has been estimated for nitrogen dioxide chemiluminescence instruments in the UK national network (Ref. 8). Provided appropriate maintenance, calibration and quality assurance procedures are carried out, continuous measurements are likely to be more accurate than the diffusion tube measurements.

Conclusions

Nitrogen dioxide concentrations recorded by diffusion tubes indicate that nitrogen dioxide concentrations currently comply with the annual mean Air Quality Strategy objective at all measurement locations. Guidance provided by DEFRA (Ref. 1) indicates that nitrogen dioxide concentrations will reduce by the target date of 31 December 2005. It is therefore concluded that nitrogen dioxide concentrations will comply with the air quality strategy objective for annual mean concentrations at the target date.

To corroborate the diffusion tube measurements at 4, Cluandra, Derrymacash, a screening assessment was carried out to determine the likely concentrations of NO_2 in this area. This is described in Section 2.3.

2.2.2 PM_{10} Measurements

New equipment was installed by Craigavon BC for the continuous monitoring of PM_{10}. As PM_{10} is a key pollutant with regards to traffic emissions, it has been considered within the assessment of air quality impacts from road traffic for completeness.

Particulate matter has been monitored via a gravimetric air sampling technique that provides discrete hourly mean concentrations. The instrument, (TEOM series 1400a) records particulate matter with a diameter of less than 10µm (PM_{10}). Concentrations measured between 28 October 2003 and 30 October 2004 have been ratified and are shown in **Table 7**.

Levels of PM_{10} (Gravimetric) have been estimated from the PM_{10} TEOM data by applying a factor of 1.3.

Table 7 Particulate measurements : Lord Lurgan Memorial park, Lurgan, October 2003 – October 2004

	Measured value	AQS Objective value	Measured concentration / AQS objective
Annual mean	16 µg TEOM/m^3 21 µg Gravimetric /m^3	40 µg/m^3	40%
90.4th percentile of 24 hour means	32 µg TEOM/m^3 41 µg Gravimetric /m^3	50 µg/m^3	82%
Number of exceedances of 24 hour objective value	3 (TEOM) 16 (Gravimetric)	35	n/a

Table 7 indicates that during the monitoring period, the air quality strategy objectives for PM_{10} were not exceeded. These results indicate that the air quality strategy objective is not likely to be breached in Lurgan.

2.3 Screening model of road traffic emissions

A screening assessment has been carried out to predict the likely impact of road traffic on air quality. The DMRB screening methodology (Ref. 12) has been used in this assessment. The DMRB procedure was developed by the Highways Agency and is regularly employed to assess the potential impacts of traffic derived pollutants in close proximity to roads.

The DMRB procedure calculates concentrations of pollutants up to 200m from the road-side using emission factors for the vehicle mix and traffic speeds on the road. The procedure accounts for the expected changes in emissions from road vehicles over time.

The Stage 1 review and assessment of air quality in Craigavon indicated the M1 as the only road within the borough requiring further consideration as part of the second stage of review and assessment. Concentrations of nitrogen dioxide and particulates have been assessed for the M1 road section between Junction 10 (Lough road) and Junction 11 (Ballynacor).

Background Concentrations

Background concentrations used in the DMRB model have been obtained from the active concentration maps provided by DEFRA (http://www.airquality.co.uk). Values used are shown in **Table 8** together with the remaining inputs to the traffic assessment. These were converted to values appropriate for the years when the air quality objectives are to be achieved.

Sensitive Locations

The M1 runs to the north and north east of the centre of Lurgan from east to west through the Craigavon Borough. There is a housing development in close proximity to the M1 in the Derrymacash area of Craigavon (see **Figure 2**). The housing development is adjacent to Derrymacash Road at the bridge across the M1 towards Derryadd.

The assessment considered ground level concentrations at intervals up to 50m from the M1 to take into account the potential nearby receptors. This will result in assessment of all potential receptors within 50m of the M1. The receptors of concern are the residential properties in Derrymacash situated adjacent to the M1.

Properties at distances further from the roads than those identified above will have lower predicted concentrations than those presented in this assessment.

Traffic Data and Vehicle Speeds

Traffic flow data for the M1, junction 10 to 11 was based on traffic count data supplied by Craigavon Borough Council (Ref. 11 and 13). The original source of the data, including the average vehicle speed data, is the Department of Regional Development (DRD) and Road Service (an agency within the DRD) (Ref. 11).

Traffic flow data, as given in the Stage 1 review and assessment for the years 2000 (measured), 2004 (projected) and 2005 (projected) have been used in the M1 (Junction 10 to 11) assessment to ensure that any changes in traffic flows are represented. Traffic flow data are given in **Table 8.**

Table 8 Traffic Assessment Input Data (Ref. 11)

	M1: Junction 10 to 11		
Year	**2000**	**2004**	**2005**
Background concentrations of nitrogen oxides(µg/m^3)	23.2	20	19.4
Background particulate concentrations (µg/m^3)	20.1	18.2	17.8
Two way mean traffic flow (AADT)	29200	32880	33800
% Heavy Goods Vehicles (HGVs)[1]	13%	13%	13%
Average Speed (kph)	104	104	104

Distance of each carriageway from sensitive receptor(m)	5, 10, 25, 50

Note 1: Transport Statistics Bulletin (Ref. 17)

Average traffic speeds used in the DMRB assessment were based on speed limits in force. An average traffic speed of 65-70mph (104-112kph) would typically be expected along the M1 (Junction 10 to 11). A speed of 65 mph (104kph) has been assumed for the assessment of this road section.

Nitrogen Dioxide Concentrations

Estimated concentrations of nitrogen dioxide for the M1 (Junction 10 to 11) are given in **Table 9**. Predictions are given for the current situation and for 2005, the target date for the nitrogen dioxide air quality objectives.

The DMRB methodology provides estimated annual mean ground level concentrations only:

> *"The NO_2 criteria are defined in terms of both the annual mean of 40$\mu g/m^3$, and the number of exceedances of a 1-hour mean of 200$\mu g/m^3$. Whilst the annual mean NO_2 value is calculated, the number of exceedances of the hourly objective cannot be calculated from the annual mean with a high degree of confidence. Therefore, as with CO, only the annual mean NO_2 value is reported."*

Table 9 Estimated nitrogen dioxide concentrations

Year	Receptor 1	Receptor 2	Receptor 3	Receptor 4
Distance from M1	**5m**	**10m**	**25m**	**50m**
	Annual mean	**Annual mean**	**Annual mean**	**Annual mean**
2000	38.4	36.9	31.5	25.7
2005	31.5	30.3	26.0	21.5
AQS Objective	40	40	40	40

Despite an increase in vehicle numbers by 2005 in comparison to 2000 traffic flows, an improvement in local air quality is predicted by the year 2005 for the M1 (Junction 10 to 11). This is due to improvements in vehicle design, fuel quality and emission control with a greater proportion of cars operating with catalytic converters.

The assessment indicates that concentrations of nitrogen dioxide will not exceed the AQS objective for annual mean concentrations by the target date of 2005 at the nearest residential properties.

It should be noted that the DMRB screening model is designed to over predict concentrations and provide a conservative assessment. Lower concentrations would be expected in reality.

Particulate Concentrations

Estimated concentrations of particulates for the M1 (Junction 10 to 11) are given in **Table 10**. These results indicate that concentrations of particulates from road traffic are predicted to comply with air quality objectives in 2000, and at the end of 2004, the target date for achieving the air quality objective for particulates.

Table 10 Predicted particulate concentrations

Receptor	Receptor 1		Receptor 2		Receptor 3		Receptor 4	
Distance from M1	5m		10m		25m		50m	
	Annual mean	No. of days> 90.4th %ile of 24 hour means	Annual mean	No. of days> 90.4th %ile of 24 hour means	Annual mean	No. of days> 90.4th %ile of 24 hour means	Annual mean	No. of days> 90.4th %ile of 24 hour means
2000	30.28	29	29.3	25	26.2	15	23.4	9
2004	28.4	22	27.6	19	25	12	22.7	7
AQS Objective ($\mu g/m^3$)	40	35 days	40	35 days	40	35 days	40	35 days

2.4 Future Developments

The current area plan for Craigavon (Craigavon Area Plan 2010 (Draft Plan)) proposes the development of new housing across the borough. Settlement objectives have been defined for the villages and smaller settlement areas of the Craigavon Borough. With reference to the M1, areas that might be of concern include:

- The village of Aghacommon – Allocated Phase 2 development land – single dwelling units of an appropriate design will normally be permitted on suitable sites.

- The smaller settlement area of Derrymacash – approximately 1km north-west of Alghacommon village and the M1 motorway. It currently comprises some 184 houses. An area to the west, off Ballynery North Road and Derrymacash Rd, has been allocated for Phase 2 development.

Such development will generate a small increase in road traffic, but would not be expected to have a significant impact on air quality.

Craigavon Borough Council has zoned approximately 128.7 hectares of land for industry in Central Craigavon. There are 2 areas that are located close to the M12, which joins the M1 at Junction 11. A 66 hectare site has been zoned for industrial, storage or distribution use and is located north of Northway and east of New Charlestown Road. The proposed development would require construction of the proposed M12-Central Way link road, road widening of Carn Rd and other traffic measures. The proposed development would clearly affect traffic flows, potentially on the M1, and resulting concentrations of traffic-derived pollutants in the area. Requirement for a Traffic Impact Assessment has been specified in the Craigavon Area Plan 2010 (Draft Plan) should the development go ahead, and this should involve consideration of air quality impacts.

A 20.2 hectare site has been zoned for industrial, storage or distribution use on land west of Charlestown Road. Although a Traffic Impact Assessment is not a requirement, there will be alterations to the access road of the site along with other traffic infrastructure.

The rest of the land surrounding the M1 is zoned as Greenbelt or Countryside Policy Area.

2.5 Conclusions

Measurement and predictions of particulate concentrations resulting from road traffic indicate that air quality objectives are not likely to be exceeded in 2004, the target date by which the air quality objective must be achieved. It is not necessary to proceed to a further stage of review and assessment for particulate concentrations arising from road traffic.

Measurements and predictions of nitrogen dioxide levels associated with road traffic within urban areas and at locations adjacent to the M1 indicate that there is no significant risk of exceedances of air quality objectives for nitrogen dioxide.

It is not necessary to proceed to a further stage in the review and assessment for nitrogen dioxide concentrations arising from road traffic.

3. PART A, B AND C PROCESSES

3.1 Introduction

In Northern Ireland, processes with the potential to release into the air significant quantities of the specified pollutants are prescribed for control under the Industrial Pollution Control (NI) Order, 1997.

Such processes are categorised as Part A, B and C. The Industrial Pollution and Radio Chemical Inspectorate (IPRI) regulate Part A and B processes. Local councils regulate part C processes.

There are no industrial sites located within Craigavon which have 'Part A' authorisations (under the Industrial Pollution Control (NI) Order, 1997) for emissions to air. Following communication with Department of the Environment's IPRI, it is understood that the closest Part A process is Lafarge Cement in Cookstown BC, which is some distance away from Craigavon.

The Stage 1 Review and Assessment Study (Ref. 3) found that none of the Part C processes (authorised for the treatment of animal matter) in the Borough and neighbouring authorities have the potential to emit significant quantities of air pollutants.

The Stage 1 Review and Assessment Study (Ref. 3) presents a list of 'Part B' processes in Craigavon authorised for emissions to air by the Department of Environment's Industrial Pollution and Radiochemical Inspectorate (IRPI). The Stage 1 review and assessment found that none of the Part B processes has the potential to emit significant quantities of air pollutants, with the exception of sulphur dioxide emissions from Craigavon Area Hospital.

Table 11 Part B Sources within Craigavon

Source	Potentially significant? (Stage 1 Review and Assessment)	Pollutant(s) of concern
Clearway Disposals	No	
Cornamucklagh Quarry	No	
Craigavon Area Hospital	Yes	SO_2
ICB Emulsions	No	
Interface Europe	No	
Maralin Quarry	No	
Polypipe (Ulster) Ltd	No	
Silverwood Enterprises Ltd	No	
Syngal	No	
Uniplas Ltd	No	

3.2 Craigavon Area Hospital

The Stage 1 review and assessment indicated that one source needed further assessment: Craigavon Area Hospital. This has since had its Part B authorisation revoked, as the clinical waste incinerator has now been closed. However,

Craigavon Area Hospital does operate a number of boilers, which could potentially contribute to levels of SO_2.

Housing development exists in the vicinity of this plant and may be considered relevant in terms of human exposure to sulphur dioxide (See **Figure 5**)

Craigavon Area Hospital currently has 6 boilers that are used on site (Ref 14). Fuel emissions from five of the boilers are released through one chimney; emissions from the sixth emergency boiler have a separate release point and have not been assessed as this boiler is rarely used.

3.2.1 Description of dispersion model

The dispersion model used in the study was ADMS (version 3). ADMS is widely accepted as the current industry objective model for dispersion from point sources such as the Craigavon Area Hospital chimney.

ADMS was considered to be the model most "fit for purpose" for the following reasons:

- The dispersion model performs more satisfactorily than earlier models for modelling concentrations arising from elevated point sources such as the release point at Craigavon Hospital;
- It represents an advanced understanding of boundary layer meteorology.

3.2.2 Study Inputs: Emissions Data

Physical source data were provided by boiler operators at Craigavon Area Hospital. The information provided is shown in **Table 12**.

There are 6 boilers that operate on the site, of which 5 use heavy fuel oil. One of the boilers is an emergency gas oil boiler which is rarely used. Throughout the year, it is normal for only 2 boilers to be operating on average. To improve efficiency, the boilers now operate on low sulphur fuel, which has a maximum sulphur content of 1%.

Emission rates have been taken from correspondence with Craigavon Area Hospital boiler operators. The boiler operators have specified the maximum fuel usage, from which Enviros has calculated the emission release rate of sulphur dioxide for the maximum short-term releases assuming a sulphur content of 1%. As a worst case assessment, the short term emission rates have been used to represent long term emission rates.

Table 12 Plant Emission Characteristics

Parameter	Release Point
Stack location (OS NI)	J030 552
Stack height (m)	45
Stack diameter (m)	0.5
Efflux temperature (°C)	250
Volumetric flow rate (m^3/s)[1]	2
Efflux Velocity (m/s)	10

Sulphur dioxide emission rate (g/s)	11.46

Note 1: At stack release conditions.

3.2.3 Study Inputs: Meteorological data

Meteorological data for the dispersion modelling study were obtained from the Meteorological Office. Measurements made at Belfast international airport (Aldergrove) over three years (1999, 2000, and 2001) were used for the modelling assessment.

3.2.4 Study Inputs: Miscellaneous

The surface roughness used in this study was 0.5 m. The surface roughness is a measure of the typical height of obstructions in the surrounding area. A value of 0.5m is appropriate for parkland and open suburbia. A value of 0.5m lies within the range of values appropriate for the study area.

The meteorological data were provided as hourly mean values. 15 minute mean concentrations were estimated by setting the appropriate averaging time in the dispersion model. This enables the model to take account of plume meandering over different timescales; however, it does not take account of the effects of fluctuations in concentrations over these timescales. The modelled 15 minute mean concentrations may be expected to be under-estimates by up to 30%. Modelled 15 minute sulphur dioxide concentrations were increased by 30% to ensure that the impact of turbulent fluctuations was fully accounted for.

Concentrations have been calculated within 2km of the Craigavon Area Hospital, and the maximum modelling value in this area is reported.

The background concentration level of SO_2 used in the modelling assessment was taken from the monitoring site at the Town Hall, Edward Street in Portadown, which employs the 8-port bubbler method. The annual mean measured SO2 concentration for 2002 was 8 $\mu g/m^3$. The background concentration for short-term mean concentrations was taken to be twice this value (Ref. 1). As a worst case assumption, the background annual mean sulphur dioxide concentrations for 2002 are assumed to continue to be the same for 2004 and 2005. In practice, sulphur dioxide concentrations will tend to decrease over time.

3.2.5 Modelling Results

The modelled process contribution values are shown in **Table 13**. **Table 13** also shows the predicted environmental concentrations derived by adding the baseline concentration to the process contribution. As a worst case assumption, the background annual mean sulphur dioxide concentrations for 2002 are expected to be the same for 2004 and 2005.

The predicted maximum modelled concentrations are given in **Table 13**. Concentrations resulting from the Craigavon Area Hospital are likely to result in lower concentrations than these in the wider surrounding area and at receptor locations.

Table 13 Sulphur dioxide concentrations resulting from Craigavon Area Hospital incinerator

Statistic	Objective ($\mu g/m^3$)	Highest Modelled Process Contribution ($\mu g/m^3$)	Baseline conc-entration ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/m^3$)	PEC / AQS
99.9th percentile of 15 minute mean sulphur dioxide concentrations	266	81.5	16	97.5	37%
99.7th percentile of 1 hour mean sulphur dioxide concentrations	350	193	16	209	60%
99.2th percentile of 24 hour mean concentrations	125	44.6	16	60.6	48%

Table 13 shows that the highest modelled concentrations are 60% or less of the AQS objectives. It is concluded that emissions of sulphur dioxide from Craigavon Area Hospital are unlikely to cause an exceedence of the air quality objectives:

3.2.6 Future Developments

Craigavon Borough Council is not aware of plans to develop new Part A process within or near to Craigavon borough and has received no applications for detailed planning permission.

With reference to the Craigavon Area Plan 2010 (Draft Plan) a number of areas for further industrial development have been specified within the Craigavon borough. However, specific proposals have not been brought forward.

3.2.7 Conclusions

Sulphur dioxide emissions from Craigavon Area Hospital are forecast to comply with air quality objectives in 2005 within Craigavon. Craigavon Borough Council is not aware of any proposed developments of new Part A process within or near the borough. It is therefore concluded that no further consideration of emissions from Part A/B or C sources is needed.

If, despite the low forecast, levels of SO_2, monitoring is considered necessary, the results of the modelling study could be re-interpreted to identify appropriate monitoring locations.

4. COMMERCIAL COMBUSTION PROCESSES (>5MW)

The Stage 1 Review and Assessment Study (Ref. 3) presents a list of small solid fuel or oil combustion systems with a thermal capacity greater than 5 MW at 4 locations in the Borough. One such operation, Craigavon Area Hospital, which used to be a 'Part B' authorised process, has been assessed in Chapter 3.

The remaining three sources, which may need further assessment are Huthamaki Van Leer (Boxmore Ltd), Riverside Textiles and Ulster Carpets. A dispersion modelling study was therefore carried out to assess the potential impacts of these developments on air quality.

4.1 Description of dispersion model

The model used was ADMS (version 3), as described in Chapter 3.

4.2 Study Inputs: Emissions and Process Data

The Council, under The Clean Air Order 1981, has approved applications for these plants, including verification of suitable chimney heights. Some of the process information for the plants, provided by the operators, was insufficient and assumptions about the processes were made, based on guidance from DEFRA (Ref. 10) and past experience of similar processes. The information provided by the operators (Ref. 14 and Ref. 16), along with assumptions made by Enviros are shown in **Table 14**.

Table 14 Plant Emission Characteristics

Parameter	Boxmore Ltd	Riverside Textiles	Ulster Carpets
Stack location (OS NI)	J111 579	J078 552	J001 548
Stack height (m)	30.5	33	27.4
Stack diameter (m)	0.35[1]	0.75[1]	0.36
Efflux temperature (°C)[1]	190	190	190
Efflux velocity (m/s)	10.9[1]	18.1[1]	13.9
Current sulphur dioxide emission rate (g/s)[2]	4.8	5.9	1.2

Note 1: Calculated based on process parameters

The emission rate of SO_2 was calculated from data provided by the operators on fuel usage (Ref. 14 and 16), along with the content of sulphur permitted in heavy fuel oil. The sulphur content in the fuel was assumed to be 1%, as set out in Directive 1999/32/EC. The Directive on '*Sulphur content of heavy fuel oil and gas oil'* 1999/32/EC prohibits the use of HFO with sulphur content higher than 1% by mass within the territory of every EU Member State from 1 January 2003 (Article 3.1 of the Directive).

It has been assumed that all the sulphur is converted to SO_2, as a worst case scenario. From past experience, the conversion to SO_2 for heavy fuel oil is likely to be about 95% with the balance being retained in the ash.

Emissions from each process exit via one release point, as given in **Table 14**.

4.3 Study Inputs: Meteorological data

Meteorological data for the dispersion modelling study were obtained from the Meteorological Office. Measurements made at Belfast international airport (Aldergrove) over three years (1999, 2000, and 2001) were used for the modelling assessment.

4.4 Study Inputs: Miscellaneous

The surface roughness used in this study was 0.5m. The surface roughness is a measure of the typical height of obstructions in the surrounding area. A value of 0.5m is appropriate for relatively small urban areas such as Portadown and Lurgan.

Concentrations have been calculated on a grid of locations extending 2000m in a north-south and east-west direction. There are 31 receptor points in each direction giving spacing between grid points of 67m, defined to give appropriate averages of nearby residential areas.

The background concentration level of SO_2 used in the modelling assessment was taken from the monitoring site at the Town Hall, Edward Street in Portadown, which employs the 8-port bubbler method. The annual mean measured SO2 concentration for 2002 was 8 $\mu g/m^3$. The background concentration for short-term mean concentrations was taken to be twice this value (Ref. 1). As a worst case assumption, the background annual mean sulphur dioxide concentrations for 2002 are assumed to continue to be the same for 2004 and 2005. In practice, sulphur dioxide concentrations will tend to decrease over time.

15 minute mean concentrations were estimated by setting the appropriate averaging time in the dispersion model and increasing the modelled 15 minute mean sulphur dioxide concentrations by 30%, as described in Chapter 3.

4.5 Study Results

Modelled concentrations arising from each site are shown in **Table 15**. Values shown are the maximum occurring on the calculation grid. Each site location tends to be a mix of residential properties and open land within close proximity to the relatively small town centres.

Table 15 Sulphur dioxide concentrations – Boxmore Ltd, Riverside Textiles and Ulster Carpets

Statistic	AQS objective ($\mu g/m^3$)	Highest Modelled Process Contribution ($\mu g/m^3$)	Baseline concentration ($\mu g/m^3$)	Predicted Environmental Concentration (PEC) ($\mu g/m^3$)	PEC / AQS
Boxmore Ltd					
99.9th percentile of 15 minute mean sulphur dioxide concentrations	266	78.4	16	94.4	40%
99.7th percentile of 1 hour mean sulphur dioxide concentrations	350	166	16	182	52%
99.2th percentile of 24 hour mean concentrations	125	42.3	16	58.3	47%
Riverside Textiles					
99.9th percentile of 15 minute mean sulphur dioxide concentrations	266	56.7	16	72.7	27%
99.7th percentile of 1 hour mean sulphur dioxide concentrations	350	75.2	16	91.2	26%
99.2th percentile of 24 hour mean concentrations	125	29.1	16	45.1	36%
Ulster Carpets					
99.9th percentile of 15 minute mean sulphur dioxide concentrations	266	22.9	16	38.9	15%
99.7th percentile of 1 hour mean sulphur dioxide concentrations	350	42.5	16	58.5	17%
99.2th percentile of 24 hour mean concentrations	125	12.9	16	28.9	23%

Modelled sulphur dioxide concentrations in the vicinity of each site were found to comply with the air quality objectives. **Table 15** indicates that current sulphur dioxide emissions from each site, including baseline concentrations, account for no more than 52% of the air quality strategy objectives for sulphur dioxide. No further assessment of these sources is required.

5. DOMESTIC AND SMALL SCALE COMMERCIAL FUEL COMBUSTION (<5MW)

5.1 Domestic use of solid and liquid fuel

Craigavon has in the past been an area of relatively high solid fuel consumption and more recently an area of high liquid fuel (oil) consumption by domestic users. Local Air Quality Management TG (03) indicates that the risk of exceedence in an area can be considered significant where the density of 'coal' burning (including coal, anthracite and smokeless fuels) houses exceeds 100 properties per 500m by 500m area. The Stage 1 Air Quality Review and Assessment indicated that the number of properties using solid fuel might exceed 300 properties per km^2 in some housing areas across Portadown and Lurgan (Ref. 1). This is further investigated as part of the Stage 2 & 3 AQR & A.

The Craigavon Borough covers an area of approximately 379 km^2 and within the Southern Board area is the most densely populated local government district (215 persons per km^2). There are currently approximately 79,800 to 81,500 people residing in the Craigavon area, this equates to approximately 30,000 households, of which the average size is 2.7 people (Craigavon Area Plan 2010 and The Corporate Plan, Craigavon Borough Council 2001 - 2005).

The Northern Ireland Housing Executive (NIHE) is responsible for council housing across the Craigavon area. Information from the NIHE indicates that, until a few years ago, open fires were used across Craigavon (Portadown and Lurgan NIHE households). Nowadays, approximately only 4% of NIHE households use open fires, the rest use room heaters. Approximately 31% of room heaters use smokeless fuel and the rest use oil. The NIHE have stated that all room heaters (fuelled by smokeless fuel) shall be replaced with oil fuelled room heaters by 2005/2006. Any newly constructed housing after 2006 will be fitted with gas-fuelled heating, as a gas main is extended from Belfast to Craigavon.

The correspondence with the NIHE discussed above indicates that the number of properties using solid fuel has decreased substantially in recent years. Recently introduced policies are in place to encourage households to use alternative fuel to coal. In particular, the proposed gas line for Craigavon in 2006 is expected to result in improved air quality. This corresponds with evidence from coal merchants in Craigavon, which suggests that coal is rarely used across the Craigavon borough at the present time for domestic or commercial uses. It is likely that all properties, including non-NIHE housing and commercial properties, are switching from coal to alternative fuels.

The Craigavon Area Plan 2010 and The Corporate Plan, (Craigavon Borough Council 2001 – 2005) indicate that the population of Portadown is approximately 30,000, and the population of Lurgan is approximately 25,000. The remaining villages make up approximately 13,000, whilst the rural areas make up approximately 12,000.

5.2 Small-scale commercial use of solid and liquid fuel

A list of small combustion plant was provided, as set out in **Table 16**. These plants are associated with schools, community centres, and leisure centres and public halls. Most of these sources are concentrated around Portadown and Lurgan.

Table 16 Small-Scale Combustion Plants in Craigavon (Ref. 15)

Property	Address
MOYRAVERY COMMUNITY CENTRE	MOYRAVERY CENTRE, CRAIGAVON
CHRYSALIS COMMUNITY CENTRE	520 BURNSIDE, CRAIGAVON
PORTADOWN HEALTH CENTRE	TAVANAGH AVENUE, PORTADOWN
ARDOWEN COMMUNITY CENTRE	MONBRIEF RD, CRAIGAVON
TOTZ'N'TEENS COMMUNITY CENTRE	MOYLINN HOUSE, 21 LEGAHORY CENTRE, CRAIGAVON
TAGNEVAN COMMUNITY CENTRE	GLENHOLME PARK, LURGAN
NORTH LURGAN COMMUNITY CENTRE	LEVIN RD, LURGAN
ST PATRICK'S PRIMARY SCHOOL	12 BALLYMACBREDAN RD, MAGHER
TRINITY PARK PRE-SCHOOL NURSERY	TRINITY PARK, MAGHERALIN, CRAIGAVON
HOLLY HOUSE DAY NURSERY	54 BELFAST RD, LURGAN
CHERRYTREES	GILFORD RD, PORTADOWN
FIRST STEPS JUNIOR ACADEMY	66A,GILFORD ROAD, PORTADOWN, CRAIGAVON
PRESENTATION PRIMARY SCHOOL	THOMAS STREET, PORTADOWN, CRAIGAVON
BLEARY PRIMARY SCHOOL	6 DEANS ROAD, BLEARY, PORTADOWN
MOUNT ZION DAY NURSERY	EDWARD STREET, LURGAN, CRAIGAVON
KIDZ PATCH – KINGS PARK	24B, AVENUE ROAD, LURGAN, CRAIGAVON
CEARA SCHOOL - SLOAN AVENUE	SLOAN STREET, LURGAN, CRAIGAVON
DRUMNAMOE NURSERY	LEVIN ROAD, LURGAN, CRAIGAVON
SEAGOE PRIMARY SCHOOL	SEAGOE ROAD, PORTADOWN, CRAIGAVON
EDENDERRY PRIMARY SCHOOL	PRINCESS WAY, PORTADOWN, CRAIGAVON
LISMORE COMPREHENSIVE SCHOOL	DRUMGASK, BROWNLOW, CRAIGAVON
FALLOWFIELD SPECIAL SCHOOL	LOUGH ROAD, CRAIGVAON
ST MICHAELS GRAMMAR SCHOOL	J.2, CORNAKINNEGAR ROAD, AGHAGAL
TULLYGALLY PRIMARY SCHOOL	21, MEADOWBROOK ROAD, CRAIGAVON
MARALIN VILLAGE PRIMARY SCHOOL	2, STEPS ROAD, MAGHERALIN, CRAIGAVON
PORTADOWN INTEGRATED NURSERY/PR IMARY SCHOOL	KERNAN ROAD, PORTADOWN, CRAIGAVON
BOCOMBRA PRIMARY SCHOOL KITCHEN	1, OLD LURGAN ROAD, PORTADOWN ,
LISMORE SCHOOL NO 2 CASH CAFETE	DRUMGASK, BROWNLOW, CRAIGAVON
BIRCHES PRIMARY SCHOOL	14, CLONMAKATE ROAD, PORTADOWN ,
ROBINS NEST	56, BANBRIDGE ROAD, LURGAN, CRAIGAVON
ARDMORE PRIMARY SCHOOL	I, LENNYS ROAD, DERRYADD, CRAIGAVON
ST MARYS PRIMARY SCHOOL	19 J., DERRYTRASNA ROAD, DERRYTRASNA
BROWNLOW COLLEGE	TULLYGALLY ROAD, CRAIGAVON
PORTADOWN COLLEGE OF FE SCHOOL	26, LURGAN ROAD, PORTADOWN, CRAIGAVON
ST MARYS PRIMARY SCHOOL	84, MAGHERY ROAD, PORTADOWN, CRAIGAVON
RICHMOUNT PRIMARY SCHOOL	105, MAY ROAD, PORTADOWN, CRAIGAVON
DONAGHCLONEY PRIMARY SCHOOL	999, BAIRD AVENUE, DONAGHCLONEY

Property	Address
ST ANTHONYS PRIMARY SCHOOL	TULLYGALLY ROAD, CRAIGAVON
KILLICOMAINE JUNIOR HIGH SCHOOL	UPPER CHURCH LANE, PORTADOWN
WARINGSTOWN PRIMARY SCHOOL	1, BANBRIDGE ROAD, WARINGSTOWN
HARRISON NURSERY SCHOOL	TOBERHEWNY LANE LOWE, LURGAN
LURGAN JUNIOR HIGH SCHOOL	TOBERHEWNY LANE, LURGAN
CARRICK PRIMARY SCHOOL	SLOAN AVENUE, LURGAN, CRAIGAVON
PORTADOWN COLLEGE	KILLICOMAINE ROAD, PORTADOWN
TANNAGHMORE SCHOOL	LAKE STREET, LURGAN, CRAIGAVON
DRUMGOR PRIMARY	DRUMGOR ROAD, CRAIGAVON
MILLINGTON PRIMARY	CRAIGAVON AVENUE, PORTADOWN
HART MEMORIAL PRIMARY SCHOOL	CHARLES STREET, PORTADOWN
ST MARYS PRIMARY SCHOOL	DERRYMORE ROAD, GAWLEYS GATE
ST PATRICKS MEAL KITCHEN	3, AGHALEE ROAD, AGHAGALLON, CRAIGAVON
UPPER BANN INSTITUTE	KITCHEN HILL, LURGAN, CRAIGAVON
ST MARY'S JUNIOR HIGH SCHOOL	ARTHUR STREET, LURGAN, CRAIGAVON
KINGS PARK PRIMARY SCHOOL	AVENUE ROAD, LURGAN, CRAIGAVON
BALLYORAN PRIMARY SCHOOL	ASHGROVE ROAD, PORTADOWN, CRAIGAVON
LURGAN MODEL PRIMARY SCHOOL	BROWNLOW TERRACE, LURGAN, CRAIGAVON
CLOUNAGH JUNIOR HIGH SCHOOL	BROWNS TOWN ROAD, PORTADOWN, CRAIGAVON
ST PATRICKS AGHACOMMON PRIMARY	l4, DERRYMACASH ROAD, LURGAN, CRAIGAVON
ST PAULS SCHOOL	FRANCIS STREET, LURGAN, CRAIGAVON
ST FRANCIS SCHOOL	FRANCIS STREET, LURGAN, CRAIGAVON
LURGAN COLLEGE	LOUGH ROAD, LURGAN, CRAIGVAON
ST JOHN THE BAPTIST	GARVAGHY ROAD, PORTADOWN, CRAIGAVON
DICKSON PRIMARY SCHOOL	POLLOCK DRIVE, LURGAN, CRAIGAVON
ST TERESA'S PRIMARY SCHOOL	36, TARRY LANE, LURGAN, CRAIGAVON
UPPER BANN INSTITUTE	36 LURGAN ROAD, PORTADOWN, CRAIGAVON

5.3 Review and assessment of domestic and small-scale commercial fuel combustion

The impact of domestic and commercial fuel use on levels of sulphur dioxide and PM_{10} was assessed by considering the measured levels of these substances at the continuous monitor located in Lord Lurgan Park and the 8-port smoke and sulphur dioxide monitor located at the Town Hall, Edward Street, Portadown. The levels of sulphur dioxide and particulate matter measured at these sites are likely to be representative of the highest public exposure to emissions of sulphur dioxide and PM10 from domestic and small-scale commercial sources.

5.3.1 Sulphur dioxide

Measured levels of sulphur dioxide are shown in **Table 17**. Data from Portadown Town Hall were taken from the Stage 1 report (Ref. 3).

Table 17 Sulphur dioxide measurements

Location	Annual mean concentration ($\mu g/m^3$)	99.2nd percentile of 24 hour mean concentrations ($\mu g/m^3$)	99.7th percentile of 24 hour means ($\mu g/m^3$)	99.9th percentile of 15 minute means ($\mu g/m^3$)
Air quality objective	None	125	350	266
Portadown Town Hall		Not measured	Not measured	Not measured
1998	6			
1999	12			
2000	8			
2001	9			
2002	8			
Lord Lurgan Park (Continuous) Oct 03 – Oct 04	5.3	23	47	59
Lord Lurgan Park (Diffusion tube) Nov 02 – Apr 03		Not measured	Not measured	Not measured
Site 82880	10.5			
Site 82881	9.4			
Site 82882	13.6			
Site 82883	6			
Site 82884	11			
Site 82885	11			
Site 82886	9.6			
Site 82887	6.5			

The continuous analyser has been operating for a full year, with 97% capture of ratified data. The measured concentrations of sulphur dioxide are well below the relevant objective levels.

The levels measured using the continuous analyser at Lord Lurgan Park are similar to, and slightly lower than, the levels recorded at Portadown Town Hall. Comparing these measurements to the air quality objectives indicates that it is highly unlikely that the air quality objectives will be exceeded in Lurgan or in Portadown.

5.3.2 PM_{10}

Measured levels of PM_{10} are shown in **Table 18**. Data from Portadown Town Hall were taken from the Stage 1 report (Ref. 3).

Table 18 PM_{10} measurements

Location	Annual mean concentration ($\mu g/m^3$)	90.4th percentile of 24 hour mean concentrations ($\mu g/m^3$)
Air quality objective	40	50
Portadown Town Hall (PM_{10})		Not measured
1998	8 (black smoke)	
1999	9 (black smoke)	
2000	6 (black smoke)	
2001	8 (black smoke)	
2002	5 (black smoke)	
Lord Lurgan Park (Continuous) Oct 03 – Oct 04	16 TEOM 21 Gravimetric	32 TEOM 41 Gravimetric

The continuous analyser has been operating for a full year, with 95% capture of ratified data. The measured concentrations of PM_{10} are within the relevant objective levels.

The levels measured using the continuous analyser at Lord Lurgan Park are higher than the levels of black smoke recorded at Portadown Town Hall. While black smoke measurements cannot be compared directly with PM_{10} measurements, the relatively low concentrations of black smoke indicate that levels of PM_{10} are unlikely to be unusually high in Portadown. In view of the similarity in the size and fuel usage of Portadown and Lurgan, it is concluded that data from Lurgan can be used to provide an indication of levels of PM_{10} in Portadown. Comparing the measurements in Lurgan to the air quality objectives indicates that it is unlikely that the air quality objectives will be exceeded in Lurgan or in Portadown.

6. CONCLUSIONS

Measurements and predictions of NO_2 concentrations resulting from road traffic indicate that air quality objectives are not likely to be exceeded in Craigavon. It is therefore concluded a fourth stage review and assessment for nitrogen dioxide resulting from road traffic emissions is not needed. Further detailed modelling assessment would only be required where there are significant proposals to change the traffic movements, for example, in the event of a new one-way system being proposed for traffic within an urban centre.

Dispersion modelling indicates that emissions of sulphur dioxide from Craigavon Area Hospital are unlikely to cause exceedences of the air quality objectives within Craigavon. Modelled sulphur dioxide concentrations in the vicinity of the hospital comprise 60% or less of the relevant objective values. No further consideration of emissions from Part A/B or C sources is needed at the fourth stage of review and assessment.

Measurement data indicate that emissions of sulphur dioxide and PM_{10} combustion of solid or liquid fuels in domestic and small-scale commercial combustion plants are not likely to give rise to exceedences of the air quality objectives. It is concluded that it is not necessary to proceed to a fourth stage review and assessment for domestic emissions and small-scale commercial combustion plants.

7. REFERENCES

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FIGURES

SCALE: NTS

CONTENT: ELR

CHECKED: DMB

CAN: CR0120004A

DRAWN: ELR

DATE: January 2005

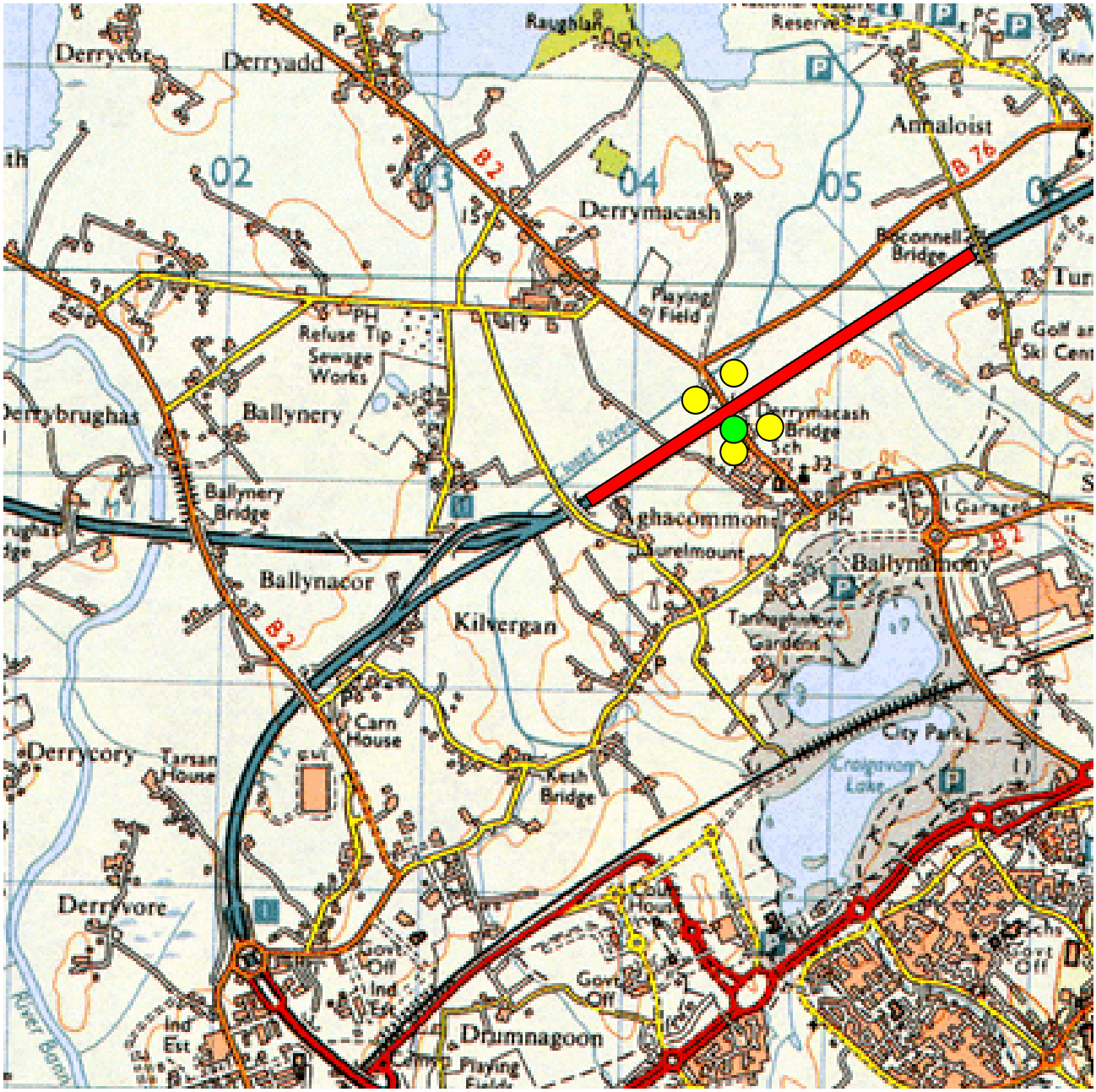
ENVIROS

Craigavon Borough Council: Stage 2 & 3 Review and Assessment of Air Quality

FIGURE 1

Craigavon Borough and surrounding road network

Craigavon Borough Council



KEY

- Areas of Receptors
- M1 Road Assessed
- NO_2 Diffusion Tube Monitoring

SCALE: NTS	CAN: CR0120004A
CONTENT: ELR	DRAWN: ELR
CHECKED: DMB	DATE: January 2005

ENVIROS

Craigavon Borough Council: Stage 2 & 3 Review and Assessment of Air Quality

FIGURE 2

Monitoring and assessment locations used for assessment of traffic using the M1

Craigavon Borough Council

KEY

- NO_2 Continuous Monitoring: Castle Lane
- PM_{10} & SO_2 Continuous Monitoring & SO_2 Diffusion Tube Monitoring: Lord Lurgan Park
- 1 NO_2 Diffusion Tube Monitoring: Union Street (5N)
- 2 NO_2 Diffusion Tube Monitoring: Ardboe Drive (7N)

SCALE: NTS

CONTENT: ELR

CHECKED: DMB

CAN: CR0120004A

DRAWN: ELR

DATE: January 2005

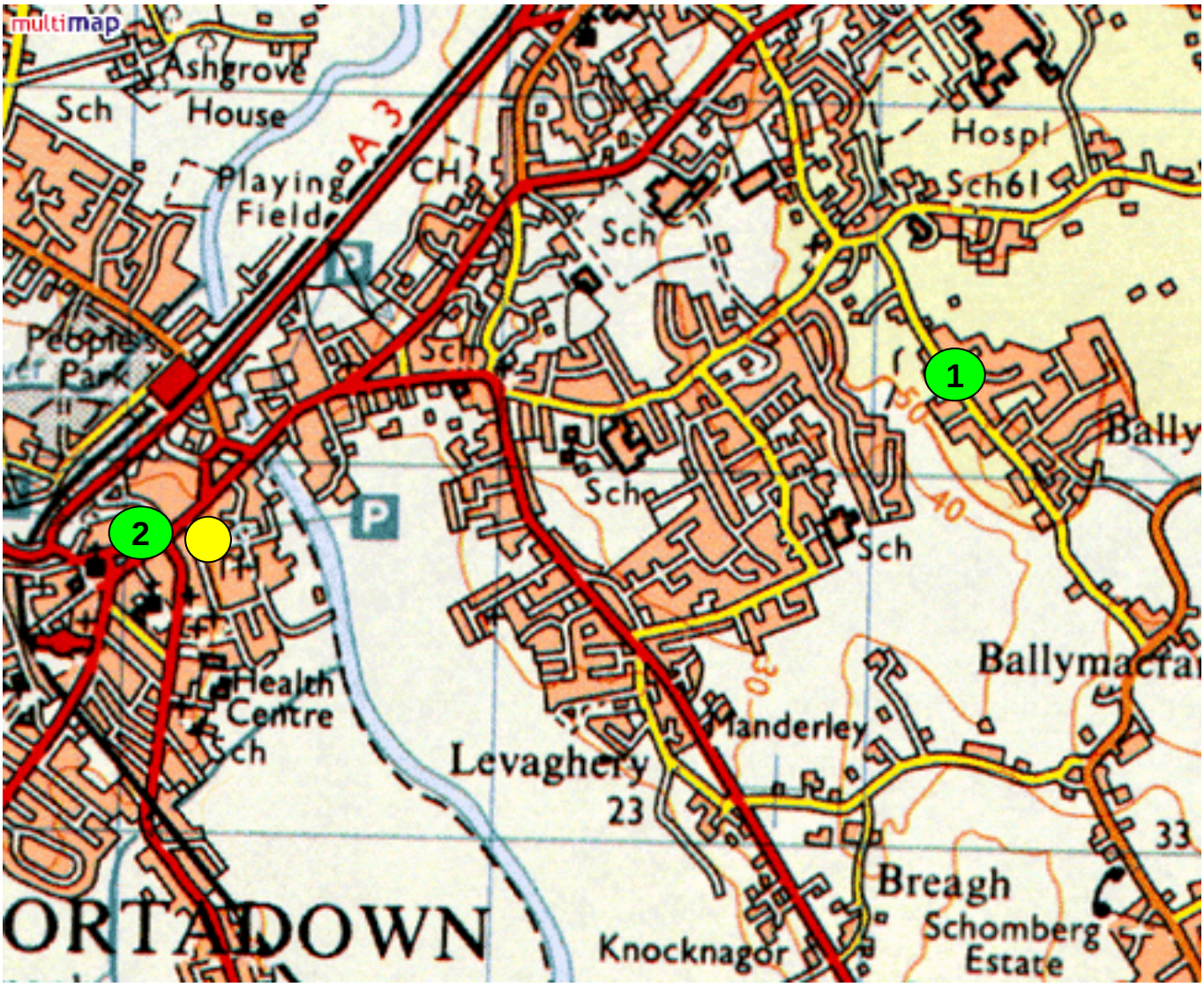
ENVIROS

Craigavon Borough Council: Stage 2 & 3 Review and Assessment of Air Quality

FIGURE 3

Monitoring Locations in Lurgan

Craigavon Borough Council



KEY

- 8-port SO_2 bubbler monitor: Edward Street
- 1 NO_2 Diffusion Tube Monitoring: Ballyhannon Road (8N)
- 2 NO_2 Diffusion Tube Monitoring: Market Street (9N)

SCALE: NTS

CAN: CR0120004A

CONTENT: ELR

DRAWN: ELR

CHECKED: DMB

DATE: January 2005

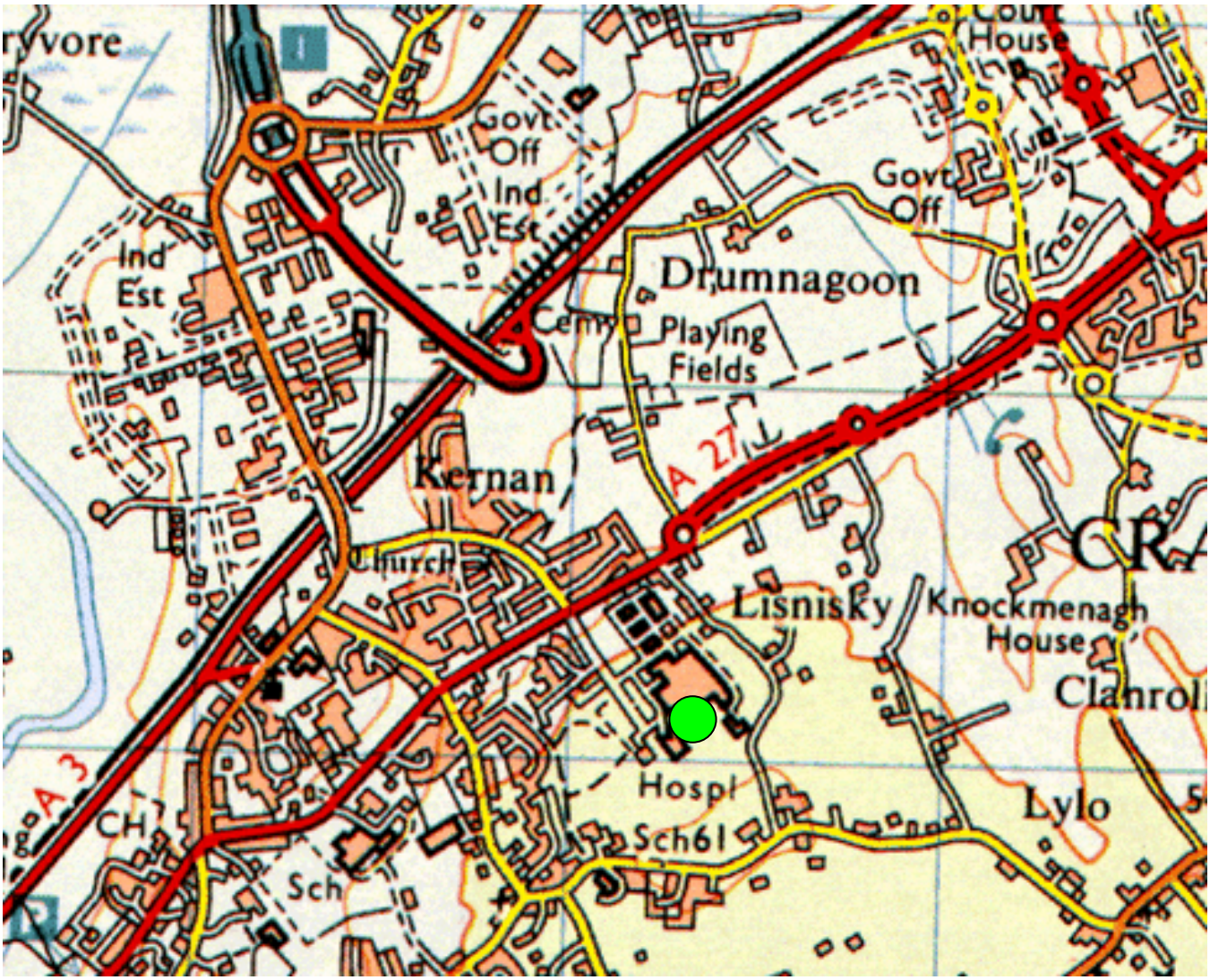
Craigavon Borough Council: Stage 2 & 3 Review and Assessment of Air Quality

FIGURE 4

Monitoring Locations in Portadown

ENVIROS

Craigavon Borough Council



KEY

Craigavon Area Hospital

SCALE: NTS

CONTENT: ELR

CHECKED: DMB

CAN: CR0120004A

DRAWN: ELR

DATE: January 2005

ENVIROS

Craigavon Borough Council: Stage 2 & 3 Review and Assessment of Air Quality

FIGURE 5

Craigavon Area Hospital and Surrounding Area

Craigavon Borough Council