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Dear David

STAGE 3 REVIEW AND ASSESSMENT - DOMESTIC MODELLING UPDATE

Policy Background

The UK Government published its strategic policy framework for air quality management in 1995 establishing national strategies and policies on air quality. The NI Environment Order came into operation in January 2003 and implements both the European Air Framework Directive 96/62EC and the UK Air Quality Strategy. The Air Quality Strategy provides a framework for air quality control through air quality management and air quality objectives.

Under the Air Quality Strategy all Local Authorities are required to undertake an air quality review. In areas where air quality objectives are not anticipated to be met by the specified date, Local Authorities are required to establish Air Quality Management Areas to improve air quality.

Local Air Quality Management Policy Guidance (LAQM.PGNI (03)) is designed to help relevant authorities with their Local Air Quality Management (LAQM) duties under Part III of the Environment (NI) Order 2002. The Environment (NI) Order 2002 provides the framework for LAQM across Northern Ireland. The Air Quality Objectives set out in the Air Quality Regulations (NI) 2003 provide the statutory basis for the system of LAQM.

This letter report on domestic fuel combustion forms the conclusion of the stage three domestic air quality review for Omagh District Council. Only PM_{10} from domestic sources are considered, as it was the only pollutant source predicted to be likely to exceed after earlier work. This letter report updates the predictions made in the preceding Stage 3 Review and Assessment report. The predictions for potential future PM_{10} levels are made through an examination of the location and size of domestic combustion sources, emissions modelling exercises and by reference to monitored air quality data. This report is an update because previous work did not include local monitoring data. Local monitoring data has now been obtained and is used to verify the modelling work already undertaken at Omagh.

As part of this report, detailed modelling using ADMS version 3.1 has been revisited at two of the kilometre square grids identified in the Stage 3 assessment (AEAT/ENV/R/1461) as likely to exceed the objectives for PM_{10}. These are:

- Area 4 – Omagh - Culmore
- Area 5 - Fintona

Purpose of the study

netcen was commissioned to complete the domestic fuel combustion section of the third stage review and assessment for Omagh District Council. Since this work was completed new local monitoring data has been made available from a local monitoring study within Omagh – Culmore grid square. This provides data more suitable for the purpose of model verification, than the monitoring data available at the time. Therefore the modelling is being revisited in this report and the model outputs previously created are re-verified with this new monitoring data.

General Approach taken

The approach taken in this study was to:

- Collect and interpret additional data to support the third stage assessment, specifically local PM10 monitoring data, for a location where exceedences were predicted;
- Re-verify the modelled PM_{10} concentrations in the selected grid squares, concentrating on the locations (receptors) where people might be exposed over the relevant averaging times of the air quality objectives;
- Present the concentrations as contour plots of concentrations and assess the uncertainty in the predicted concentrations

This guidance in LAQM.TG(03), published in February 2003 has been used for this assessment.

The units throughout are presented in $\mu g\ m^{-3}$ gravimetric PM_{10} (which is consistent with the presentation of the new AQS objectives), unless otherwise noted.

This document is the conclusion of a Third Stage Air Quality review for Omagh District Council for PM10 from domestic fuel combustion.

Meteorological data used in the dispersion modelling

Hourly sequential data was obtained for 1999 from the Meteorological Office for the Aldergrove site for input into the ADMS dispersion model.

Ambient monitoring

A 6-month winter period monitoring study was undertaken within the Tamlaght area of Omagh District Council. This is within the Omagh – Culmore grid square. Continuous monitoring of PM_{10} was undertaken using a TEOM. The model bias is calculated using this monitoring data and the model concentrations adjusted for the modelled grid squares.

PM_{10} has been measured:

- By TEOM continuous monitoring, 26 September 2003 to 10 April 2004
  (OS Grid Reference (443723) in Omagh - Culmore. A factor of 1.3 has been applied to the TEOM PM_{10} data to arrive at a gravimetric equivalent dataset.

The summary of concentrations recorded by the continuous monitor is provided in the appendix.

This 6 month period is a winter period and therefore captures the significant contribution of domestic fuel combustion emissions. The location of the site is relevant from a perspective of localised domestic fuel combustion and is within the Omagh – Culmore grid square where the pervious study predicted exceedances.

A comparison with Derry data was considered to correct the period to annual concentrations. The data for this comparison is given in the appendix. However this correction would have reduced the percentile value. Therefore by not making the period to annual correction we have taken a more pessimistic view of ambient concentrations and a precautionary approach. If, using this approach, no exceedance is

identified we can have greater certainty that there will not be an exceedance. If an exceedance were to be identified the necessity for this approach could be reconsidered.

All the PM_{10} concentrations presented and used in this study are in gravimetric equivalents.

The data from the continuous monitor has been ratified by netcen. The data conforms to the QC standards used in the Defra network.

The following table shows the daily measured concentrations from the 26 September 2003 to 10 April 2004. The average concentration (ratified) for the site does not exceed the annual or 24 hour objective for PM_{10}.

Summary of continuous PM_{10} ratified data from the 26 September 2003 to 10 April 2004. Concentrations are in gravimetric equivalents.

	PM_{10}Concentration, $\mu g\ m^{-3}$
Average over period	24
90 %ile of 24hour mean	36
Data capture	97.3%

Background values used in the modelling have been taken from the mapped data available on the netcen website at http://www.airquality.co.uk/archive/laqm/tools.php?tool=background

A grid reference at the centre of each of the modelled areas was used to determine the background concentration to be used across that grid. The background values therefore were

Omagh – Culmore - 23$\mu g\ m^{-3}$
Fintona - 22$\mu g\ m^{-3}$

The dispersion model ADMS 3.1 was been used to predict the PM_{10} levels in Omagh – Culmore and Fintona. The emissions arising from fuel use survey data were modelled as volume sources. Emissions have been weighted with both seasonal and diurnal emission patterns. The seasonal emission pattern was obtained from the Building Research Establishment Domestic Energy Model (BREDEM, BRE, 1985). The pattern was derived using formulae that allow a degree day to be calculated. The degree day provides a method to weight emissions to the colder periods of the year. A seasonal profile was derived using the 1999 Aldergrove meteorological data. The modelled concentrations have then been added to estimate background concentrations. For more detail on the modelling approach and input data please refer to the Omagh District Council Stage 3 report (AEAT/ENV/R/1461).

Model bias

The monitoring site at Springhill Park in the neighbouring authority had previously been used as a reference site: e.g. model concentrations in Omagh were adjusted by taking the ratio between the modelled concentration at the Strabane site and the predicted measured value in 1999 from the modelled values at other locations. The purpose of this adjustment was to ensure that the modelled concentrations equalled the measured values at the monitoring site. Now local monitoring data is available this model bias correction can be made using the local data, which enables the modelling approach to best take account of any geographical and source peculiarities and reduce the model uncertainty. Subsequently revised plots are provided here.

Results of modelling

Figure 1: Modelled PM_{10} concentrations in the Omagh - Culmore area in 1999. The model predicts that the 90.41 percentile of 24 hour PM_{10} concentrations will not be exceeded

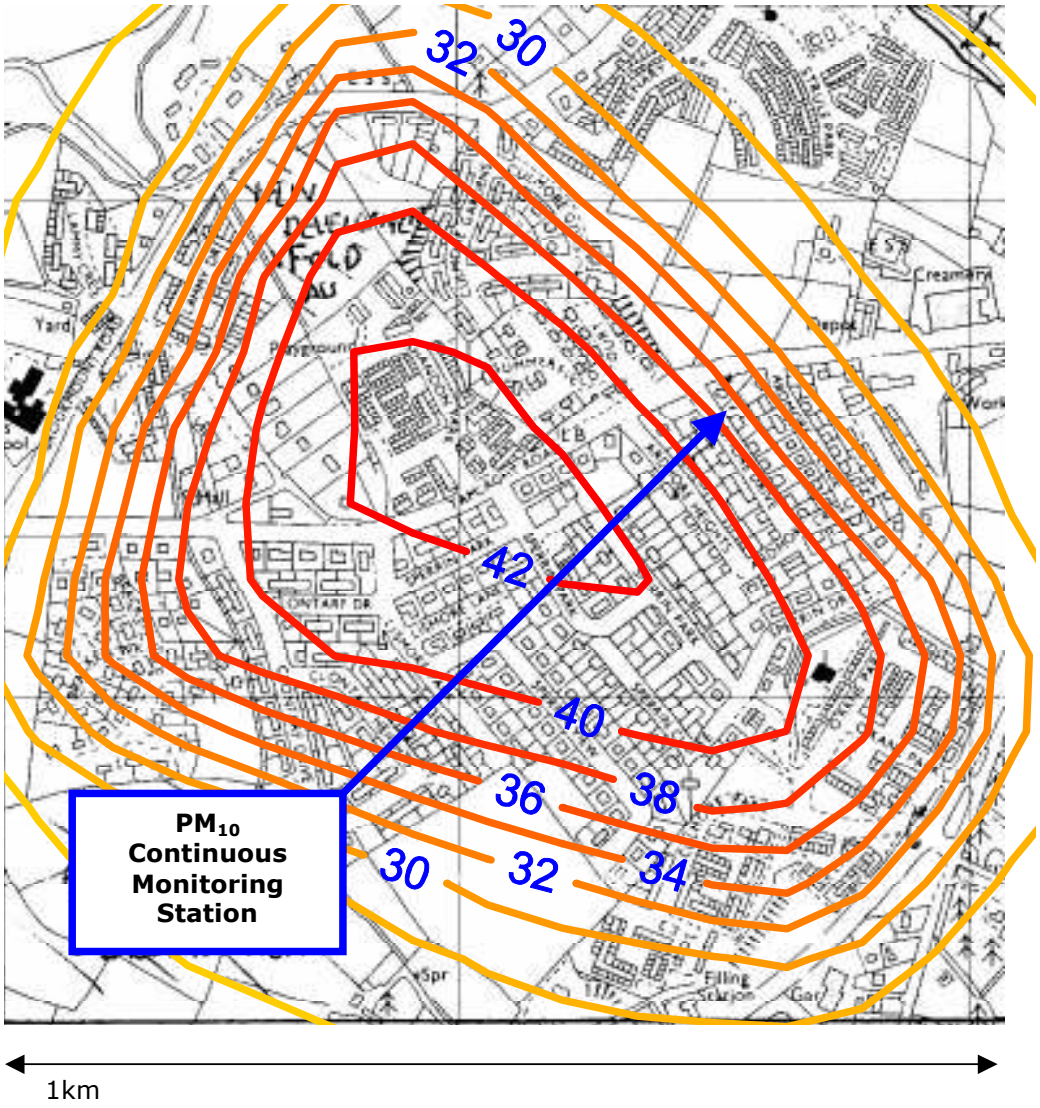
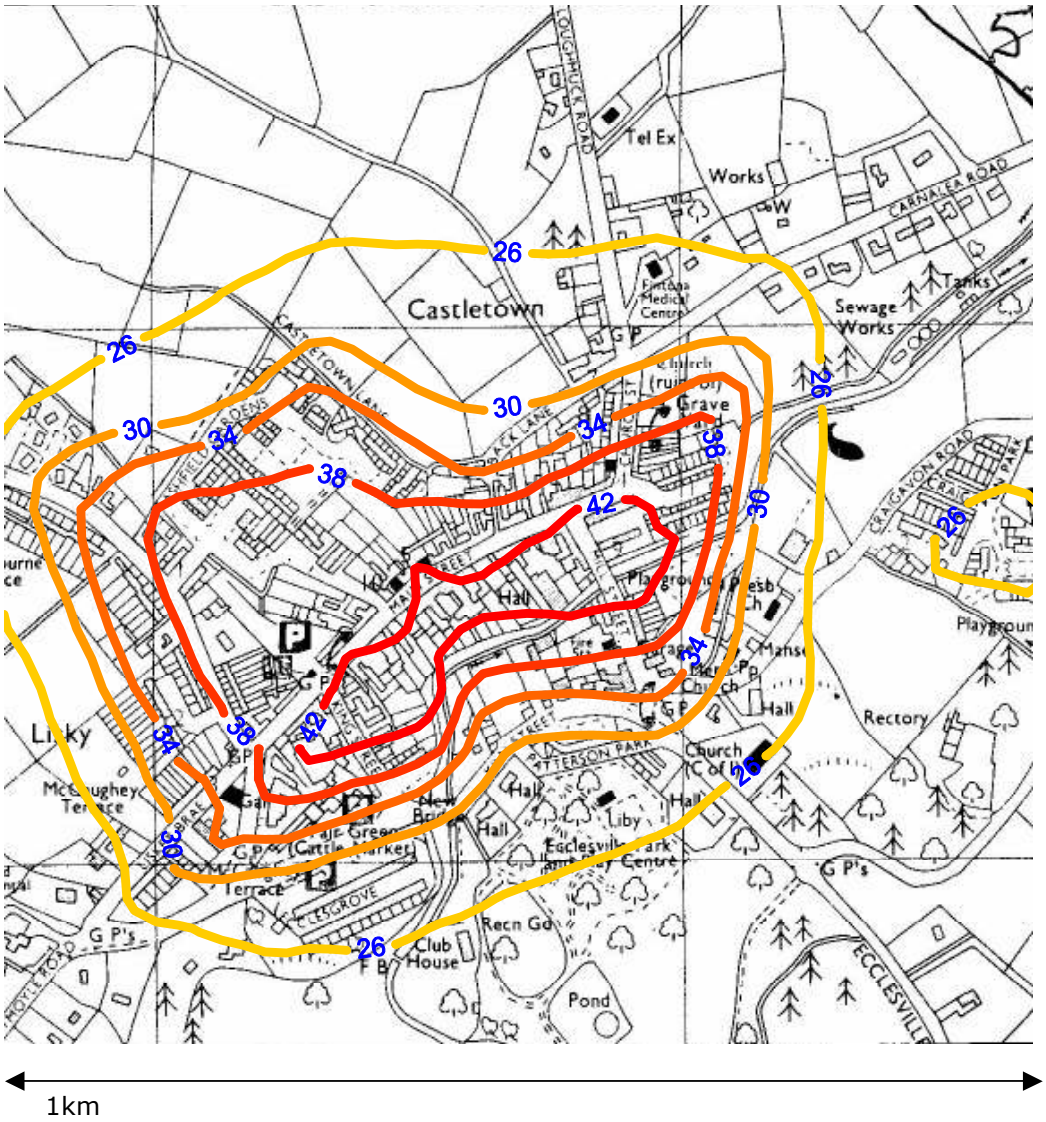


Figure 2: Modelled PM_{10} concentrations in the Fintona area in 1999. The model predicts that the 90.41 percentile of 24 hour PM_{10} concentrations will not be exceeded

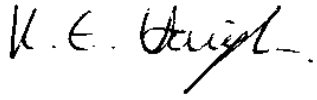


Summary of the likelihood of exceeding the objectives for PM10

The modelling has been undertaken using a precautionary approach. It is predicted that the 24 hour mean PM_{10} objective of 50μg m^{-3} will not be exceeded in either of the modelled areas. As this is the most stringent objective it is also predicted that the annual mean objective of 40 mg m3 will therefore also be met. Therefore neither of the locations considered in this report are predicted to exceed the objectives.

It is recommended that no further assessment of this source is necessary and it is <u>not</u> necessary to declare an AQMA. The next stage of assessment for Omagh District Council will therefore be a Progress Report in April 2005.

Yours sincerely



Kate Haigh
Air Quality Consultant

Appendix

Produced by netcen on behalf of Omagh District Council

OMAGH TAMLAGHT
26 September 2003 to 10 April 2004

These data have been fully ratified by netcen

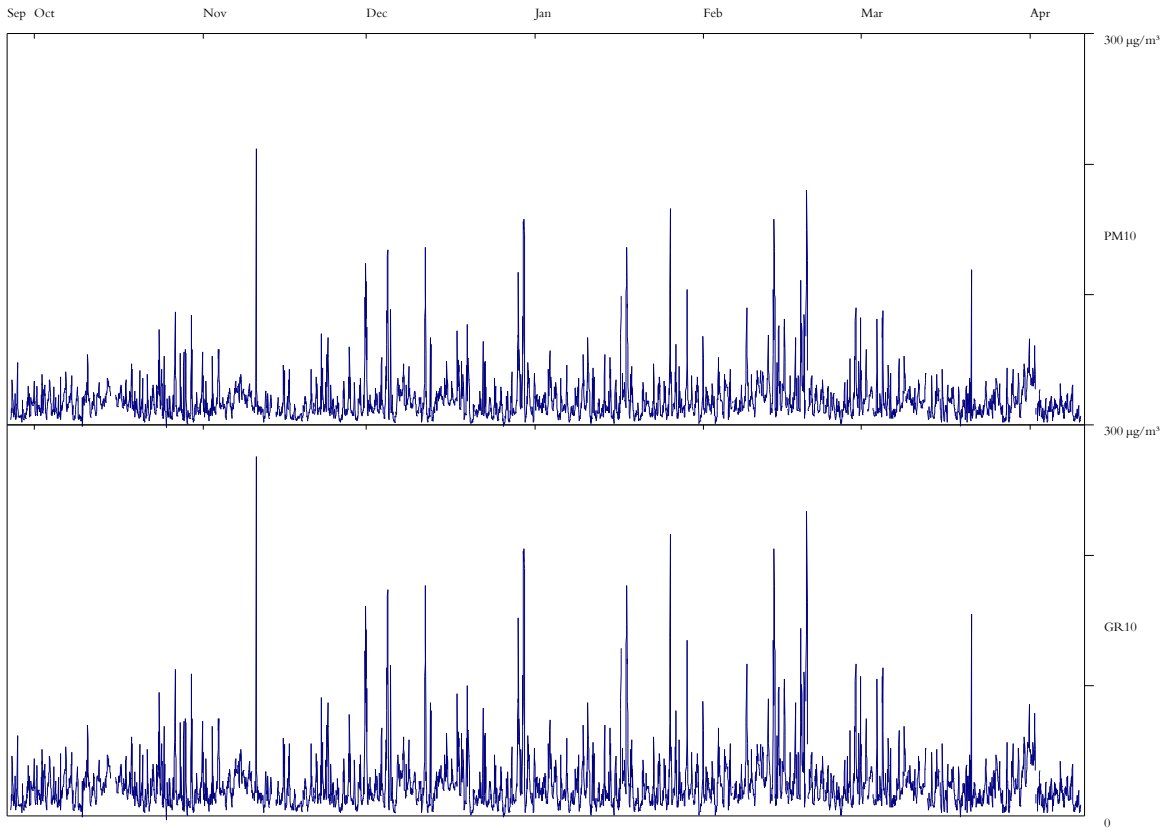
POLLUTANT	PM_{10}	GR_{10}*
Number Very High	0	-
Number High	0	-
Number Moderate	44	-
Number Low	4583	-
Maximum 15-minute mean	407 µg m^{-3}	529 µg m^{-3}
Maximum hourly mean	212 µg m^{-3}	276 µg m^{-3}
Maximum running 8-hour mean	121 µg m^{-3}	157 µg m^{-3}
Maximum running 24-hour mean	58 µg m^{-3}	76 µg m^{-3}
Maximum daily mean	56 µg m^{-3}	73 µg m^{-3}
90.4 percentile of daily means	28 µg m^{-3}	36 µg m^{-3}
Average	19 µg m^{-3}	24 µg m^{-3}
Data capture	97.3 %	97.3 %

* GR_{10} in gravimetric units
All mass units are at 20'C and 1013mb

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	6	6
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	-	-

Produced by netcen on behalf of Omagh District Council

Omagh Tamlaght Air Monitoring
Hourly Mean Data for 26 September 2003 to 10 April 2004



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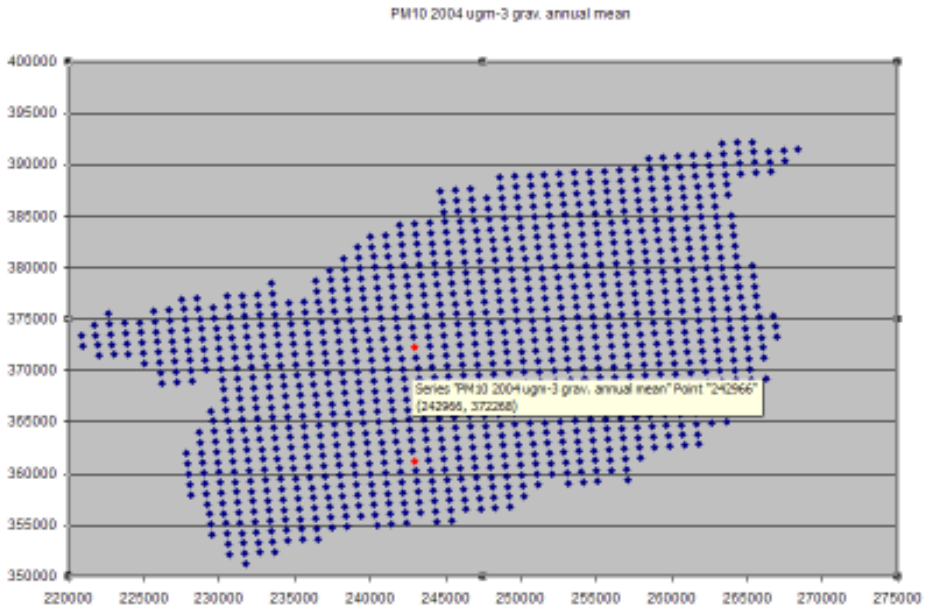
Omagh Culmore Background



Fintona Background