Dungannon and South Tyrone Borough Council

Detailed Assessment for NO_2 Diffusion Tubes on Church / Perry Street, Dungannon.

JUNE 2007

Executive Summary

Dungannon and South Tyrone Borough Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for any of the prescribed pollutants under review.
However, a subsequent appraisal by the University of the West of England (UWE) completed on behalf of the Environment and Heritage Service, determined that the Council had used an unsuitable bias correction factor for the NO_2 diffusion tubes which are situated at a number of locations throughout Dungannon Town. The bias was not part of a suitable co-location study that was deemed effective by Air Quality Consultants, on the basis that it was not comparable with other similar co-location sites.

Following further consultation with UWE, the Council accepted that a new bias correction factor would need to be used in order to adjust the NO_2 diffusion tube results to the correct readings. As a consequence of this, it was apparent that the results obtained for one of the tubes located on Church Street was now exceeding the objective limit of 40µg/m^3.
Dungannon and South Tyrone Borough Council accepted that the new result was significant and informed the Environment & Heritage Service that a detailed assessment would be completed with regard to the exceedences on Church Street.

In order to get a more accurate representation of the extent of the NO_2 pollutant within Church Street, 9 additional diffusion tubes were placed at 3 other locations along the street (including Perry Street) to complement the 3 existing tubes, which were situated at the Northern end of the street, close to the junction with Market Square. The additional tubes were situated at the new locations for a period of six months.

Following the six month evaluation of NO_2 pollution in Church Street an estimated annual mean was determined using a ratio derived from monitoring results from 3 neighbouring local authorities (Armagh, Banbridge & Newry and Mourne). This method is detailed in Box 6.5 of LAQM TG(03). The estimated annual mean for sites A, B and C shows that there is no breach of the objective limits.
During the preparation of this report, the annual mean result for the existing NO_2 tube location on Church Street (Site 5) became available. A result of **40.42 µg/m_2** demonstrates that there is a breach the objective limits at this location.

It is therefore considered by Dungannon and South Tyrone Borough Council that an Air Quality Management Area (AQMA) **will be** declared for the northern end of Church Street.

Contents

1.0 Introduction

Dungannon and South Tyrone Borough Council submitted their Updating and Screening Assessment to the Environment & Heritage Service in June 2006. The report concluded that the Council was not required to carry out any further detailed assessments for any of the prescribed pollutants under review.
However, a subsequent appraisal by the University of the West of England (UWE) completed on behalf of the Environment and Heritage Service, determined that the Council had not used the appropriate bias correction factor for the NO_2 diffusion tubes which are situated at a number of locations throughout Dungannon Town.

UWE informed the Council in August 2006, that the bias factor which was provided by Gradko International (who also supply the Councils NO_2 diffusion tubes) was unsuitable as it had not been formulated from a reliable co-location study where the diffusion tube preparation method 20% TEA in Water had been used.

The Gradko bias factor had been determined as a result of a co-location study at Liverpool John Lennon Airport in Speke, Liverpool. However UWE advised the council that it was necessary to use a bias factor which was part of more than one co-location study.

Following further consultation with UWE, the Council accepted that a new bias correction factor would need to be used in order to adjust the NO_2 diffusion tube results to the correct readings. As a consequence of this, it was apparent that the results obtained for one of the tubes located on Church Street were now exceeding the objective limit of 40µg/m^3.

Dungannon and South Tyrone Borough Council accepted that the new result was significant and informed the Environment & Heritage Service that a detailed assessment would be completed with regard to the exceedences on Church Street.

Dungannon and South Tyrone Borough Council placed an order with Gradko International for the provision of 9 additional NO2 diffusion tubes, which were placed at three locations along Church Street and Perry Street in triplicate format.
The tubes were placed here for a duration of six months whereupon an annual mean would be determined by using the estimation ratio method as described in BOX 6.5 in Section 6-8 of LAQM TG03.

2.0 Annual Mean Estimation

The objective limit for NO2 is assessed on the basis of an annual mean result. In the majority of cases this is accurately portrayed in a predetermined programme involving 12 months of collated data. Whereby the mean result is determined over the 12 month period and the bias factor is added to adjust the result to a more accurate assessment of the pollutant levels.
In some cases this is not possible and it may be the Councils only option to complete a short term monitoring assessment. Dungannon and South Tyrone Borough Council opted to complete only six months of further sampling so that the time frame upon which the LAQM Regime was based would not slip outside the boundaries of the recommended timescales outlined in Table 1.3, section 1-8 of LAQM TG03. It would in doing so bring the council into line with the next stage of the LAQM regime with the Progress Report stage timetabled for the end of April 2007. In a situation where the Council would not have to declare an AQMA for Church / Perry Street, then they would be in the position to re-enter back into the regime at the appropriate point without any overlap or outstanding requirements expected of them.
It is possible to estimate an annual mean from a short term monitoring period. LAQM TG03 highlights this possibility in Box 6.5, section 6-8 (*Approach to the estimation of annual mean nitrogen dioxide concentrations from short-term monitoring data*).
This method of estimation produces a ratio from the annual mean NO2 concentrations from significant years for other monitoring stations within a 50 mile radius of the monitoring site being assessed.

The guidance says;

> *The adjustment is based on the fact that patterns of pollutant concentrations usually affect a wide region. Thus if a three month period is above average at one place it will almost certainly be above average at other locations in the region.*

In order to assess the annual mean concentration for the 6 month sampling period at Sites A, B, & C on Church / Perry Street, a ratio has been derived from long term monitoring locations across the Southern Group Region. The locations used to calculate the Ratio are

Site Name	Grid Ref	Site Type
Irish Street - Armagh	54 20’33.19 N , 6 39’32.58 W	Kerbside
Dromore Street - Banbridge	54 21’09.87 N , 6 15’53.03 W	Kerbside
Water Street - Newry	54 10’32.46 N , 6 20’11.95 W	Kerbside

Site 5 is the existing site at the northern end of Church Street.

Site Name	Grid Ref	Site Type
Church Mews Sheltered Accommodation Church Street Dungannon BT71 6Tl	54 30’13.99 N , 6 46’10.10 W	Kerbside

3.0 RESULTS

Below is the results of the triplicate sampling for the 3 locations on Church Perry Street in Dungannon. It is noticeable that levels are highest at location C in comparison with the other sampling locations (A & B) as this is closer to the junction at the northern end of Church Street. Site C is located opposite Site 5, but is on the side of the road where traffic does not become congested. These initial results demonstrated to the Council that it was unlikely that an AQMA for these locations on Church / Perry Street would be declared, following the calculation of the estimated annual mean.

Table 1: Diffusion Tube Results For 4 sites on Church / Perry Street, Dungannon September 06 to March 07 from Gradko International

Month	Site A Tube 1	Site A Tube 2	Site A Tube 3	Site B Tube 1	Site B Tube 2	Site B Tube 3	Site C Tube 1	Site C Tube 2	Site C Tube 3
September	17.99	15.28	22.12	17.95	17.45	18.09	24.98	25.11	17.04
October	30.65	31.39	27.72	28.57	23.78	27.33	34.66	32.46	31.73
November	18.61	22.47	20.68	20.18	19.79	19.00	29.12	32.20	28.73
December	19.36	18.18	18.45	17.35	18.66	22.20	27.89	29.33	29.85
January	26.21	21.69	23.42	18.78	18.61	19.00	33.87	31.75	29.62
February	34.39	NS	29.44	31.68	32.14	28.51	38.88	38.48	47.06
March	31.72	34.05	34.96	27.76	29.39	27.30	41.52	38.01	37.92
Mean	25.56	23.84	25.26	23.18	22.83	23.06	32.99	32.48	31.71
Sep 06 to Mar 07		24.89			23.02			32.39	
Bias Adjusted 0.98		24.39			22.56			31.74	

Sites A, B, & C are triplicate sites which were added to compliment the detailed assessment and to give an overview of the distribution on NO_2 pollution on the entire length of Church / Perry Street.

The tables below demonstrate how the estimated annual mean results for Sites A, B & C were determined by using NO2 data from the 2006 results of background diffusion tube monitoring locations in Armagh, Banbridge & Newry.

Table 2: Monthly Diffusion Tube Results and Annual Mean for 1 Background site in 3 Neighbouring Councils

Diffusion Tube Anuual Mean (Am) for 1 Long-Term Montoring Site in Armagh, Banbridge & Newry 2006														
Location	January	February	March	April	May	June	July	August	Spetember	October	November	December	Mean	Bias Adjusted Mean
Armagh – Desert Lane	11	18	17	11	13	12	10	NR	NR	15	14	16	14	**11**
Banbridge - Springfields	37	12	11	9	10	9	8	8	9	19	11	13	13	**17**
Newry – Monaghan Row	23	23	21	16	16	40	17	12	18	23	20	9	20	**16**

Table 3: Periodic Means (Oct 06 – Mar 07) in 3 Neighburing Councils

Diffusion Tube Periodic Mean (Pm) Armagh, Banbridge & Newry Oct 2006 to Mar 2007								
Location	October	Nov	Dec	January	February	March	Mean	Bias Adjusted Mean
Armagh – Desert Lane	15	14	16	12	20	8	14	11
Banbridge - Springfields	19	11	13	13	17	7	13	17
Newry – Monaghan Row	23	20	9	14	23	19	14	11

Table 4: Short Term Diffusion Tube Ratios

Estimated Short Term Diffusion Tube Ratio			
Location	Annual Mean 06 (**Am**)	Periodic Mean (**Pm**)	**Ratio**
Armagh – Desert Lane	11	11	1
Banbridge - Springfields	17	17	1
Newry – Monaghan Row	16	11	1.45
		Average (Ra)	**1.15**

Table 5: Estimated Annual Average for 4 Monitoring Location on Church Street

SITE	Site A 1, 2 & 3	Site B 1, 2 & 3	Site C 1, 2 & 3
Church Street 6mths	**24**	**22**	**31**
Annual Ave	**28**	**26**	**37**

Tables 3 to 6 demonstrate how the estimated annual average is calculated from the short term diffusion tube data gathered over a 6 month period at 4 sites on Church Street in Dungannon. It is clear from the results in Table 5 that Site 5 is exceeding the objective limit of 40 µg/m^3 for NO_2 emissions. Sites A, B & C are all well below the objective limit.

Table 6: 2006 NO2 Diffusion Tube Data for Site 5 (existing site at northern end of Church Street, Dungannon).

Date	Site 5A	Site 5B	Site 5C
Jan-06	54.46	57.10	55.20
Feb-06	40.79	40.74	40.91
Mar-06	37.80	46.05	42.43
Apr-06	41.87	44.39	44.27
May-06	35.58	35.13	36.83
Jun-06	37.72	44.88	0.00
Jul-06	40.72	47.26	46.71
Aug-06	36.36	38.24	36.25
Sep-06	44.01	43.74	47.59
Oct-06	45.48	50.15	47.28
Nov-06	33.87	44.05	37.11
Dec-06	37.63	48.82	23.38
Mean	**40.52**	**45.05**	**38.16**
Triplicate Mean	**41.24**		
Bias Adj	**40.42**		

Note : Bias adjustment factor derived from http// www.uwe.ac.uk/aqm/review/diffusiontube300307

Table 6 shows the annual mean for NO2 at the existing site at the northern end of Church Street (Site 5). The result of 40.42 µg/m^3 shows that there is a breach of the objective limit of 40 µg/m^3 at this location.

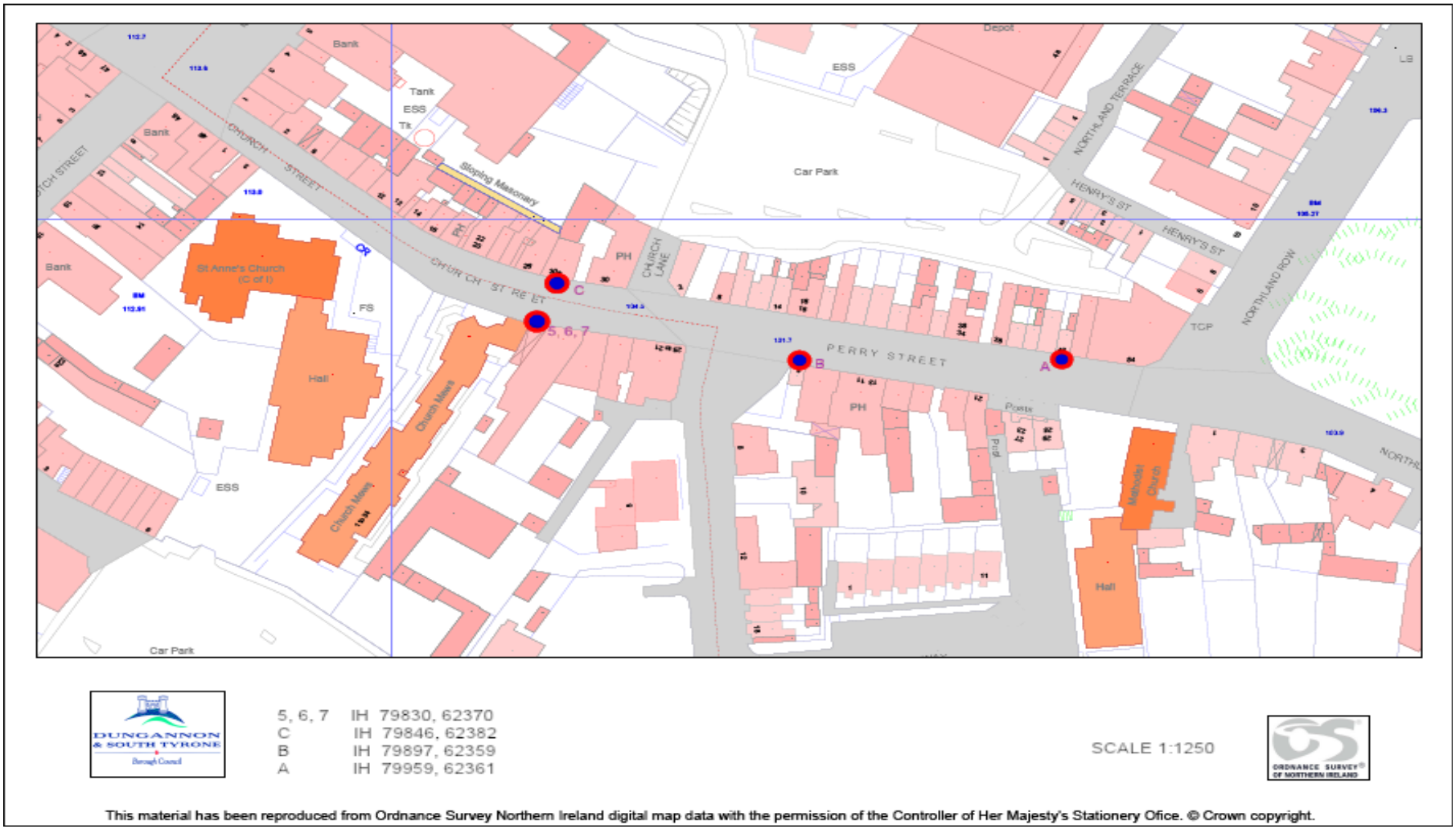
4.0 Conclusions

The results in Table 6 shows that there is a breach of the objective limit of 40 µg/m^3 at Site 5 in Church Street, Dungannon. There are no breaches of the objective limit at Sites A, B & C.

5.0 Recommendations

The estimated annual mean for Site 5 (40.42µg/m^3) is **above** the objective limit of 40 µg/m^3 and Dungannon and South Tyrone Borough Council should declare an AQMA for the northern end of Church Street. The declaration of the AQMA should be included in the agenda of the next available Council meeting following approval of this report by UWE and EHS.

APPENDICES



Appendix 1 – Sampling Locations on Church Street and Perry Street, Dunagannon

Appendix 2 – Location A. Perry Street Dungannon. (Tubes on drain pipe at O2 Shop)

Appendix 3 – Location B. Perry Street Dungannon. (Tubes behind road-sign inner post)

Appendix 4 – Location C. Church Street Dungannon. (Tubes on black lamp post).

Appendix 5 – Location 5. Existing Church Street Site. (Tubes on lamp post).