



RESTORMEL BOROUGH COUNCIL

REVIEW AND ASSESSMENT OF LOCAL AIR QUALITY
UPDATED PROGRESS REPORT
NOVEMBER 2008

Review and Assessment of Local Air Quality Updated Progress Report November 2008

Executive Summary

The Council is required by legislation to produce annual reports relating to local ambient outside air quality in relation to seven particular “pollutants of concern”.

The 2008 report takes the form of a “Progress Report” which comments on any monitoring that has taken place since the major report in 2004 and any significant local developments that might also have occurred.

The amount of monitoring for Particulates (PM₁₀) in the Borough is now much reduced when compared to that undertaken in 2003-05. None of this is undertaken by or on the behalf of the Council, but rather is conducted by local industry and a parish council. The data is however supplied to the Council for public dissemination. The results continue to be consistent with that previously found and do not indicate a likely breach of National Air Quality Objectives (NAQO) for this pollutant.

An 18 month long Nitrogen dioxide (NO₂) diffusion tube survey of St Austell was carried out between October 2006 & March 2008. Exceedences of the NAQO annual average value of 40 µg/m³ were recorded in two areas of the town at kerbside locations. These results predict exceedences of the 40 µg/m³ value at the façade of neighbouring residential premises along one stretch of Holmbush Road. A more detailed, 12 month, diffusion tube survey has been commissioned and will commence in Feb 2009 in order to validate these predictions. There is no indication that NAQO values for NO₂ are being breached anywhere else in the Borough.

There is unlikely to be a breach of NAQOs for the other 5 “pollutants of concern” (Carbon monoxide, benzene, sulphur dioxide, lead and 1,3 butadiene).

All monitoring information is available on the air quality pages of the Council’s website (www.restormel.gov.uk)

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UPDATED PROGRESS REPORT NOVEMBER 2008

1 **Introduction**

1.1 Part IV of the Environment Act 1990 requires every local authority to produce an annual report on air quality issues. For the year 2008 the legislation requires the format of this report to be a “progress report” and to be less substantive than a full “Review and Assessment”.

1.2 The aim of the progress report is to:-

- Prevent air quality issues from only being considered periodically; and
- Provide a vehicle for regular communication on local air quality issues to appropriate bodies and the general public, especially if there have been significant developments between the periodic, but more substantive, Review & Assessments of Local Air Quality.

1.3 An initial Progress Report was published in April 2008. Since then the results of an eighteen month long Nitrogen dioxide diffusion tube survey in St Austell have been announced. The results of that survey require the initial Progress Report to be updated. This report will address the issues of:-

- All new monitoring data generated since March 2005, including the St Austell NO₂ monitoring
- New developments within the Borough which might have a significant impact on local air quality.

2 **Previous Reviews and Assessments**

2.1 The review in 2000 concluded that National Air Quality Objectives (NAQO) would not be breached for the seven “pollutants of concern” :

- Benzene
- Carbon monoxide
- Lead
- Nitrogen dioxide
- Particulate matter
- Sulphur dioxide; and
- 1,3 butadiene

2.2 The 2004 review involved a detailed assessment of particulate matter (PM₁₀) before again concluding that the NAQO would not be breached for any of the seven pollutants. These reviews can be read at www.restormel.gov.uk

2.3 All assessments for Benzene, Carbon monoxide, Lead, Sulphur dioxide, and 1,3 butadiene were based on nationally modelled data and there is no reason to think that concentrations of these pollutants have increased since those reviews.

2.4 For nitrogen dioxide and particulate matter, local knowledge and local concern respectively, has meant that some localised monitoring has occurred within the Borough since 2005. The monitoring locations are displayed in Appendix 1 Fig1.

3 Particulate matter (PM₁₀)

3.1 PM₁₀ is that fraction of airborne dust which is so fine as to be able to penetrate, when breathing, the deepest and most sensitive parts of the lung. It is convenient to think of them as particles with a diameter of less than 10 micrometres (µm). In comparison a human hair has a thickness of about 100µm. National Air Quality Objectives (NAQO) seek to constrain PM₁₀ levels to exceeding a daily average level of 50µg/m³ (micrograms per cubic metre) on not more than 35 days a year together with an annual average of not more than 40µg/m³.

3.2 Ongoing public concern about dust generally from the china clay industry led to the creation of the China Clay Area Dust Monitoring Forum (CCADMf) in 2002. This forum comprised representatives of the China Clay industry and its regulators (Restormel Environmental Health Dept, Fowey Port Health & County Planning dept). Under the auspices of the CCADMf a very extensive and detailed 2 year programme of PM₁₀ monitoring commenced in April 2003.

3.3 The final report of the CCADMf was published in March 2007. Its key conclusions were:

- There are a number of sources of PM₁₀, both natural and manmade; and from locations local, regional and international.
- The industry does increase ambient PM₁₀ levels by as much as 8 µg/m³ as a daily average, depending upon location and weather conditions;
- Using the National Air Quality Objectives as reference points (a daily average of 50 µg/m³ not to be exceeded on more than 35 days per year and an annual average of not more than 40 µg/m³) these objectives were not exceeded anywhere; and
- Cornwall is often subject to episodes of high levels of PM₁₀ (over 50 µg/m³) simultaneously with other parts of the country.

This report is available via the air quality page at www.restormel.gov.uk

3.4 Although the comprehensive monitoring of the CCADMf programme has ceased, monitoring continued at four locations (see Appendix 1 Fig 1). The three at Treviscoe, Par Docks and Par Green are run by Imerys Minerals PLC, whilst the one at St Stephen which ceased monitoring in November 2008 was run by St Stephen-in-Brannel Parish Council. The data from these monitors has been supplied to the Council and is available on-line at www.restormel.gov.uk as well as being disseminated through local area liaison groups established by the China Clay industry. The Council does not itself monitor PM₁₀ levels in the Borough.

3.5 Since 2005, levels of PM₁₀ are consistent with those observed during the CCADMf programme. Mean daily values are consistently higher (by approx 6-8 µg/m³) in the vicinity of china clay processing areas (20-27 µg/m³) than would be the case at background sites (13-19 µg/m³). Apart from data for the monitor at Par Green in 2006-07 they do not indicate a breach of National Air Quality Objectives (NAQO) at these locations. Summary data is in Appendix 2 table 1.

3.6 During 2006-7 the monitor at Par Green did malfunction occasionally with the possibility of spurious results being recorded, but not excluded from this analysis. It is also known that numerous bonfires occurred near the monitor but it has not been possible to say whether or not these coincided with the days of exceedence. In any event formal action was taken by the Council to require the occupier of land in the vicinity of the Par Green monitor to abate a smoke nuisance caused by excessive bonfires there.

4 **Nitrogen Dioxide**

4.1 Work by the Cornwall Air Quality Forum (CAQF) elsewhere in Cornwall has led to the declaration of an Air Quality Management Areas (AQMA) in Camborne-Redruth (in 2007) and in Bodmin (in 2008). Both these AQMAs are in areas of relatively low traffic volumes in slow moving congested areas in very close proximity to sensitive locations, eg dwellings, schools, play areas, roadside pedestrian seating. St Austell has areas with similar traffic characteristics.

4.2 A diffusion tube study in 2002 revealed elevated levels of Nitrogen dioxide in these parts of St Austell, but not to the extent as to likely to breach the NAQO of an annual average of not more than $40 \mu\text{g}/\text{m}^3$ at sensitive locations. It should be noted that there is no robust medical basis for setting the annual average limit because of any direct toxic effect at or around that level, but the World Health Organization describe $40 \mu\text{g m}^{-3}$ as a prudent one.

4.3 However increasing levels of traffic, increased summertime congestion and the experiences of Camborne & Bodmin led to the commencement of another diffusion tube study in October 2006. Diffusion tubes were deployed at 36 sites, mainly kerbside (see Appendix 3 Fig 1). These sites were specifically targeted as likely to represent worse case situations.

4.4 The final report on this study has now been published (see Appendix 4). Exceedences of the annual average value of $40 \mu\text{g m}^{-3}$ were recorded at 7 sites in 2 areas of the town- Holmbush Road and South Street (see Appendix 3 Table 1). Both areas are characterized by

- Medium gradients; with
- intermittent flows of steady traffic due to nearby junctions, roundabouts and traffic lights of approx 26000 vehicles per day in the case of Holmbush Road and 15000 in the case of South Street; and
- encroaching dwellings.

4.5 The method of monitoring does not allow short-term ie one-hourly values to be measured, but experience elsewhere suggests that the short term NAQO of not more than $200 \mu\text{g}/\text{m}^3$ (as a one-hour mean value) is unlikely to be breached unless the annual average is well over $60 \mu\text{g}/\text{m}^3$ For reasons set out below this is unlikely to be the case at Holmbush Road.

4.6 Using the recently published mathematical model from Air Consultants Ltd it has been possible to predict the likely value at the facades of the nearest dwellings to these monitoring sites (see Appendix 3 Table 2). This model predicts a rapid reduction in NO_2

value with distance from the kerbside, nonetheless it still predicts levels above 40 µg/m³ at the facades of 3 nearby dwellings along Holmbush Road.

- 4.7 Following discussions with DEFRA's technical consultants a more in-depth 12 month diffusion tube survey of this part of Holmbush Road has been commissioned aimed at validating these predicted values. It will commence in February 2009.

5 New Developments

- 5.1 Guidance LAQM. PRG(03) suggests that the following possible local developments should be considered for their possible impact on the exceedence of NAQOs:

New Part A process:

An Energy from Waste facility may be constructed at St Dennis within 2-3 years. Planning and Environmental Permitting applications have been made accompanied by an Environmental Impact Assessment and a Health Impact Assessment, which will identify and address the pollutants of concern.

The modeling results contained in the assessment predict a maximum process contribution at any site within the chimney plume dispersal area of 0.070% and 0.33% of the NAQS annual standard for PM₁₀ and NO₂ respectively, which is not significant.

A Bio-gas plant is also proposed at Fraddon. Again modeling carried out for the Environmental Assessments accompanying the planning application suggest that the emissions from this plant will not be significant in terms of additional PM₁₀ and NO₂ concentrations at nearby dwellings.

New Part B process:

No significant developments are anticipated.

New retail development:

The redevelopment of St Austell town centre is now underway. The effect that its completion in 2 years time will have on existing identified sensitive locations has not been modelled.

New road schemes:

No significant developments are anticipated.

New mineral development:

The extension of clay tipping at Scarcewater has commenced. The monitoring at St Stephen has not indicated any adverse effect on PM₁₀ levels in the area. The extension of clay tipping in the Biscovillack area has not yet commenced but is not expected to affect significantly PM₁₀ levels in the area.

New landfill development:

No such developments envisaged.

Mixed use development (residential/commercial):

Although significantly locally developments are proposed for the outskirts of Newquay they are not expected to have significant adverse effects on pollutants of concern in

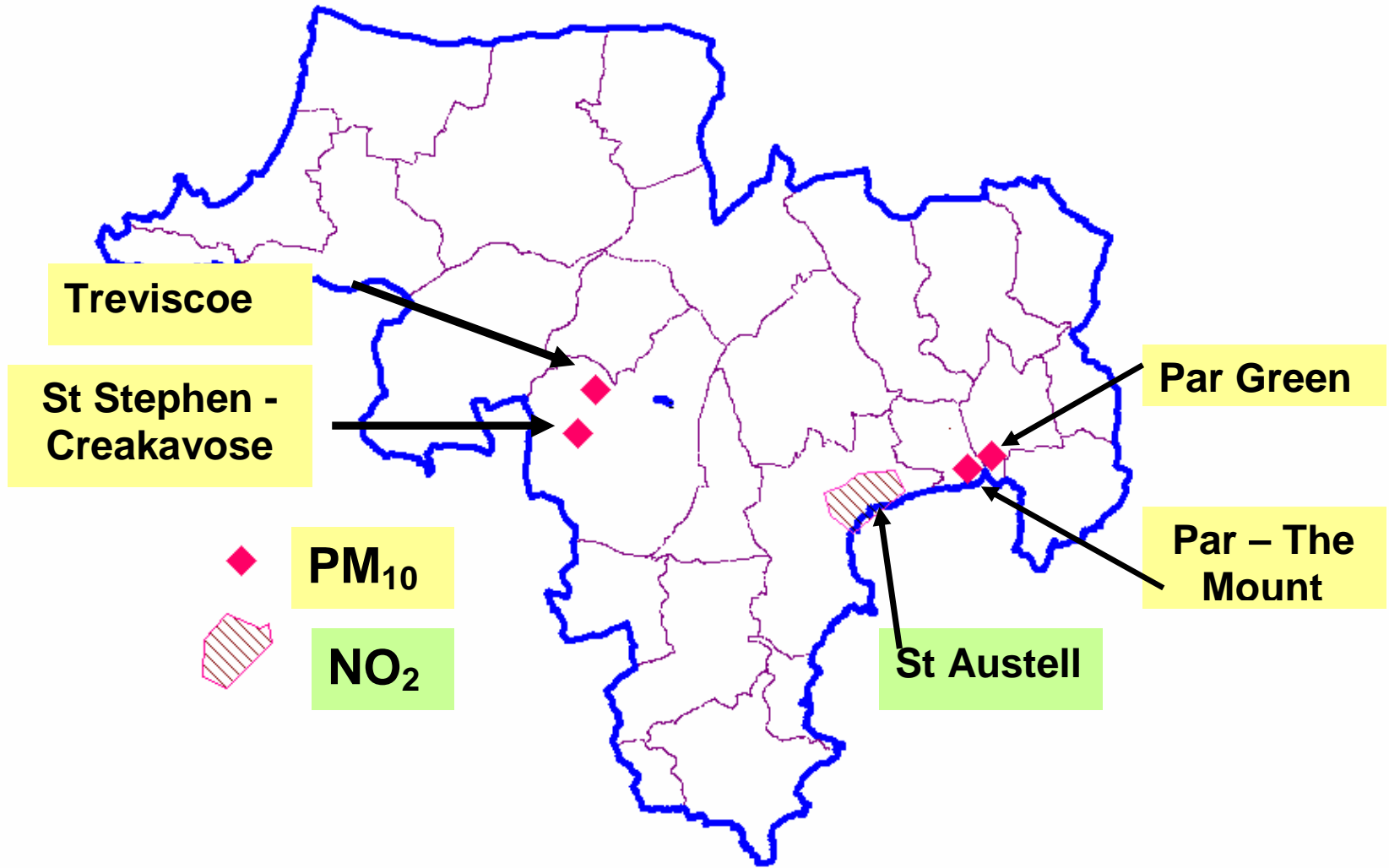
and around the town.

6 CONCLUSION

- 6.1 There is a likelihood that an existing National Air Quality Objective for the pollutant Nitrogen dioxide is being exceeded in St Austell and that further monitoring be undertaken to inform so as to enable a “Detailed Assessment” of this pollutant to be carried out.

- 6.2 There is no evidence to suggest that NAQOs for any of the other pollutants of concern are being, or are likely to be, breached

Appendix 1 Fig 1 Pollution Monitoring locations in Restormel 2005-08



Appendix 2: Table 1a : Summary of PM₁₀ monitoring data

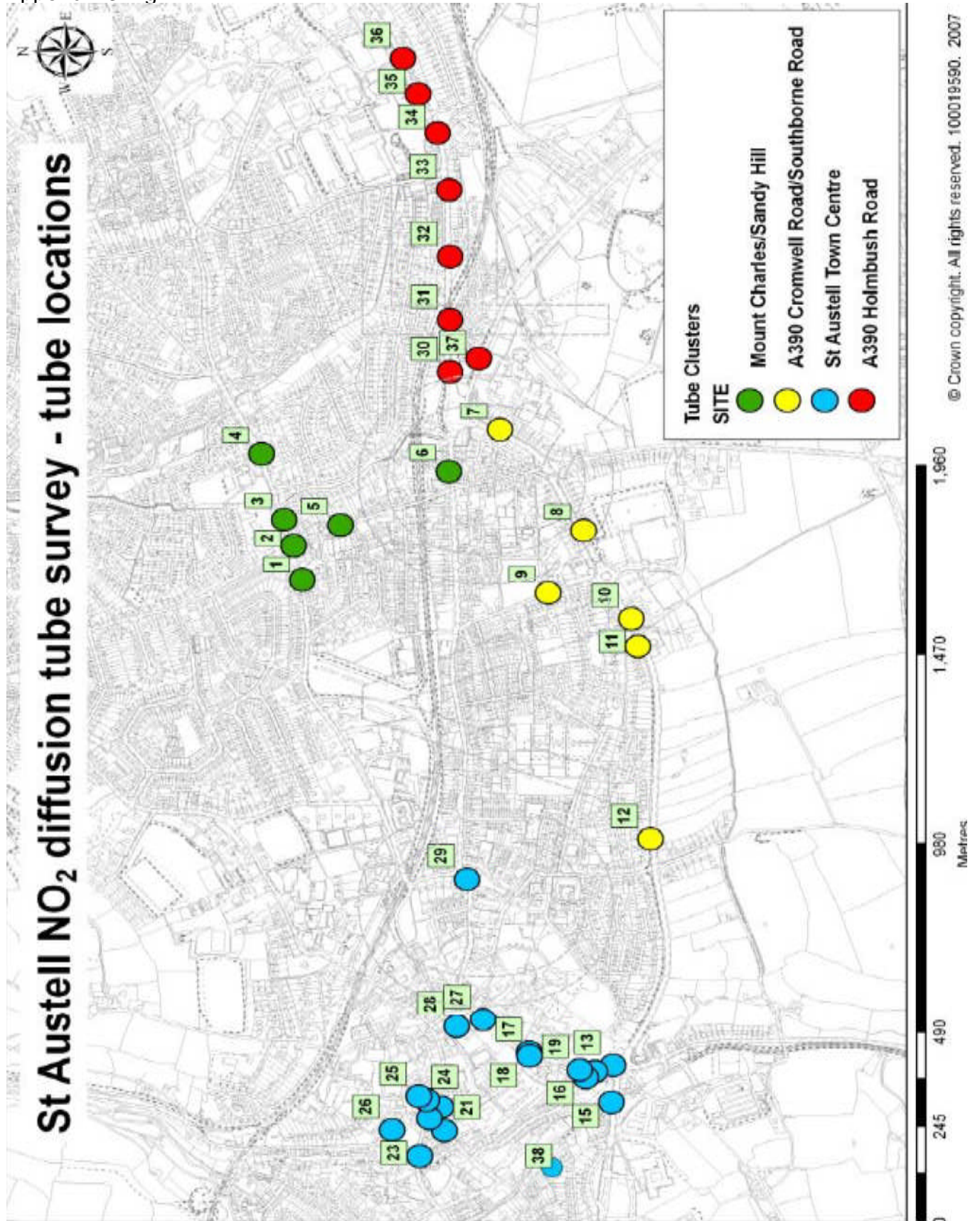
Site	Monitor type	2004-05					2005-06				
		Days monitored	% of year monitored	No of exceedences	%of monitored days in excess of 50 µg/m ³ Daily mean value	Average daily level (µg/m ³)	Days monitored	% of year monitored	No of exceedences	%of monitored days in excess of 50 µg/m ³ Daily mean value	Average daily level (µg/m ³)
The Mount-Par	TEOM ¹	252	69	4	1.5	21.1	320	87.6	2	0.6	22.2
Par Green	Osiris	322	88	24	7.4	24.2	270	73.9	10	3.7	18.3
Treviscoe	TEOM ¹	229	62	1	0.4	25.2	292	80.0	4	1.3	25.0
St Stephen - Creakavose	Osiris ¹	328	90	9	2.7	19.7	294	80.5	11	3.7	23.3
Plymouth	TEOM ¹	359	98	13	3.6	21.5	354	96.9	0	0	13.6
Narberth – West Wales	TEOM ¹	243	66	0	0	13.7	335	91.8	0	0	16.0

Notes: 1 Measured value adjusted by factor of 1.3

Appendix 2: Table 1b: Summary of PM₁₀ monitoring data

	Monitor type	2006-07					2007-08				
		Days monitored	% of year monitored	No of exceedences	%of monitored days in excess of 50 µg/m ³ Daily mean value	Average daily level (µg/m ³)	Days monitored	% of year monitored	No of exceedences	%of monitored days in excess of 50 µg/m ³ Daily mean value	Average daily level (µg/m ³)
The Mount-Par	TEOM ¹	272	74.5	4	1.5	22.1	200	54.6	2	1.0	20.9
Par Green	Osiris	111	30.4	16	14.4	33.4	244	66.6	10	4.1	23.2
Treviscoe	TEOM ¹	297	81.3	21	7.0	27.3	269	73.5	2	0.7	22.1
St Stephen - Creakavose	Osiris	233	63.8	16	6.8	27.1	84	22.9	5	5.9	22.5
Plymouth	TEOM ¹	269	73.7	4	1.5	15.4	245	66.9	3	1.2	19.5
Narberth – West Wales	TEOM ¹	245	67.1	3	1.2	18.2	270	73.7	0	0	16.5

Appendix 3 Fig 1



Appendix 3 Table 1: St Austell NO2 diffusion tube results summary .
 Emboldened values highlight those over NAQO threshold.

Tube no	Location	12 mth Mean (Oct06-Sept 07)	18 mth Mean (Oct 06-Mar 08)
STA1	Polkyth Rd: o/s The Family Foodstore	19.5	20.5
STA2h <input type="checkbox"/> STA3n <input type="checkbox"/> STA4Hi <input type="checkbox"/> STA5Hi <input type="checkbox"/> STA6n <input type="checkbox"/> STA7Ch <input type="checkbox"/> STA8r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA1	Clifden Rd: opp jnt of Sandy Hill	31.4	31.0
STA3n <input type="checkbox"/> STA4Hi <input type="checkbox"/> STA5Hi <input type="checkbox"/> STA6n <input type="checkbox"/> STA7Ch <input type="checkbox"/> STA8r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA11ut <input type="checkbox"/> STA12ut <input type="checkbox"/>	Sandy Hill :s/o no. 4 opp Cornish Ford	28.0	29.3
STA4Hi <input type="checkbox"/> S TA5Hi <input type="checkbox"/> STA 6n <input type="checkbox"/> STA7Ch <input type="checkbox"/> STA8r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d	Sandy Hill	20.0	21.0
STA5Hi <input type="checkbox"/> S TA6n <input type="checkbox"/>	13		

Appendix 3 Table 2: Predicted NO₂ values at residential facades nearest measured site

Tube no	Location	12 mth Mean (Oct06-Sept 07)	18 mth Mean (Oct 06-Mar 08)	measured distance kerbside to tube location	measured distance kerbside to nearest facade	predicted 18 month value at nearest façade at background NO ₂ value of 11µg/m ³
STA1	Polkyth Rd: o/s The Family Foodstore	19.5	20.5	-	-	-
<input type="checkbox"/> STA2h <input type="checkbox"/> STA3n <input type="checkbox"/> STA4Hi <input type="checkbox"/> STA5Hi <input type="checkbox"/> STA6n <input type="checkbox"/> STA7C <input type="checkbox"/> STA8 <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA1	Clifden Rd: opp jnt of Sandy Hill	31.4	31.0	-	-	-
<input type="checkbox"/> STA3n <input type="checkbox"/> STA4Hi <input type="checkbox"/> STA5Hi <input type="checkbox"/> STA6n <input type="checkbox"/> STA7C <input type="checkbox"/> STA8 <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA11u <input type="checkbox"/> STA12ut	Sandy Hill :s/o no. 4 opp Cornish Ford	28.0	29.3	-	-	-
<input type="checkbox"/> STA4Hi <input type="checkbox"/> STA5Hi <input type="checkbox"/> STA6n <input type="checkbox"/> STA7C <input type="checkbox"/> STA8	Sandy Hill	20.0	21.0	-	-	-

<input type="checkbox"/> r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d						
<input type="checkbox"/> STA5Hi <input type="checkbox"/> STA6n <input type="checkbox"/> STA7C h <input type="checkbox"/> STA8 r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA11	Clifden Rd: o/s no. 80	24.2	24.3	-	-	-
<input type="checkbox"/> STA6n <input type="checkbox"/> STA7C h <input type="checkbox"/> STA8 r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA11u t <input type="checkbox"/> STA12ut <input type="checkbox"/> STA13ut <input type="checkbox"/> STA14ic <input type="checkbox"/> STA15t	Mount Charles Rd: o/s no. 1	24.0	25.6	-	-	-
<input type="checkbox"/> STA7Ch <input type="checkbox"/> STA8r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA11u t <input type="checkbox"/> STA12ut	Polmear Rd: o/s Bethany	34.5	34.0	-	-	-
<input type="checkbox"/> STA8r <input type="checkbox"/> STA9ro <input type="checkbox"/> STA10d <input type="checkbox"/> STA11u t <input type="checkbox"/> STA12ut	A390 Cromwell Rd: o/s no. 23	28.3	28.5	-	-	-

<input type="checkbox"/> 2ut <input type="checkbox"/> ST <input type="checkbox"/> AI3ut <input type="checkbox"/> STAI4ic <input type="checkbox"/> STAI5t: <input type="checkbox"/> STAI6i <input type="checkbox"/> c <input type="checkbox"/> STAI7d						
<input type="checkbox"/> STA9ro <input type="checkbox"/> STAI10d <input type="checkbox"/> STAI11ut <input type="checkbox"/> STAI2ut <input type="checkbox"/> ST <input type="checkbox"/> AI3ut <input type="checkbox"/> STAI4ic <input type="checkbox"/> STAI5t: <input type="checkbox"/> STAI6i <input type="checkbox"/> c <input type="checkbox"/> STAI7d <input type="checkbox"/> STAI8t:	Woodland Rd: o/s no. 11	18.2	18.9	-	-	-
<input type="checkbox"/> STAI10d <input type="checkbox"/> STAI11ut <input type="checkbox"/> STAI2ut <input type="checkbox"/> ST <input type="checkbox"/> AI3ut <input type="checkbox"/> STAI4ic <input type="checkbox"/> STAI5t: <input type="checkbox"/> STAI6i <input type="checkbox"/> c <input type="checkbox"/> STAI7d <input type="checkbox"/> STAI	A390 Southbourne Rd: btwn nos 86 & 88	37.1	36.7	-	-	-
<input type="checkbox"/> STAI11ut <input type="checkbox"/> STAI2ut <input type="checkbox"/> STAI3ut <input type="checkbox"/> ST <input type="checkbox"/> AI4ic <input type="checkbox"/> STAI5t:	A390 Southbourne Rd: opp. Little Chef o/s Casa Mia B&B no 55	28.1	28.1	-	-	-

<input type="checkbox"/> STAI6ic <input type="checkbox"/> STAI7d <input type="checkbox"/> STAI8t: <input type="checkbox"/> STAI9t <input type="checkbox"/> STAI20t: <input type="checkbox"/>						
<input type="checkbox"/> STAI2ut <input type="checkbox"/> STAI3ut <input type="checkbox"/> STAI4ic <input type="checkbox"/> STAI5t: <input type="checkbox"/> STAI6ic <input type="checkbox"/> STAI7d <input type="checkbox"/> STAI8t: <input type="checkbox"/> STAI9t <input type="checkbox"/> STAI20t: <input type="checkbox"/> STAI21S <input type="checkbox"/>	A390 Southbourne Rd: o/s Cusgarne	40.0	37.8	-	-	-
<input type="checkbox"/> STAI3ut <input type="checkbox"/> STAI4ic <input type="checkbox"/> STAI5t: <input type="checkbox"/> STAI6ic <input type="checkbox"/> STAI7d <input type="checkbox"/> STAI8t: <input type="checkbox"/> STAI9t <input type="checkbox"/> STAI20t: <input type="checkbox"/> STAI21S <input type="checkbox"/> STAI22II <input type="checkbox"/>	Penwinnick r/a: btwn 73 & Wimereux Restaurant	32.2	32.8	-	-	-
<input type="checkbox"/> STAI4ic <input type="checkbox"/> STAI5t: <input type="checkbox"/> STAI6ic <input type="checkbox"/> STAI7d <input type="checkbox"/>	South St: o/s no. 66	38.3	38.2	-	-	-

STA18t: STA19t <input type="checkbox"/> STA20t: <input type="checkbox"/> STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/>						
STA15t: <input type="checkbox"/> STA16ic <input type="checkbox"/> STA17d <input type="checkbox"/> STA18t: STA19t <input type="checkbox"/> STA20t: <input type="checkbox"/> STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/> STA2 3d: <input type="checkbox"/> STA2 4d: <input type="checkbox"/>	Penwinnick Rd: by r/a sign	32.7	31.9	-	-	-
STA16ic <input type="checkbox"/> STA17d <input type="checkbox"/> STA18t: STA19t <input type="checkbox"/> STA20t: <input type="checkbox"/> STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/> STA2 3d: <input type="checkbox"/> STA2 4d: <input type="checkbox"/>	Moorland Rd: o/s no. 3	29.3	29.2	-	-	-
STA17d <input type="checkbox"/> STA18t: STA19t <input type="checkbox"/> STA20t: <input type="checkbox"/> STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/> STA2 3d: <input type="checkbox"/>	South St: by mini r/a opp Trinity St	36.7	35.9	-	-	-

STA2 4d: <input type="checkbox"/> STA2						
STA18t: ST A19t <input type="checkbox"/> STA20t: <input type="checkbox"/> STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/> STA2 3d: <input type="checkbox"/> STA2 4d: <input type="checkbox"/> STA2 5dm <input type="checkbox"/> ST A26Wa <input type="checkbox"/> STA27dm	South St mini r/a: junction Trinity St	33.1	34.0	-	-	-
STA19 t <input type="checkbox"/> STA30 II <input type="checkbox"/> STA3 I h <input type="checkbox"/> STA32 h <input type="checkbox"/> STA33 h <input type="checkbox"/> STA34 h <input type="checkbox"/> STA35 h <<A390 Southbour ne R	South St: o/s no. 60	44.6	43.6	1.04	4.2	34.4
STA20t: <input type="checkbox"/> STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/> STA2 3d: <input type="checkbox"/> STA2 4d: <input type="checkbox"/> STA2	Trinity St: o/s Hair Workshop	21.8	21.7	-	-	-

5dm <input type="checkbox"/> ST A26Wa <input type="checkbox"/> STA27dm <input type="checkbox"/> STA28t: <input type="checkbox"/> STA29a						
STA21 S <input type="checkbox"/> STA2 2II <input type="checkbox"/> STA2 3d:	West Hill: o/s. 14	16.5	16.7	-	-	-
STA22II <input type="checkbox"/> STA23d: <input type="checkbox"/> STA24d : <input type="checkbox"/> STA25d m <input type="checkbox"/> STA2 6Wa <input type="checkbox"/> ST A27dm <input type="checkbox"/> STA28t: <input type="checkbox"/> STA29a ST A30II	Truro Rd: o/s Dentist next door to Walkers Chip Shop	24.6	24.4	-	-	-
STA23d: <input type="checkbox"/> STA24d : <input type="checkbox"/> STA25d m <input type="checkbox"/> STA2 6Wa <input type="checkbox"/> ST A27dm <input type="checkbox"/> STA28t: <input type="checkbox"/> STA29a ST A30II STA3	Truro Rd: o/s St Austell Printing Co.	24.3	23.9	-	-	-
STA24d: <input type="checkbox"/> STA25d m <input type="checkbox"/> STA2 6Wa <input type="checkbox"/> ST A27dm <input type="checkbox"/> STA28t: <input type="checkbox"/>	A39I Bodmin Rd: o/s Adeba Toys	29.4	29.2	-	-	-

STA29a ST A30II STA3 Ih ST A3						
STA25dm <input type="checkbox"/> STA26 Wa <input type="checkbox"/> ST A27dm <input type="checkbox"/> STA28t: <input type="checkbox"/> STA29a ST A30II STA3 Ih ST A32h ST A3	Grants Walk: adj W & T Sanders Ltd.	27.3	27.3	-	-	-
STA26Wa <input type="checkbox"/> STA27d m <input type="checkbox"/> STA2 8t: <input type="checkbox"/> STA2 9a ST A30II STA3 Ih ST A32h ST A	A391 Bodmin Rd: rear of Solarium o/s 36	19.4	19.5	-	-	-
STA27dm <input type="checkbox"/> STA28t: <input type="checkbox"/> STA29a ST A30II STA3 Ih ST A32h ST A33h ST A34h ST A3	South St: o/s Golden Penny Café	33.6	34.8	-	-	-
STA28t: <input type="checkbox"/> STA29a ST	Victoria Pl: o/s Alias Smith	21.0	21.8	-	-	-

A30II STA3 Ih ST A32h ST A33h ST A34h ST A35h <input type="checkbox"/> STA36h <input type="checkbox"/> STA37h						
STA29a ST A30II STA3 Ih ST A32h ST A33h ST A34h ST A35h <input type="checkbox"/> STA36h <input type="checkbox"/> S	East Hill: o/s NFU Mutual Insurance	24.9	25.4	-	-	-
STA30 II <input type="checkbox"/> STA3 I h <input type="checkbox"/> STA32 h <input type="checkbox"/> STA33 h <input type="checkbox"/> STA34 h <input type="checkbox"/> STA35 h <<A390 Southbour ne Rd: opp	Holmbush Rd: opp no 19	41.0	41.5	1.05	5.4	31.3
STA31 h <input type="checkbox"/>	Holmbush Rd: o/s Esso Westbourne Motors	61.8	62.5	0.83	2.5	51.5

STA3 2 h <input type="checkbox"/> STA3 3 h <input type="checkbox"/> STA3 4 h <input type="checkbox"/> STA3 5 h <<A390 Southb ourne Rd: opp. Little C						
STA32 h <input type="checkbox"/> STA33 h <input type="checkbox"/> STA34 h <input type="checkbox"/> STA35 h <<A390 Southbour ne Rd: opp. Little Chef o/s Casa M	Holmbush Rd: o/s field	41.1	42.2	0.78	8.6	27.8
STA33 h <input type="checkbox"/> STA34 h <input type="checkbox"/> STA35 h <<A390 Southbour ne Rd: opp. Little Chef o/s Casa Mia B&B No 55 <input type="checkbox"/>	Holmbush Rd: o/s no. 32	47.0	45.9	0.72	10.1	28.5
STA34	Holmbush Rd: opp no.	44.6	44.3	1.4	2.1	41.4

<p>h <input type="checkbox"/> STA3 5 h <<A390 Southb ourne Rd: opp. Little Chef o/s Casa Mia B&B No 55 <input type="checkbox"/> < <A390 Southb</p>	<p>73</p>					
<p>STA35 h <<A390 Southb ourne Rd: opp. Little Chef o/s Casa Mia B&B No 55 <input type="checkbox"/> < <A390 Southb ourne Rd: opp.</p>	<p>Holmbush Rd: o/s no. 68</p>	<p>50.3</p>	<p>48.9</p>	<p>3.5</p>	<p>4</p>	<p>47.5</p>
<p>STA36h <input type="checkbox"/> STA37h <input type="checkbox"/> STA38t o <input type="checkbox"/> STA1 9 t <input type="checkbox"/> STA30 II <input type="checkbox"/> STA3 I</p>	<p>Holmbush Rd: o/s no. 90 MEAN</p>	<p>38.2</p>	<p>38.6</p>	<p>-</p>	<p>-</p>	<p>-</p>

<input type="checkbox"/> h STA32						
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Final Report on the diffusion tube monitoring of nitrogen dioxide in St Austell

October 2006 – March 2008

Air Quality Unit, Cornwall College, TR15 3RD (caqf@cornwall.ac.uk)

Commissioned by Graham Martin, Principal EHO, Restormel Borough Council.

1.0 Introduction

1.1 2002 monitoring programme

An extensive nitrogen dioxide (NO₂) diffusion tube survey, commissioned by Cornwall County Council, was undertaken at 74 sites in St Austell over a two-month period, 16th May – 17th July 2002. This indicative, short-term investigation revealed elevated concentrations of NO₂ in South Street and along the A390 (<http://www.cornwall-airquality.org.uk/pdf/StAustellNO22001.pdf>).

1.2 Current monitoring programme

In response to the 2002 short-term monitoring programme, a 12-month NO₂ diffusion tube monitoring programme was commissioned by Restormel Borough Council targeting long-term traffic-related pollution hotspots and predevelopment sites. The monitoring period was extended to 18 months as part of Cornwall College's 3.9 project '*Site specific baseline traffic-related NO₂ concentrations at proposed development sites*'; funded by the European Social Fund.

2.0 Nitrogen dioxide

NO₂ is not only a health damaging pollutant but also a proxy measure for other traffic-related pollutants. The UK Government's National Air Quality Strategy (NAQS) objectives for NO₂ (DEFRA, 2000) are given in Table 1 below. As stated in the LAQM.TG(03) the NAQS annual mean objective applies to 'air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present'. The NAQS 1-hour mean objective is more specific and only applies to those locations where members of the public are regularly present for an hour or more, in locations close to heavily trafficked roads. Air Quality Consultants Ltd state that if an annual mean concentration exceeds 60 µg m⁻³ then it is likely that the NAQS 1-hour mean objective would have been exceeded.

Table 1. NAQS objectives for NO₂.

Nitrogen dioxide (NO ₂)	Measured as	Concentration
	Annual mean	40 µg m ⁻³
	1-hour mean, 18 exceedences	200 µg m ⁻³

3.0 Sites

The monitoring sites are divided geographically into four clusters: Mount Charles/Sandy Hill, A390 Cromwell Road/Southbourne Road, St Austell town centre and A390 Holmbush Road as illustrated in Appendix 1. NETCEN estimated background NO₂ concentrations in the St Austell area range from 11 – 14 µg m⁻³.

3.1 Mount Charles/Sandy Hill

Sites 1 – 5 are located around the Sandy Hill crossroads, a busy area with four-way traffic lights close to residential properties. Sites 3 and 4 are located on an incline opposite Sandy Hill primary school. Site 5 is located outside residential properties in Clifden Road. Site 6 is located at the Mount Charles crossroads, with two-way traffic lights and close to residential properties and another primary school.

3.2 A390 Cromwell Road/Southbourne Road

Sites 7 and 8 are located on the downhill side of the A390 Cromwell Road, close to Penrice School. Site 9 is located in Woodland Road, a relatively quiet through-route. Sites 10 – 12 are located on the A390 Southbourne Road, site 10 on the uphill side, site 11 opposite and site 12 close to the traffic lights at the crossroads with Sawles Road. The A390 is the main bypass around St Austell town centre and this section also serves the Asda superstore. All of the residential properties at these sites are set back from the roadside.

3.3 St Austell town centre

Sites 13 and 15 are located on the A390 either side of the Penwinnick roundabout. Sites 14, 16 and 19 are located on South Street near to the Moorland Road junction and sites 17 and 18 are located either side of South Street at the conjunction with the Trinity Street mini-roundabout. This section of South Street forms a steep incline and residential properties here are located close to the roadside.

Site 38, Pondhu Road, is considered a background site as this is a one-way street in a residential area, more than 100 m from a main road.

Sites 20 – 26 are located at the western end of the town. Site 20 is located on Trinity Street near to the precinct of shops by the junction with Truro Road and Bodmin Road. Site 21 is located on the drainpipe of a property in West Hill on a steep incline. Sites 22 and 23 are located on drainpipes of business properties in Truro Road, of which some have residential accommodation above. Site 24 is located on a drainpipe on Adeba Toys in Bodmin Road. Site 25 is located on a pedestrian access above a tight bend in Bodmin Road and site 26 is located further along Bodmin Road on the drainpipe of a residential property on the roadside.

Site 27 is located at the bus stop in South Street close to site 7 from the 2002 survey. Site 28 is located on the drainpipe of a business property with residential accommodation over in Duke Street, a busy one-way through-route used predominantly by buses and taxis. Site 29 is located close to business and residential properties at the top of East Hill near to the mini-roundabout.

3.4 A390 Holmbush Road

Sites 30 – 36 are located along the A390 Holmbush Road close to residential properties. Sites 31 and 32 are located on the uphill side of the incline. Sites 33 – 36 are located close to traffic lights. Site 36 is a duplicate site, i.e. two diffusion tubes are collocated to confer confidence in the analysed results. The A390 Holmbush Road is the main trunk-road eastbound out of St Austell and also serves the Tesco superstore and filling station in Daniels Lane.

Site 37 is located opposite Penrice School, Charlestown Road to investigate the impact of school

Appendix 4
traffic.

Appendix 4

4.0 Equipment

4.1 Diffusion tubes

Diffusion tubes are a relatively cheap method of NO₂ monitoring that provides a monthly average concentration for the immediate area in which they are deployed. Tubes were supplied by Gradko International and used the preparation method 20% TEA (triethanolamine) in water. Tubes were exposed at the beginning of each month for one-month periods.

In field inter-comparison exercises and QC testing undertaken by the Workplace Analysis Scheme for Proficiency (WASP) programme for NO₂ diffusion tube analysis (operated by the Health and Safety Laboratory), tubes supplied by Gradko International (Type 1, 20% triethanolamine (TEA) in water) performed well and had a Relative Standard Deviation (RSD) of standardised results for 2003 of 7%; significantly below the median of 12% for all participating laboratories. Gradko International was also given a Performance Score of “Good” for QC solution analysis for 2003 (Loader *et al*, 2005).

Annual bias adjustment factors were applied to the raw values, as recommended by DEFRA. Values recorded in 2006 were adjusted by a factor of 0.98 and all subsequent values by 0.89 (<http://www.uwe.ac.uk/aqm/review/diffusiontube300307.xls>).

5.0 Results

5.1 Mount Charles/Sandy Hill cluster

Figure 1 illustrates there was no recorded exceedance of the NAQS annual objective in 2007 at any site in the Mount Charles/Sandy Hill area.

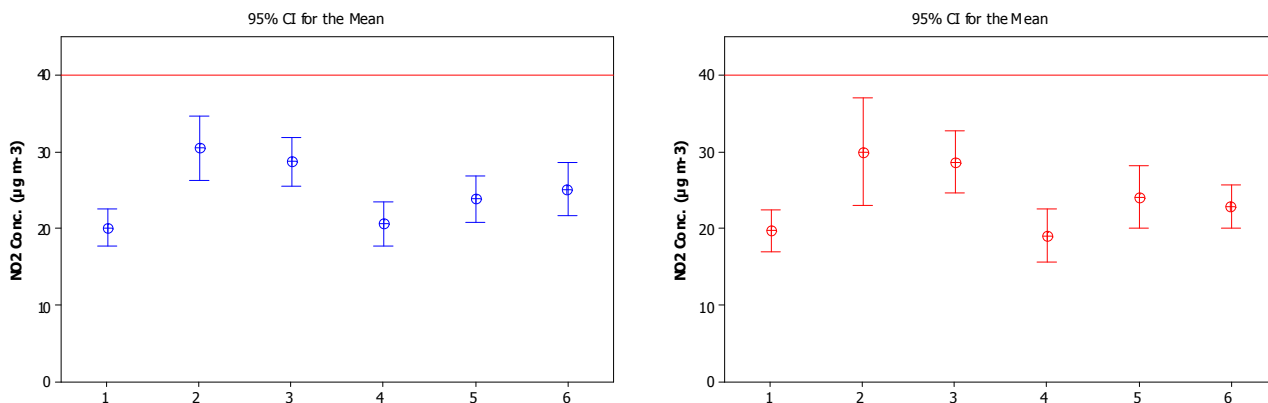


Figure 1. 18-month (blue) and 2007 calendar year (red) mean NO₂ concentration (including 95% confidence interval (CI)) for Mount Charles/Sandy Hill cluster

5.2 A390 Cromwell Road/Southbourne Road

As Figure 2 illustrates both Sites 10 and 12 recorded at least one monthly value >40µg m⁻³; however, the monitoring period mean for all sites in the Cromwell Road/Southbourne Road area did not exceed the NAQS annual objective of 40µg m⁻³.

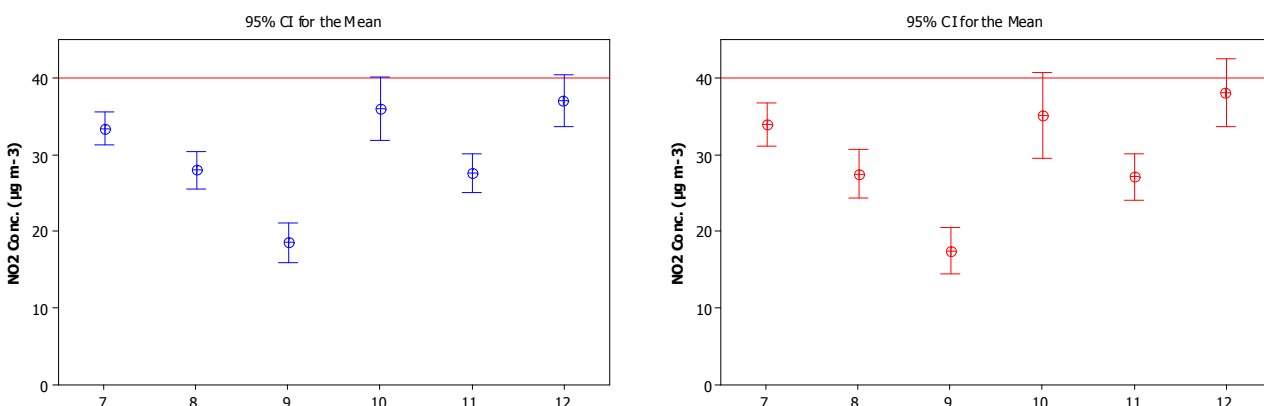


Figure 2. 18-month (blue) and 2007 calendar year (red) mean NO₂ concentration (including 95% CI) for A390 Cromwell Road/Southbourne Road.

5.3 St Austell town centre

There was 1 exceedance of the NAQS annual objective of 40 µg m⁻³ at Site 19 where a 12-month mean concentration of 42.7 µg m⁻³ was recorded (Figure 3). No other sites in the St Austell town centre recorded an exceedance.

A large confidence interval was initially evident at the background Site 38; this was due to the range of concentrations recorded (8 µg m⁻³ – 66 µg m⁻³). After further analysis two months of data were identified as being statistical outliers and were removed, this brought the programme mean inline with the NETCEN estimated background concentration of 11 – 14 µg m⁻³.

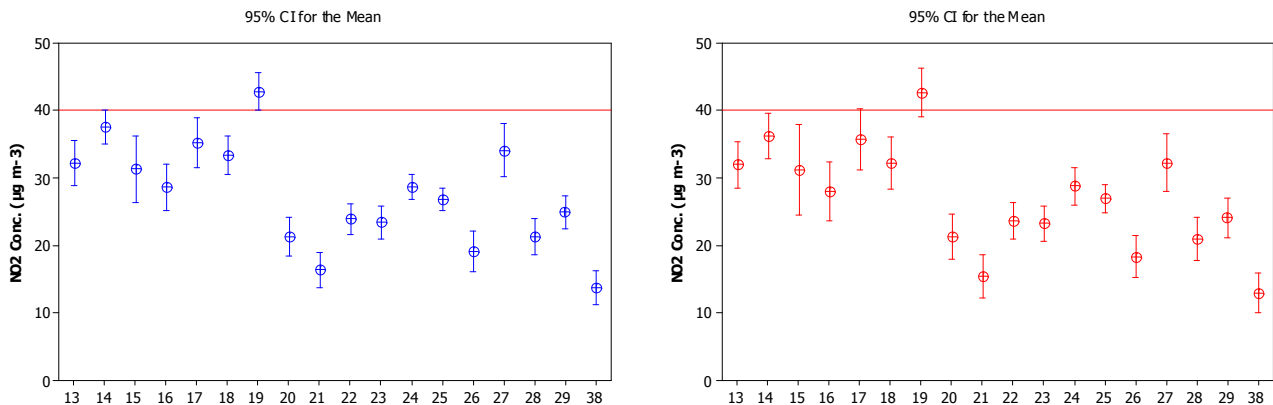


Figure 3. 18-month (blue) and 2007 calendar year (red) mean NO₂ concentration (including 95% CI) for St Austell Town Centre

5.4 A390 Holmbush Road

Figure 4 highlights five exceedances (sites 31 – 35) along the Holmbush bypass of the NAQS annual mean. Site 30 recorded a concentration >40µg m⁻³ over the complete 18-month monitoring period; however, over the NAQS calculated period a concentration <40µg m⁻³ was recorded therefore not exceeding the annual mean objective.

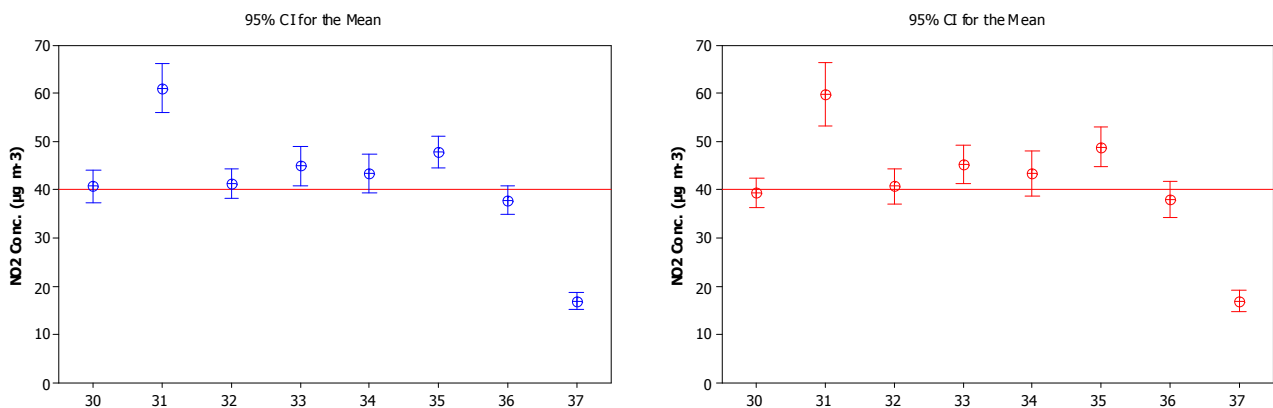
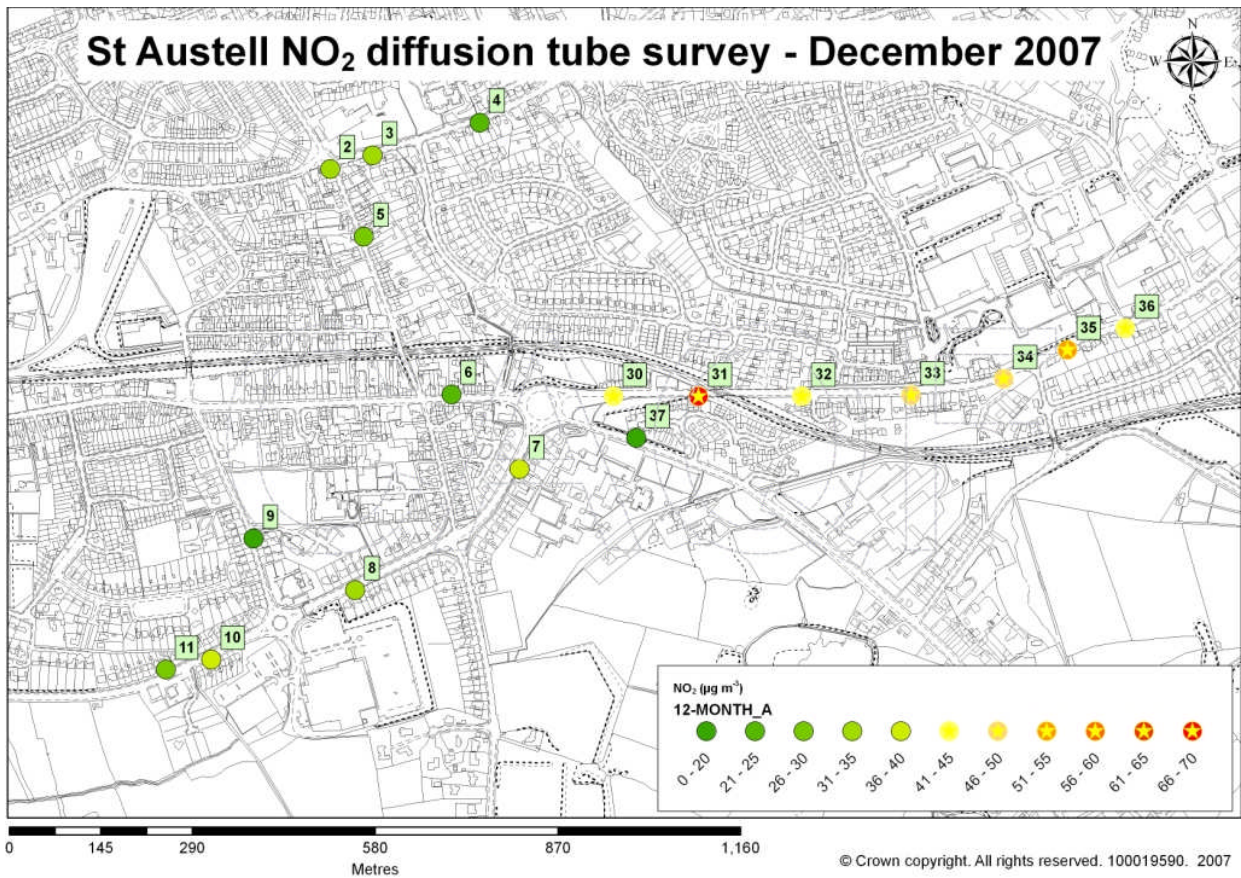


Figure 4. 18-month (blue) and 2007 calendar year (red) mean NO₂ concentration (including 95% CI) for Holmbush Road.

Appendix 4
(a)



(b)

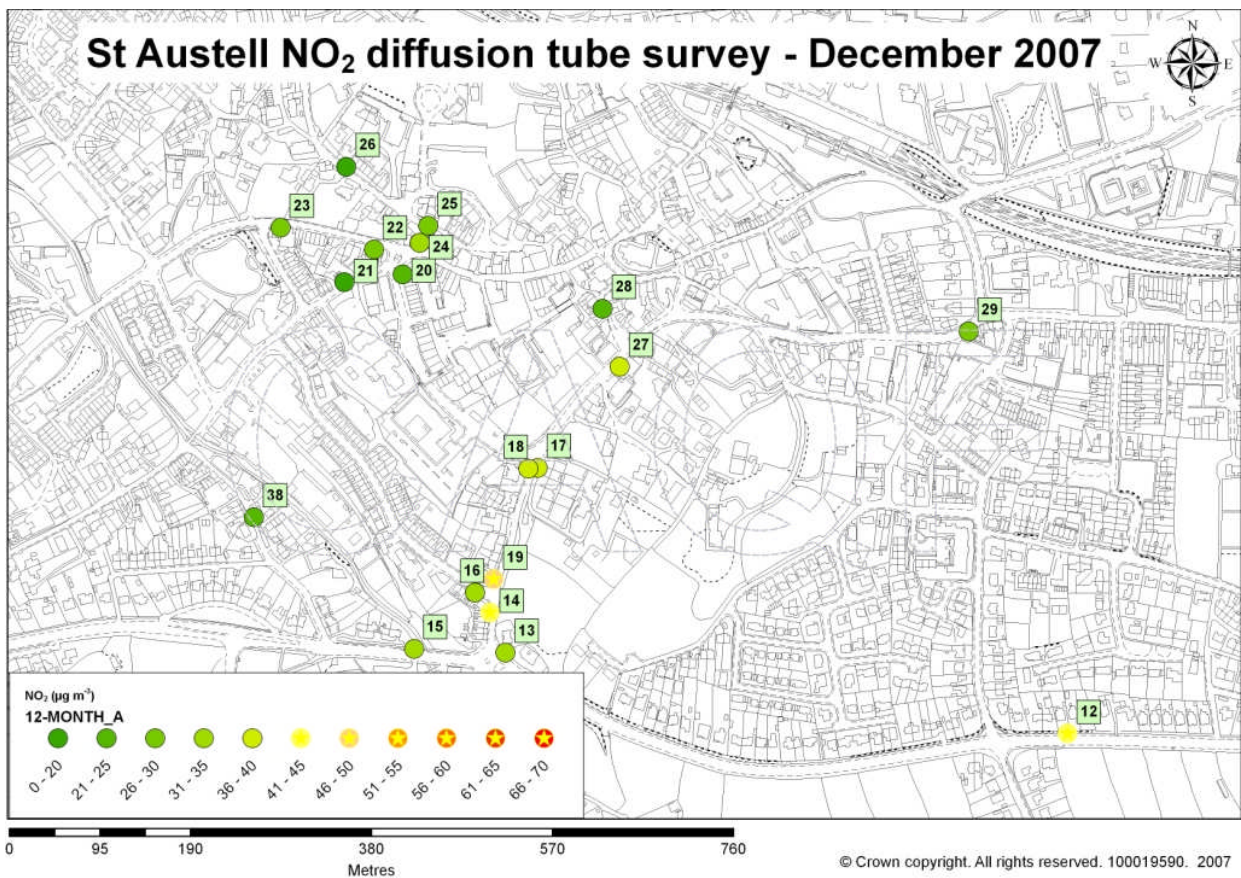


Figure 5. 2007 calendar year diffusion tube concentration and location in (a) Mount Charles/Sandy Hill cluster; A390 Cromwell Road/Southbourne Road; A390 Holmbush Road and (b) St Austell town centre.

5.5 Collocated diffusion tubes

A pair of diffusion tubes was collocated at Site 36 to allow for an inter-comparison of the diffusion tube monitoring method (Figure 6). A paired t-test statistical analysis reveals no statistical difference between the two means ($p = 0.118$) and therefore allows confidence in comparability between sites.

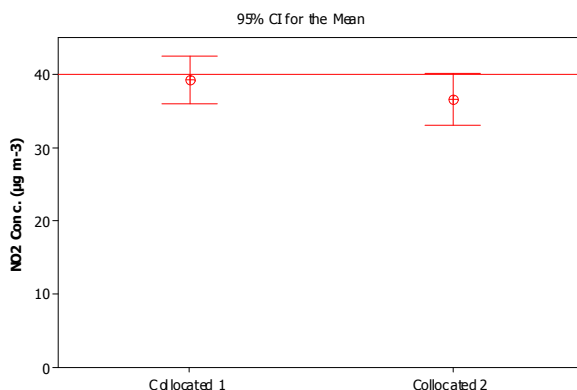


Figure 6. A comparison of mean concentrations recorded by the collocated diffusion tube over the 18-month monitoring period.

5.6 Exposure period

The mean exposure period of diffusion tubes was 31 days \pm 3 days (Figure 7); this is within the DEFRA guidelines stated in *'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance'*.

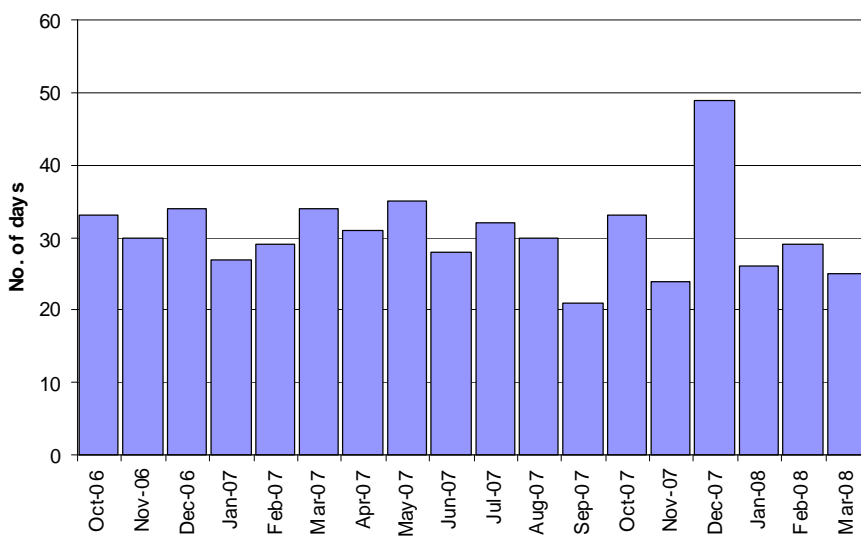


Figure 7. Number of day's diffusion tubes were exposed during the monitoring programme.

Appendix 4

6.0 Discussion

6.1 NAQS exceedances

National Air Quality Strategy objectives are calculated over a calendar 12-month period and therefore the values used in the discussion relate to the 2007 calendar year monitoring period.

Six of the 38 monitoring sites exceeded the NAQS annual mean objective of $40 \mu\text{g m}^{-3}$; five sites along the Holmbush bypass (Site 31 – 35) and one site on South Street (Site 19). The Holmbush bypass tubes recorded annual mean concentrations from $38.1 \mu\text{g m}^{-3}$ – $59.9 \mu\text{g m}^{-3}$ (Figure 4 and 5a) and the exceedance on South Street recorded an annual mean of $42.7 \mu\text{g m}^{-3}$ (Figure 3 and 5b).

As there are exceedances of the NAQS annual objective and there are residential properties within 10 metres of the kerbside adjacent to the exceedance, an Air Quality Management Area would have to be declared under section 83(1) of the 1995 Environment Act. The cause of the exceedances is traffic-related and similar conditions prevail at both locations; that is, canyon street topography; high daily traffic flow; traffic lights and roundabouts and vehicles accelerating up an incline. A continuous monitor and an automatic traffic counter would allow a further analysis of the situation as a means to possible remediation.

There are a number of other sites that could potentially exceed the NAQS annual mean objective (i.e. are within 10% of the objective value); however, these are either situated near the locations outlined above or are not within 10 metres of residential properties and therefore do not come under the statutory obligation.

Site 31 recorded an annual mean of $59.9 \mu\text{g m}^{-3}$ and therefore it is suggested that the NAQS hourly mean objective may also have been exceeded based on research by Air Quality Consultants Ltd.

6.2 Background and predevelopment sites

All other sites within the St Austell area did not exceed the NAQS annual mean objective due to the site lacking one or more of the attributes listed above such as street topography. The data recorded for these sites is valuable as baseline data for recording any future change in air quality as a result of developments or road lay-out alteration.

Diffusion tubes in the Mount Charles/Sandy Hill area recorded mean concentrations of $19.1 \mu\text{g m}^{-3}$ – $30.0 \mu\text{g m}^{-3}$ (Figure 1 and 5a); tubes in the Cromwell Road/Southborne Road area recorded mean concentrations of $17.4 \mu\text{g m}^{-3}$ – $38.1 \mu\text{g m}^{-3}$ (Figure 2 and 5a) and tubes located in St Austell town centre area recorded mean concentrations of $13.0 \mu\text{g m}^{-3}$ – $36.3 \mu\text{g m}^{-3}$ (Figure 3 and 5b) not including the exceedance in South Street.

6.3 Quality control

A pair of diffusion tubes was collocated at Site 36 to allow an inter-comparison of the diffusion tube monitoring method. A visual (Figure 6) and statistical analysis of the long-term means reveals a good agreement which allows confidence in the monitoring method and the comparability between sites.

Exposure periods had a range of 21 – 49 days (mean 31 ± 3 days) falling within the DEFRA guidelines (with the exception of December 2007) that suggest an exposure period to be no less than 1 week and no more than 5 weeks.

7.0 Conclusion

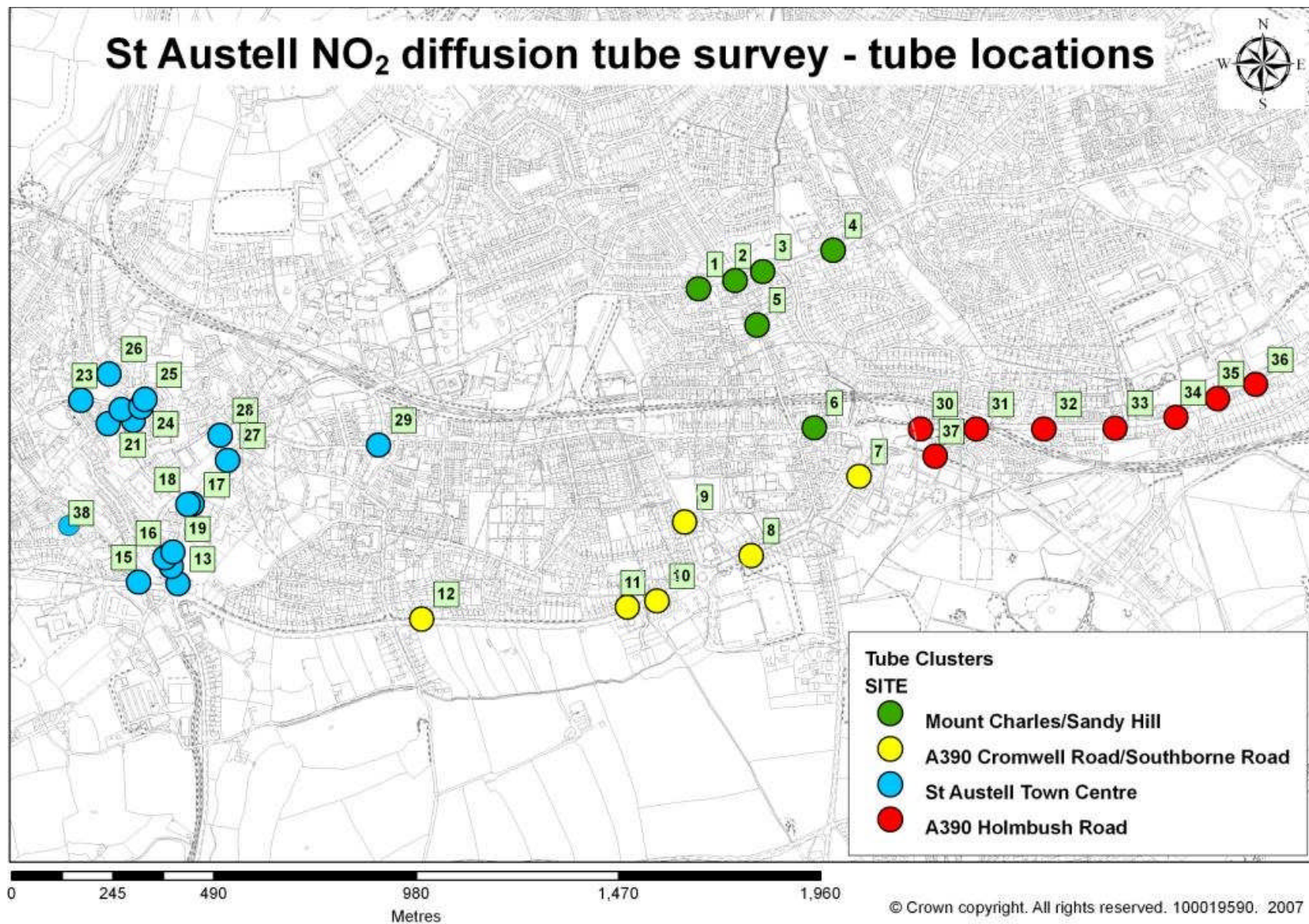
- Six sites recorded exceedances of the NAQS annual mean objective of $40 \mu\text{g m}^{-3}$ in 2007; these were Sites 31 – 35 along the Holmbush bypass and Site 19 on South Street. It is suggested an AQMA declaration will be required with regard to these areas under section 83(1) of the 1995 Environment Act.
- A combination of canyon street topography, inclines, traffic management and high traffic flows is suggested as contributory factors.
- Background and predevelopment sites recorded mean NO_2 concentrations $<40 \mu\text{g m}^{-3}$.
- The pair of collocated diffusion tubes recorded statistically similar 18-month means allowing confidence in the inter-comparability of the survey. Diffusion tubes had a mean exposure time of 31 days; within the DEFRA guidelines for exposure time.

Confidentiality

All sampling results from the monitoring sites in St Austell will be the property of Restormel Borough Council, and will be subject to strict confidentiality and not disclosed any third party without prior formal permission from Restormel Borough Council.

Disclaimer

Cornwall College cannot accept any responsibility for the use to which the information is put nor for decisions, inferences or conclusions that are made on the basis of the information provided. No responsibility is taken for the accuracy of the sampling unless this is done under our own supervision.



Appendix 1. Diffusion tube locations and their geographic sub-divisions