AECOM **Environment** Durham County Council May 2012

Menceforth Cottages, Chester-le-Street: Local Air Quality Management Detailed Assessment

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Menceforth Cottages: Air Quality Detailed Assessment

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1 Introduction

AECOM were commissioned by Durham County Council to undertake a Detailed Assessment of local air quality near Menceforth Cottages residential properties, Chester-le-Street.

Menceforth Cottages are a row of residential terraced properties directly adjacent to the B6313 Pelton Fell Road, to the west of Chester-le-Street. The road in this location passes through a shallow, heavily wooded valley, and provides access to the town centre for the residential areas to the west.

Monitoring has been undertaken at this location since 2007 and concentrations near, or above, the annual mean objective for nitrogen dioxide (NO_2) have been consistently recorded. High concentrations in 2007 and 2008 were initially attributed to local roadworks causing congestion, however, high concentrations were again recorded in 2010 and 2011 (no monitoring was undertaken during 2009).

This Detailed Assessment has been undertake to determine whether it is appropriate to declare an AQMA in this area, and to identify any other nearby locations of concern that should also be included in the AQMA, or where further monitoring or modelling assessment work may be required. This assessment only considers the area around the cottages where monitoring has indicated an exceedence of the annual mean objective for NO_2.

2 Legislation and Guidance

2.1 European Legislation

The European Union (EU) has implemented a number of limit values for specific atmospheric pollutants to control public exposure. The limits are derived from observed health effects for exposure at different concentrations and durations.

Under EU law, the defined limit values are legally binding from the date it enters into force, with a limited number of permitted exceedences for certain short-term limits. Where member states exceed these limits, they may be subject to infraction proceedings resulting in fines unless they can prove that sufficient action plans are being put in place to control exposure as far as possible with the intention to bring levels below the relevant limit. These limits apply to sulphur dioxide (SO_2), nitrogen dioxide (NO_2), fine particulate matter of under 10 μm in diameter (PM_{10}) lead, carbon monoxide (CO) and benzene, and have been implemented in the UK Standards Regulations (discussed below in Section 2.3).

The EU legislation also uses ‘target values’ for certain pollutants, which are less binding than the limit values and must be attained as far as possible by a define date. Pollutants subject to this regime include ozone (O_3), arsenic, cadmium, nickel and poly-aromatic hydrocarbons (PAHs).

The EU limit values do not apply to workplaces where provisions concerning health and safety at work apply and to which members of the public do not have regular access.

2.2 The UK Air Quality Strategy

The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all local authorities in England, Scotland, Northern Ireland and Wales to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years.

Should the reviews indicate that the objectives prescribed in the Air Quality Strategy (HMSO, 2007a) will not be met at relevant locations, the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves.

The Air Quality Strategy identifies several ambient air pollutants that have the potential to cause harm to human health. These pollutants are associated with local air quality issues, with the exception of ozone, which is recognised as being a regional problem.

The Air Quality Strategy sets standards and objectives for the pollutants that are associated with local air quality. These objectives aim to reduce the health impacts of the pollutants to negligible levels. The objectives have been incorporated into the Air Quality Regulations. The most important pollutants with regards to combustion processes are typically NO_2 and PM_{10}. Standards and objectives have been set to address long term (annual) exposure, and short term (daily and hourly) exposure. The relevant standards and objectives for this assessment are provided in Section 2.3.

2.3 Pollutants of Concern -

The local air quality monitoring identified a breach of the annual mean objective for NO_2 in the study area, which is a combustion product emitted from vehicle exhaust.

2.3.1 Nitrogen Dioxide

The Government and the Devolved Administrations adopted two Air Quality Objectives for nitrogen dioxide (NO_2) which were to be achieved by the end of 2005. In 2010, mandatory EU air quality limit values on pollutant concentrations were to apply in the UK, however the UK Government has applied for derogation. The EU limit values for NO_2 are the same as the national objectives (HMSO, 2007):

- An annual mean concentration of 40 µg/m^3; and
- An hourly mean concentration of 200 µg/m^3, to be exceeded no more than 18 times per year.

In practice, meeting the annual mean objective has been and is expected to be considerably more demanding than achieving the 1-hour objective. The annual mean objective of 40 µg/m^3 is currently widely exceeded at roadside sites throughout the UK, with exceedences also reported at urban background locations in major conurbations. Exceedences are associated almost exclusively with road emissions.

There is considerable year-to-year variation in the number of exceedences of the hourly objective, driven by meteorological conditions which give rise to winter episodes of poor dispersion and summer oxidant episodes. Analysis of the relationship between 1-hour and annual mean NO_2 concentrations at roadside and kerbside monitoring sites indicate that exceedences of the 1-hour objective are unlikely where the annual mean is below 60 µg/m^3 (AEA, 2008).

NO_2 and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as NO_X. All combustion processes produce NO_X emissions, largely in the form of NO, which is then converted to NO_2, mainly as a result of its reaction with ozone in the atmosphere. Therefore the ratio of NO_2 to NO is primarily dependent on the concentration of ozone and the distance from the emission source.

In recent years a trend has been recognised whereby roadside NO_2 concentrations have not been falling, or have been increasing, at certain monitoring sites, despite emissions of NO_X falling. The 'direct NO_2' phenomenon is having an increasingly marked effect at many urban locations around the country and must be considered when undertaking modelling studies and in the context of future local air quality strategy. At the end of September 2010 Defra released a brief FAQ (Frequently Asked Question) note on the issue (Defra, 2010), acknowledging that NO_2 concentrations have not fallen as projected over the past 6-8 years, and also published a draft report in March 2011 entitled "Trends in NO_X and NO_2 emissions and ambient measurements in the UK" (Defra, 2011), which discusses the disparity between modelling and monitoring in detail.

Defra is expected to publish revised vehicle emissions factors, new information on fleet composition and new projections for future years in June 2012 (Defra, 2012), which is expected to significantly improve the accuracy of model predictions. Whilst Defra has recommended that modelling work for Further Assessment should be postponed until this information is available, it advises that local authorities who are currently undertaking modelling for review and assessments for the purposes of determining the need for an AQMA may continue to use the current vehicle emissions factors provided all dispersion modelling is verified against local monitoring data.

3 Baseline Conditions

3.1 Local Air Quality Management

The Local Air Quality Management Review and Assessment reporting undertaken by Durham County Council has recognised that high concentration of NO_2 have continued to be recorded around Menceforth Cottages, to the west of Chester-le-Street.

The 2009 Updating and Screening Assessment recognised that there was an exceedence of the NO_2 annual mean objective recorded at this location, which was partially attributed to an extended period of road works. Monitoring was continued at this location to decide whether it would be necessary to proceed to a Detailed Assessment.

The 2011 Progress Report concluded that, due to continued breaches of the annual mean NO_2 objective at Menceforth Cottages, a Detailed Assessment should be undertaken in this location.

The 2012 Draft Updating and Screening Assessment summarises new monitoring data recorded at sites installed in the Chester-le-Street town centre during 2011. These sites recorded high concentrations of NO_2 very close to the annual mean objective, and so monitoring is being continued in the town centre in order to determine whether any breaches of the annual mean objective are likely to occur at locations of relevant exposure in this area. The decision to progress to a Detailed Assessment, and potentially designate an AQMA in this is area, will be discussed in the next round or Review and Assessment once sufficient monitoring data is available.

3.2 Monitoring

Durham County Council operate a passive diffusion tube monitoring network throughout the County, as well as an automatic continuous monitoring station in Durham City, which is used to determine a local bias adjustment factor for the tube data.

In Chester-le-Street, the Council currently operate ten passive diffusion tube monitoring locations (see Table 1 and Appendix A, Figure 2). Four sites, including Menceforth Cottages, have been operational since 2007, with a further three sites installed in 2010 and three more during 2011. No exceedences of the NO_2 annual mean objective were recorded in 2011, although high concentrations close to the objective were recorded at Menceforth Cottages and a new site at the Aldi supermarket on Picktree Lane (see Appendix A, Figure 2). As discussed above in Section 3.1, monitored concentration in the town centre 2011 were slightly below the annual mean objective, and so monitoring will continue in order to determine whether further work will be necessary in this area.

Table 1: Chester-le-Street Monitoring

New Tube Reference	Tube Name	Annual Mean NO_2 Concentration ($\mu g/m^3$)				
		2007	2008	2009	2010	2011
D22	Ropery Lane	-	-	Monitoring programme suspended during 2009	25.1	23.6
D23	Menceforth Cottages	**40.0**	**47.2**		**43.9**	39.1
D24 [A]	Market Place	**45.3**	37.1		30.7	29.3
D25	Pelaw Grange Court	**42.5**	32.9		30.5	34.1
D26	North Road	**47.3**	37		39.8	36.4
D27	3 Blind Lane	-	-	-	35.8	34.2
D28	15 Cherry Banks	-	-	-	36.5	31.3
D64	Aldi	-	-	-	-	39.6
D65	Newcastle Road	-	-	-	-	30.1
D66	Pelaw Bank	-	-	-	-	29.0
D85	No.24 Picktree Terrace	-	-	-	-	-

Note: Exceedences of the NO_2 annual mean objective are shown in bold

[A] D24 (Market Place) was discontinued at the end of March 2012

[B] D85 (No.24 Picktree Terrace) was installed in April 2012 near the bus depot

3.3 Background Pollutant Concentrations

Modelled estimations of background air quality concentrations are provided on the UK Local Air Quality Management website (Defra, 2012) for each 1 km square in the UK. The estimated background concentrations for the Ordnance Survey grid square containing the proposed development (X427500, Y551500) are provided in Table 2. These data were downloaded in May 2012, shortly after new estimated background pollutant concentrations were published by Defra for the 2010 model year, based on monitored pollution data, as well as refined age distribution and emission factors for road vehicles, and which is considered to be more accurate than the previous methodology. The revised values are noticeable higher than those previously published by this resource, which his consistent with monitoring evidence at locations throughout the UK.

The values used in the model have not been projected forward from 2010 to 2011, as there has been no clear trend of declining background concentrations elsewhere in the region.

Table 2: Estimated 2010 Annual Mean Background Pollutant Concentrations

Pollutant	**Annual Mean Concentration ($\mu g/m^3$)**
NO_X	33.3
NO_2	21.6

4 Assessment Methodology

The local air quality assessment was undertaken using the AAQuIRE detailed dispersion modelling software to predict concentrations of NO_2 at selected sensitive receptor locations, derived from road vehicles on the local road network.

4.1 Dispersion Modelling

4.1.1 AAQuIRE

The AAQuIRE dispersion modelling software, developed by AECOM, was used for the detailed assessment of the operational phase. The model is fully validated and has been extensively used worldwide.

As discussed in Section 2.3.1, in recent years it has been noted that NO_2 concentrations have typically not been falling, particularly at roadside monitoring sites nationwide, despite emissions of NO_X falling. At the end of September 2010 Defra released a brief FAQ note on the issue (Defra, 2010), acknowledging that NO_2 concentrations have not fallen as projected over the past 6-8 years. At the present time it is thought likely that vehicle emissions factors for diesel vehicles underestimate NO_X and NO_2 emissions in ‘real-world’ conditions. In particular, it is thought likely that diesel Euro 2, 3, 4 and 5 vehicles emit similar quantities of NO_X as Euro 1 engines. Therefore, for the purposes of this modelling study, the vehicle emissions database that is interrogated by AAQuIRE has been altered so that NO_X emissions from diesel Euro 2-5 vehicles equal NO_X emissions from diesel Euro 1 vehicles, although with an increasing proportion of Euro 6 being introduced to the fleet after 2015. A guidance document commissioned by Defra (KCL, 2011) on “Trends in NO_X and NO_2 emissions and measurements in the UK” provides further support and evidence for the alterations that were made to the vehicle emissions database.

As discussed above in Section 2.3.1, it is expected that Defra will soon publish revised vehicle emissions factors, new information on fleet composition and new projections for future years. However, as this is not yet available, at the time of writing (May 2012) the methodology used in this assessment was considered to be the most accurate and representative method of predicting current and future NO_X and NO_2 concentrations, as the model was verified using monitoring data.

4.1.2 Conversion of NO_X to NO_2

The proportion of NO_2 in NO_X varies greatly with location and time according to a number of factors including the amount of oxidant available and the distance from the emission source. NO_X concentrations are expected to decline in future years due to falling emissions, therefore NO_2 concentrations will not be limited as much by ozone and consequently it is likely that the NO_2/NO_X ratio will in the future increase. In addition, a trend has been noted in recent years whereby roadside NO_2 concentrations have been increasing at certain roadside monitoring sites, despite emissions of NO_X falling. The ‘direct NO_2’ phenomenon is having an increasingly marked effect at many urban locations throughout the UK and must be considered when undertaking modelling studies.

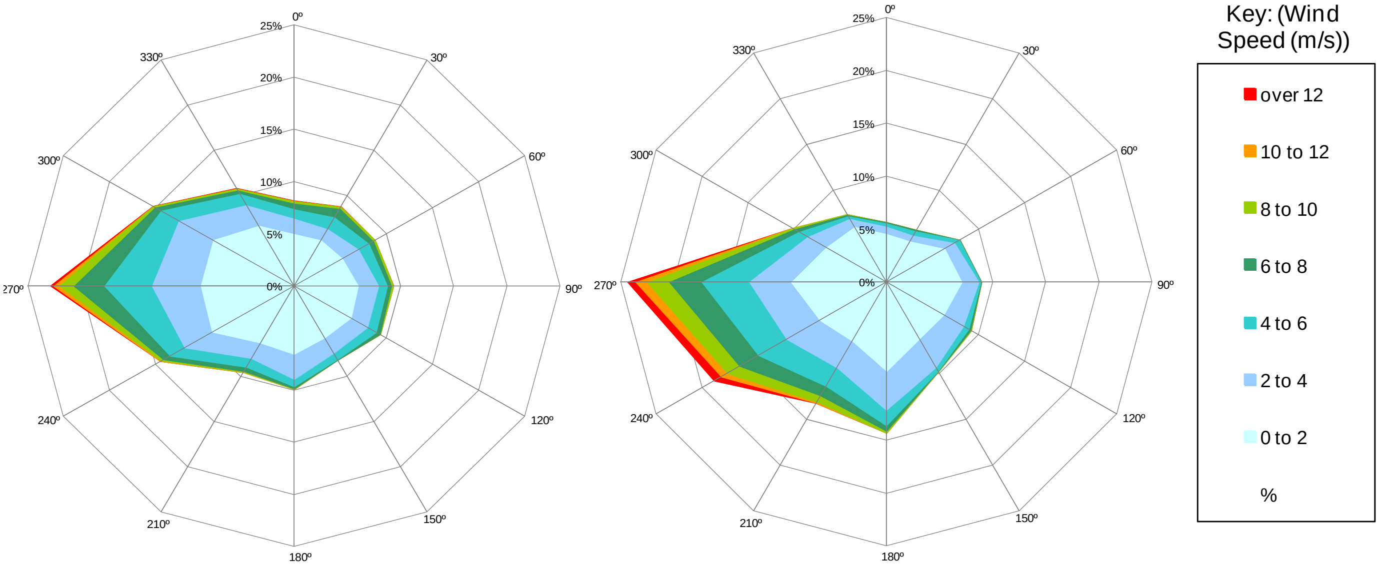
In this study modelled NO_X values were converted to NO_2 using the ‘NO_X to NO_2’ calculator, released in January 2010, and available at the UK Local Air Quality Management website (Defra, 2012). The year and region for which the modelling has been undertaken are specified and local factors, such as an appropriate factor of NO_X emitted as NO_2, are used in the calculation.

4.1.3 Meteorological Data

The meteorological dataset applied to the model was recorded at Newcastle Airport in 2010 and 2011. The airport is located approximately 15 km to the north of the study site and is considered to be a good representation of the regional conditions at the study site.

The prevailing meteorological conditions are indicated by the wind rose in Figure 1 and 2, whereby the prevailing direction is from the west, with a strong south-westerly component in 2011, which is considered to be broadly typical for the study area and the UK as a whole. The prevailing wind direction will increase dispersions of atmospheric pollutants towards the east and north, resulting in slightly greater exposure at receptor locations to the north-east of the roads.

Figure 1: Newcastle Airport Windrose, 2010 and 2011



4.2 Traffic Flow Data

The traffic flow data used in the assessment was obtained from the Durham County Highways Department, and based on traffic count data recorded in 2011 on the B6313 Pelton Fell Road, to the west of the railway bridge (see Appendix A, Figure 2).

Traffic flow data was not available for North Approach, which meets the B6313 at a T-junction to the west of Menceforth Cottages and so a conservative value of 75% of the flow Pelton Fell was applied, which was considered to be conservative as this a relatively small road only providing access to the residential area.

Additional traffic flow counts recorded on Newcastle Road and Picktree Lane near the Chester-le-Street town centre were also obtained for subjective comparison purposes.

Table 3: Traffic Flow Data

Road	Direction	AADT	%HGV
Pelton Fell Road (Near Menceforth Cottages)	Eastbound	6321	6.4
	Westbound	6845	5.6
	2-way	13166	6.0
Newcastle Road (North of Chester-le-Street town centre)	Northbound	4099	10.9
	Southbound	4484	9.8
	2-way	8583	10.3
Picktree Lane (East of Chester-le-Street town centre)	Eastbound	6840	7.7
	Westbound	6416	7.8
	2-way	13257	7.7

4.3 Sensitive Receptor Locations

The annual mean concentration of NO_2 were predicted at five locations considered to be representative of relevant local exposure, as well as the monitoring location at the facade of the Menceforth Cottages. The assessed locations are shown in Table 4 and in Appendix A, Figure 2.

The modelled receptor locations are shown in Appendix A, Figure 3, alongside a plot of predicted annual mean NO_2 concentration, which was created using a 10m Cartesian grid

Table 4: Modelled Receptor Locations

ID	Location	OS Grid Coordinates		Type
		X	Y	
D23	Menceforth Cottages	426880	551720	Monitor / Residential
1	Glen Terrace	426466	551870	Residential
2	Furnace Farm	426473	551821	Residential
3	Viador	427165	551733	Residential
4	Twelfth Avenue	426827	551666	Residential
5	Maplewood	426650	551826	Residential

5 Assessment Results

5.1 Modelled Outputs

The AAQuIRE detailed dispersion model was used to assess the annual mean concentration of NO_2 at the sensitive receptor locations discussed in Section 4.3.

5.1.1 Model Verification

Modelling results are subject to systematic and random error; systematic error arises due to many factors, such as uncertainty in the traffic data and the composition of the vehicle fleet, and uncertainty in the meteorological dataset. Therefore, when using modelling techniques to predict concentrations it is necessary to make a comparison between the modelling results and the monitoring data to ensure that the model is reproducing actual observations. The accuracy of the modelling results are relative to the accuracy of the comparison results, therefore greater confidence can be placed in the overall predicted concentrations if good agreement is found for the base year.

The model results were compared with the passive monitoring undertaken at the Menceforth Cottages to determine a model adjustment factor of 3.2 using the 2010 model scenario using monitoring and meteorological data for the same year, and 3.7 using the 2011 model scenario and data.

An adjustment factor was calculated as follows:

$$NO_{X\ [\text{monitored, traffic contribution}]} = NO_{X\ [\text{monitored}]} – NO_{X\ [\text{background}]}$$
$$NO_{X\ [\text{modelled, traffic contribution}]} = NO_{X\ [\text{modelled}]} – NO_{X\ [\text{background}]}$$

$$\text{Adjustment Factor} = NO_{X\ [\text{monitored, traffic contribution}]} / NO_{X\ [\text{modelled, traffic contribution}}$$

The adjustment factor was subsequently applied to the modelled NO_X concentrations, and background NO_X added to give the adjusted NO_X concentrations ($NO_{X\ [\text{model adjusted}]}$):

$$NO_{X\ [\text{model adjusted, traffic contribution}]} = NO_{X\ [\text{modelled, traffic contribution}]} \text{ x Adjustment Factor}$$
$$NO_{X\ [\text{model adjusted}]} = NO_{X\ [\text{model adjusted, traffic contribution}]} + NO_{X\ [\text{background}]}$$

The adjusted NO_X concentrations were then converted to $NO_{2.}$ using version 2.1 of the 'NO_2 to NO_X' calculator provided by the Air Quality Archive and in accordance with the technical guidance, LAQM.TG(09).

The values used to determine the adjustment factor are shown in Table 5. However, as only one monitoring location was used for the adjustment it was not possible to determine any error values. Therefore, a subjective assessment of other local monitoring data has been undertaken and discussed in Section 5.1.2, below.

Table 5: Model Verification and Adjustment (all values in µg/m^3)

Site ID	Background NO_2	Monitored Conc			Modelled Conc		% NO_X Difference [(mod-mon)/mon]	Ratio of monitored road contribution NO_X/modelled road contribution NO_X
		Total NO_2	Road NO_X	Road NO_2	Total NO_2	Road NO_X		
2010 Model Year								
D23	21.6	43.9	56.9	22.3	29.6	18.1	-32%	3.15
2011 Model Year								
D23	21.6	39.1	41.6	17.5	26.8	11.2	-31%	3.69

5.1.2 Sensitive Receptor Locations

As discussed in Section 4.3, six residential properties near the study area were selected as sensitive receptor locations representative of relevant exposure. The concentrations predicted by the model are shown in Table 6.

The four locations further from the road, Receptors 2 to 5, were all predicted to be well below the annul mean objective in both 2010 and 2011.

Receptor D23, the monitoring location at the facade of Menceforth Cottages, was predicted to be slightly below the annual mean objective for the 2011 study year, and above the objective for the 2010 study year, in accordance with the concentrations used to verify the model.

The receptor location at G|en Terrace, Receptor 1, is located approximately 350 m to the west of Menceforth Cottages. This location is very similar to Menceforth Cottages in that it is at the facade of a row of properties facing onto the main road. The predicted annual mean concentration at G|en Terrace was over the annual mean objective in 2010 and nearly 50 $\mu g/m^3$ in 2011. The model predicted higher concentrations at Receptor 1 than at Receptor D23 due to the orientation of the road to the prevailing wind direction (Receptor 1 is downwind of the road, whereas Receptor D23 is upwind). It is considered likely that the model may have over predicted the concentration at Receptor 1, as the high values monitored at D23 (Menceforth Cottages) are related to the sheltering effects of the building, which may not be occurring to the same magnitude at G|en Terrace.

Table 6: Modelled Receptor Locations

ID	Location			Type	Monitored Concentration		Modelled NO_2 Concentration ($\mu g/m^3$)	
	Name	X	Y		2010	2011	2010	2011
D23	Menceforth Cottages	426880	551720	Monitor	**43.9**	39.1	**43.9**	39.1
1	Glen Terrace	426466	551870	Residential	-		**44.5**	**49.6**
2	Furnace Farm	426473	551821	Residential			29.7	29.6
3	Viador	427165	551733	Residential			30.4	32.1
4	Twelth Avenue	426827	551666	Residential			28.7	27.6
5	Maplewood	426650	551826	Residential			29.3	31.7

Note: Exceedences of the NO_2 annual mean objective are shown in bold

The NO_2 monitoring in Chester-le-Street town centre is discussed in Section 3.2, and the concentrations measured are generally lower than those recorded at Menceforth Cottages. However, the traffic flows in the town centre (as shown in Section 4.2) are very similar to those at the Cottages, and together with the likely slower average speeds and queuing in the town centre it is surprising that the measured concentrations at Menceforth cottages are higher. Therefore, this suggests that local conditions on the Pelton Fell Road may be a significant contributing factor to poor dispersion and elevated roadside pollutant concentrations, relative to the town centre.

5.1.3 Plotted Results

A plot of the predicted annual mean 2011 NO_2 concentration is provided in Appendix B, Figure 3. The extent of the area predicted to exceed the annual mean objective is highlighted in red.

The extent of the 40 $\mu g/m^3$ contour includes the facades of the Menceforth Cottages, as well as the properties at Glen Terrace. No other residential, or otherwise sensitive location, is within this extent.

The contour is predicted to extend beyond the boundary of the plot to the west, east and south. However, as discussed above, there is monitoring data from Chester-le-Street town centre, approximately 500m to the east of the Menceforth Cottages, where the roadside concentration was generally lower. This suggests that the elevated NO_2 concentration will be constrained within the valley section of the Pelton Fell Road.

The 40 $\mu g/m^3$ contour was predicted to extend south through North Approach. However, there are no properties sufficiently close the carriageway to be included within this extent, and so it is not considered that this is a significant concern.

6 Conclusions and Summary

The air quality monitoring at Menceforth Cottages, Chester-le-Street, has recorded concentration of NO_2 in excess of the annual mean objective consistently for several years.

Therefore, a Detailed Assessment has been undertaken using the AAQuIRE detailed dispersion model to predict the concentration of NO_2 at roadside and sensitive residential receptor locations near the Cottages.

The concentration of NO_2 predicted by the model was verified using the monitoring data recorded at Menceforth Cottages in 2010 and 2011. The data recorded since 2007 indicates and exceedence of the annual mean objective in this location, although the 2011 data was slightly lower than the objective. However, it is considered appropriate to declare the entirety of these properties as within a new AQMA.

The properties at Glen Terrace, approximately 350 m to the west of the Menceforth Cottages, are predicted to be exposed to an annual mean NO_2 concentration greater than that recorded at Menceforth Cottages. Given that it is not known why such elevated concentrations have been measured at Menceforth Cottages based on the traffic data and traffic conditions, it is uncertain as to whether the model has over predicted concentrations at Glen Terrace or not. Nevertheless, these properties will also be designated within the AQMA as a cautious approach, although monitoring using passive diffusion tubes will be undertaken in 2013 to confirm that this designation is appropriate.

The model results were also compared subjectively with the monitoring data recorded within Chester-le-Street town centre. Despite this area being relatively more congested, with slower moving traffic, the monitored roadside NO_2 concentrations are generally lower than those recorded at the Cottages. This suggests that the physical characteristics of the valley are contributing to the elevated concentration on NO_2, and it would not be appropriate to extend the AQMA any further than the section of road between, and including, Menceforth Cottages to Glen Terrace.

7 References

Air Quality Archive (2012) http://www.defra.gov.uk/environment/quality/air/air-quality/laqm/ accessed April 2012

Air Quality Framework Directive (96/62/EC).

COMEAP (1998). The Quantification of the Effects of Air Pollution on Health in the United Kingdom. HMSO, London.

Council Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air.

Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe.

Defra (2009a) Local Air Quality Management, Technical Guidance LAQM.TG (09)

Defra (2009b) Local Air Quality Management, Policy Guidance LAQM.PG(S) (09)

Defra (2010) The Air Quality Standards Regulations

Defra (2011) Trends in NO_X and NO_2 emissions and ambient measurements in the UK

Defra (2012) Update on Emissions Factors and LAQM Tools

Directive 2000/69/EC relating to limit values for benzene and carbon monoxide in ambient air.

Directive 2002/3/EC relating to ozone in ambient air.

Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.

Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.

Durham County Council (2009) Updating and Screening Assessment

Durham County Council (2011) Progress Report

Durham County Council (2012) Draft Updating and Screening Assessment

HMSO (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The Stationery Office (TSO) (1995) Part IV Environmental Act 1995

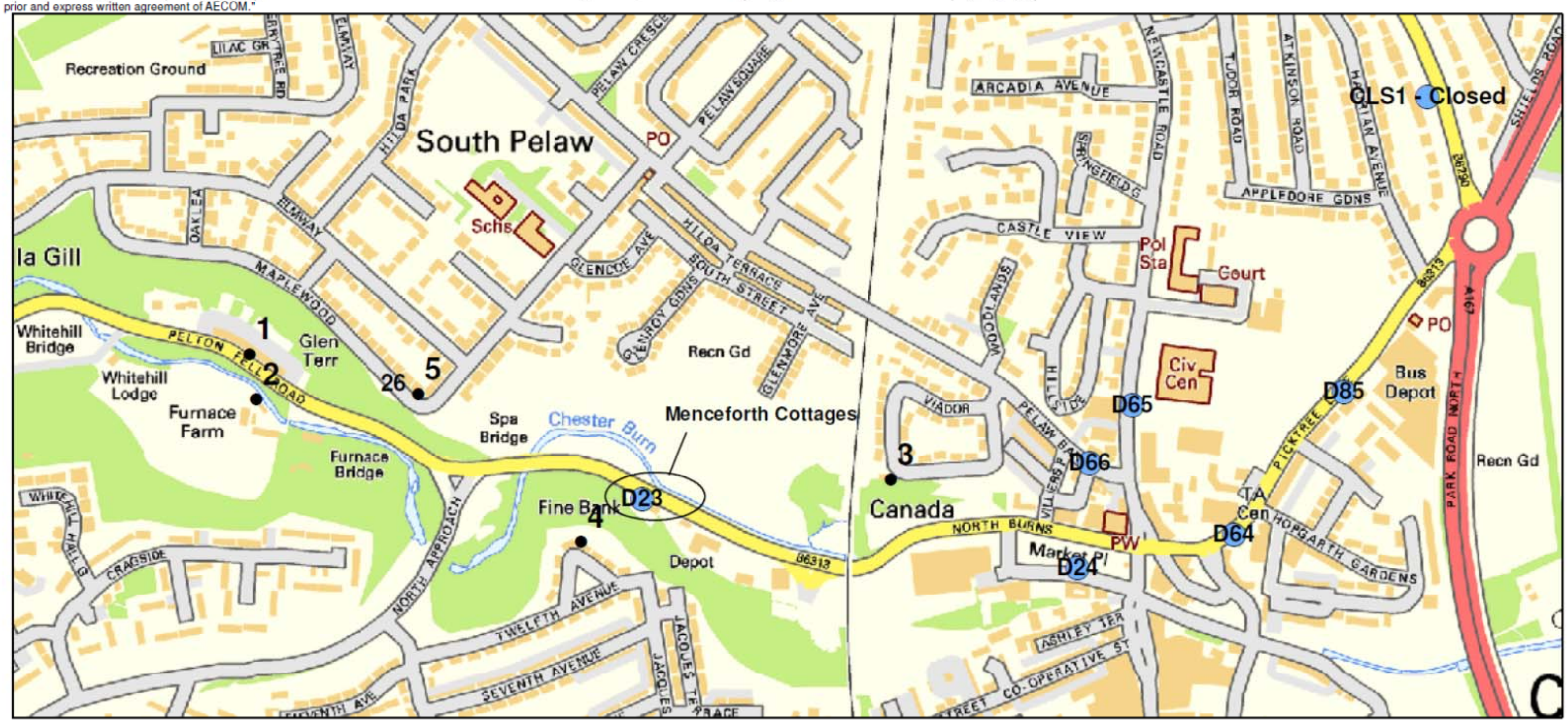
8 Appendices

Appendix A: Map of Study Area

Appendix B: Plotted Model Results

Appendix A: Map of Study Area

Figure 2: Locations of Local Air Quality Monitoring and Residential Properties



● DCC Monitoring Locations

● Modelled Receptor Locations (Location 3 east of plotted area)

Note: D24 Closed end of March 2012

D85 Installed April 2012

0 65 130 260 390 520

Meters

N

W E

S

Project	LAQM				
Title	Menceforth Cottages Detailed Air Quality Assessment				
Client	Durham County Council				
Scale	See Scale Bar	Drawn by	DCU	Rev.	
Date	May 2012	Chk'd by	TAS	1	

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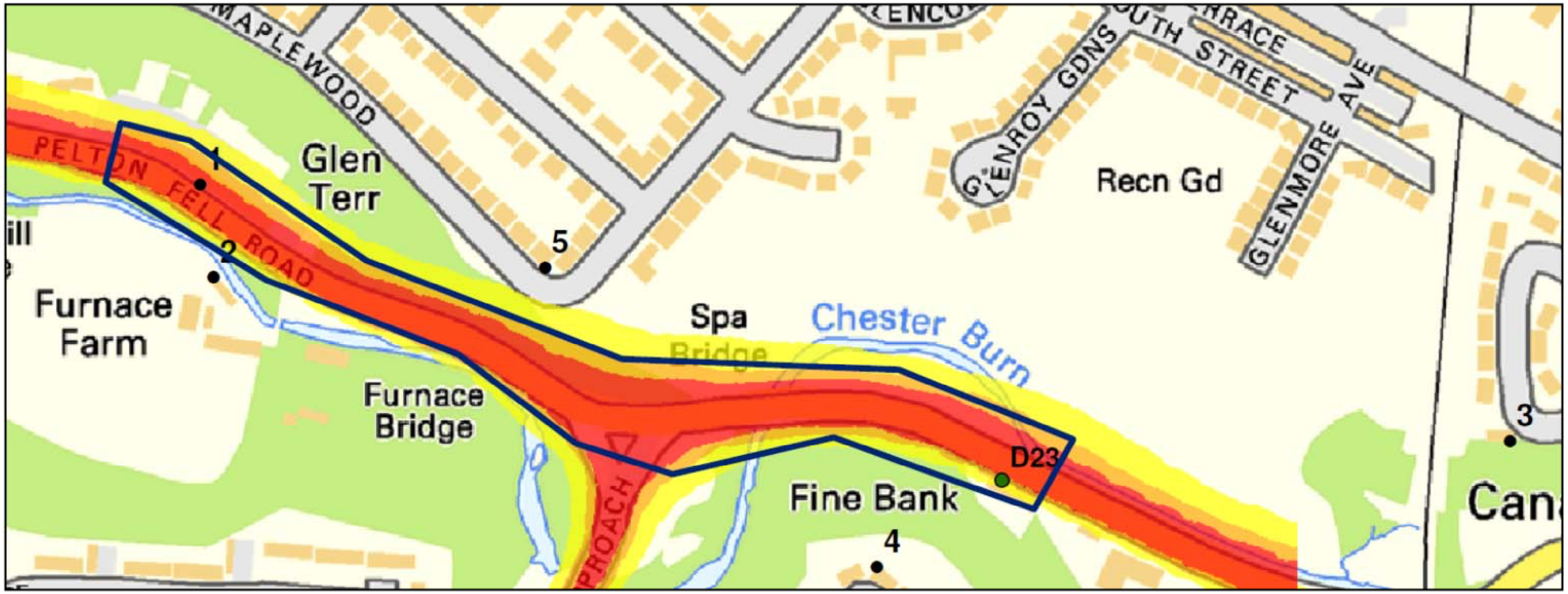
Appendix B: Plotted Model Results

Figure 3: Modelled Annual Mean NO_2 Concentration, 2010



2010 Annual Mean NO_2, ug/m^3

- ☐ < 36
- 🟨 36 - 40
- 🟧 40 - 44
- 🟥 > 44
- ● DCC Monitoring Locations
- ● Modelled Receptor Locations (Location 3 outside plotted area)
- ╲ Extent of proposed AQMA

0 30 60 120 180 240

Meters

N
W E
S

Project	LAQM				
Title	Menceforth Cottages Detailed Air Quality Assessment				
Client	Durham County Council				
Scale	See Scale Bar	Drawn by	DCU	Rev.	
Date	May 2012	Chk'd by	TAS	1	

AECOM