11.0 AIR QUALITY

11.1 Introduction and Methodology

11.1.1 Road traffic represents one of the many sources of air pollutants and is classified as a mobile line pollution source. Other contributions include industrial processes, domestic activities, aviation, rail transportation and natural atmospheric reactions.

11.1.2 The environmental effects to which vehicle emissions contribute are predominately associated with the release of carbon monoxide (CO), nitrogen oxides (NO_x), hydrocarbons and particulates (PM_{10}). Historically, lead has also been a concern, but since the introduction of unleaded fuel and with continuing improvements in engineering technology, road emissions and lead have been substantially reduced. Vehicular emissions also contribute negligibly to overall sulphur dioxide (SO_2) levels.

11.1.3 The Environment Act 1995 bought about a fundamental change in the approach to air pollution by introducing the concept of Local Air Quality Management (AQMA). The duties of the local authorities under this act are to monitor and review air quality in their district.

11.1.4 The UK-Air Quality Standards (UK-AQS) define pollution concentration levels that minimise risk to health. The UK-AQS Objectives are policy targets and have been set with regard to what is realistically achievable within the timescale specified. It should be noted that the approach adopted by the strategy is to apply the objectives where members of the public, in no-occupational capacity and at locations close to ground level, are likely to be exposed over time. The UK-AQS objectives are summarised in Table 1, at the end of this chapter.

11.2 Baseline Conditions

11.2.1 Due to a smoke control programme that was introduced in the late 1950s, levels of smoke and sulphur dioxide have reduced since this time and vehicle emissions represent the most significant source of pollution in Wolverhampton, with NO_2 and particulates PM_{10} being the pollutants most likely to give cause for concern. Wolverhampton City Council (WCC) completed their first review and assessment of air quality in 2001. and although these pollutants were present (NO_2 and PM_{10}) the report concluded that there was no current exceedence of the air quality objectives in Wolverhampton.

11.2.2 Since the initial review, WCC network of monitoring stations has expanded and a subsequent updated screening and assessment exercise was completed in 2003. This identified 3 potential 'hot spot' areas, with the air quality in Lichfield Street, Wolverhampton above the Government Air Quality Objectives of 40 ug/m^3 for No_2 and $PM_{10.}$ In response to this WCC has declared the whole of the city, which encompass Bilston, as an Air Quality Management Area (AQMA). The extent of the AQMA is shown in figure 11.0 and air quality 'receptor' locations for the Bilston area shown on figure 11.1.

11.2.3 The air quality receptors for Bilston show the NO_2 levels fall within the Government Air Quality limit of 40 µg/m^3. The diffusion tube site on Prosser Street, which is the closest survey point to the BUV site shows a 2004 average of 28 and a predicted 2005 level of 27 µg/m^3. The exception is on Lichfield Street, Bilston with an average daytime NO_2 (µg/m^3) level of 46, with predicted levels falling to 43 by 2005. This is above the Government Target level for Air Quality.

11.2.4 To predict the air quality for the opening year, the Design Manual for Roads and Bridges (DMRB) Volume 11 Screening Method has been followed. In accordance with these standards an assessment has been made of the approximate number of households (i.e. individual residential properties) within a 200m radius of the new highways or junctions that may be adversely affected by changes in air quality. Results of this analysis are shown in figure 11.2 and Table 2. The figures in this Table relate exclusively to residential properties, in view of the fact that receptors are potentially present at these locations 24 hours of the day, 7 days a week (unlike commercial and industrial properties, medical and educational establishments and places of worship, which are more likely to be in use during normal working hours only). In addition, the numbers using these latter property uses are difficult to estimate as accurately.

Table 2 Approximate Number of Households (i.e. Individual residential properties) within 200m of Proposed Highway Improvements

Highway Improvements	0m-50m	50m-100m	100m-150m	150m-200m
A. BCR/Oxford St Roundabout (M)	0	2	10	44
B. Northcott Rd/Highfield Rd Junction (P)	3	5	14	45
C. Dudley St/Highfield Rd Junction (M)	7	14	53	40
D. Highfield Rd/BUV Road Roundabout (P)	0	31	51	37
E. Cosley Rd/BUV Road Roundabout (P)	0	45*	75*	90*
F. BCR/Dudley St Signals (M)	0	8	6	7
G. BCR/Bankfield Rd Signals (M)	0	0	8	40
H. Vulcan/Loxdale	0	0	0	4
I. BUV Central Spine Road between Dudley St.Bankfield Road (P)	6*	17*	29*	41*
J. BUV Central Spine Road to Highfield Rd (P)	6*	17*	29*	41*

*estimated based on 1 property per 333m^2
(P)-Proposed new junctions/highway
(M)-Modified junctions/highways

11.3 Assessments of Impacts

Impacts during Construction

11.3.1 The main pollutants during construction are likely to be dust and particle matter generated during earth moving and demolition operations (particularly during the summer). Demolition and construction activities have the potential to produce airborne dust and may cause annoyance to occupiers of land and properties in the locality of the works. Generally dust particles (particles less than 30µm in diameter) will deposit to ground within 100-200m from its source. On the Bilston site boundary there are residential properties at Carder Crescent, Broadmoor Road and Prosser Street that are within this zone.

11.3.2 However, the impacts are not judged to be significant due to their temporary nature and the potential for their avoidance/reduction is possible by employing 'best practice' construction methods. These include:-

- During hot weather maintain a damp surface by water spraying internal haul roads
- Minimise vehicle speeds on the site

- Providing wheel wash facilities
- Enclosing or covering containers to prevent escape of dust and waste materials
- Control and regulation of activities during dry or windy weather
- Ensure plant and engines are switched off when not in use.

Operational Impacts

11.3.3 Road traffic has been identified as the main pollutant in Wolverhampton and any significant impact on air quality will be from this source of pollutant.

11.3.4 Due to the uncertainty in traffic forecasting and the size of traffic flow change needed to affect air quality, receptors adjacent to links with less than 10% traffic change are not considered to be affected (Transport Analysis Guidance-webtag Unit 3.3.3).

11.3.6 A Traffic Impact Assessment (TIA) report completed by Waterman Burrow Crocker in September 2005 predicted that the percentage increase in traffic flow for arms that do not lead into the site in the 2014 opening year (ignoring possible rerouting effects) would be below the 10% threshold, except for at:

- Ladymoor Road/Highfield Road/Broad Lane junction (17% AM peak hour, 16% PM peak hour)

11.3.7 The proposed road layout for the Bilston Urban Village (BUV) is a result of both the shape of the existing site and a framework for the development proposals. The dominant route through the site will be the central spine road which will run from a new junction on Coseley Road, in the West, to access the BCR/Oxford Road Roundabout, in the east. Additional roads will connect with the spine road from either modified or new junctions on the existing highway boundary.

11.3.8 A total of 7 highway access points both new and existing are proposed on the BUV site. These locations have been identified as most likely to see an impact due to traffic flow and are summarised in Table 3 and indicated on Figure 11.3.

11.3.09 Impacts on Existing Junctions

11.3.10 Currently the existing highway network suffers from congestion during the am and pm peaks on the A463 BCR at the Oxford Street roundabout and the A463 BCR Coseley Road roundabout. BUV inbound and outbound traffic flows will increase traffic flow at these junctions.

- The predicted increase in flows at the Coseley Road junction will be within the 10% threshold and will be controlled by new traffic measures that will improve efficiency at this junction, and therefore may lead to improvements in air quality. The number of households within 200m of this junction is low and the number of receptors exposed to traffic related pollution in this area would also be low.

- Lichfield Street (which is served by the northern arm on the A463/Oxford Street roundabout) already suffers from air quality levels above Government recommendations. Traffic is likely to increase slightly at this junction as a result of the BUV but this increase will be below the 10% threshold and air quality is unlikely to deteriorate further.

11.3.11 The results of the TIA predicts that off-site highway works would result in an overall improvement in the operation of the existing highway network. Also properties located on the BCR are primary retail or industrial units and are not considered to be as highly sensitive to the effects of air quality. Measures include:-

- The proposed stopping up of Dudley Street will significantly reduce congestion at the BCR/Dudley Street junction and improvements in air quality should occur at this location.

- As part of the Dudley Street stopping up process, Dudley Street traffic flow will be diverted to Bankfield Road. In the short term this will increase flow at the BCR/Bankfield Road junction. This junction currently suffers from queuing problems during the PM peak flow. However the proposed signalisation of this junction will improve the junction capacity, reducing queue lengths which should improve air quality.

11.3.12 The impact of changes in air quality is most likely to effect those receptors that live within 50 metres of the road network, where opportunities for pollution dispersal is limited. The number of residential properties (and hence the number of potential receptors) that fall within this zone on the existing routes that are most likely to experience increases in traffic movements from the BUV is very small and considered to be of only slight significance.

11.3.13 Impact on the proposed BUV

11.3.14 The most densely populated area in the vicinity of the proposals, and therefore of most concern, are those new properties that will be served by the Central Spine Road, which runs east to west, through the development. However there are proposed measures for this spine road to discourage it from forming a 'rat –run'. These include traffic management measures, an improved and frequent public

transport system, and a safe and pleasant footway/cycleway network which will run through the site. Also the mixed residential and employment uses proposed on the site should provide opportunities for residents to live close to their work place. These traffic management and public transport measures, together with the green corridor that runs adjacent to the central spine road and properties being located away from any potential congestion should result in a very low number of receptors sensitive to air quality.

11.4. Predicted Concentrations for Air Quality

11.4.1 The DMRB provides a simple to use spreadsheet for assessing the effects of road traffic on air quality. It produces conservative results which quantify the impact that new roads, vehicle numbers or traffic speeds can have on air quality. It is intended that if the results show that air quality limits may be exceeded, or an incremental increase is significant, then a detailed air quality assessment should be carried out.

11.4.2 The DMRB method requires the following data is necessary:-

- Year for assessment- this has been based on the base year (2004) and the opening year (2014)
- Receptor locations- these locations are taken where members of the public will be exposed to the pollution over appropriate time scales. The distance has been assessed at locations where the impact of the scheme is expected to be greatest due to changes in traffic conditions, i.e. boundary junctions.
- Road Network- road included in the calculations are those expected to make a significant contribution to pollution at the receptor locations. The selection of the road has been based on predicted traffic flows from the development and number of receptors affected.
- Road Type- The BCR is classified as Category A (All Motorways and 'A' Roads). All other routes have been classified as Category B (Urban Roads which are neither Motorway nor 'A' roads).
- Traffic data and annual average speed- This has information has been taken from assessment completed in Waterman Burrow Crocker's, Traffic Impact Assessment dated October 2005.

11.4.3 Based on the proposed layout and predicted increase in traffic movements, a number of key receptor sites were identified and used as locations for predictions of NO_2 concentrations. The results are summarised in Table 3 and figure 11.3, and indicate that air quality will improve at all key receptors by 2014 and meet Government target levels of 40 µg/m^3.

Table 3: Predicted Annual Mean NO_2 Concentrations (µg/m^3) at a minimum 10m distance from Carriageway

		Annual Mean NO_2 Concentrations (µg/m^3)			
Receptor No.	**Location**	**2004**	**2014 Without development**	**2014 With development**	**Change between 2004 and opening year**
A	BCR/Oxford St Roundabout	43.5	30.83	30.16	-13.34
B	Northcott Rd/Highfield Rd Junction	33.84	25.99	26.05	-7.79
C	Dudley St/Highfield Rd Junction	35.10	26.73	26.78	-8.32
D	Highfield Rd/BUV Road Roundabout	30.63	24.10	24.11	-6.52
E	Cosley Rd/BUV Road Roundabout	30.22	23.85	23.86	-6.36
F	BCR/Dudley St Signals	33.18	25.50	25.56	-7.62
G	BCR/Bankfield Rd Signals	30.52	24.01	24.03	-6.49
H	Vulcan/Loxdale	30.43	23.96	23.97	-6.45
I	BUV Central Spine Road between Dudley St.Bankfield Road	n/a	n/a	25.52	n/a
J	J. BUV Central Spine Road to Highfield Rd	n/a	n/a	24.65	n/a

( )- Measured No_2 Concentrates

11.4.5 The results show that the 2014 with development traffic will have a slight negative effect on air quality compared with the predicted 2014 without development results. However compared with the 2004 base year conditions there is a significant improvement and government targets will be achieved. These improvements are due to junction improvements which will lead to less congestion, future improvements in motor engine efficiency and the use of clean fuels. Also the predicted increase in traffic (due to the BUV) on existing routes will not contribute to more than 10% additional flow.

11.4.6 The Department for Environment Food and Rural Affairs (DEFRA)

Technical Guidance Note TG(03) states that where annual average NO_2 level would be achieved, so also would the short term objective which allows 18 exceedences per year of an hourly average concentration of 200 ug/m^3.

11.5 Mitigation Proposal

11.5.1 The scope for mitigation of any adverse effect on air quality through route choice or design is limited in comparison with reductions in the emission rates achievable through improved vehicle technology. However, mitigation measures will include:

- Use of ‘best practice’ measures during the construction stage e.g. dust control strategies, pre-planning regarding timing and working methods for earthworks
- The implementation of speed limits that will encourage traffic to travel at speeds that minimise the levels of vehicular emissions (providing that road safety standards are not breached)
- Junction improvements and sequencing of traffic signals to facilitate efficient traffic movements and minimise waiting times.

11.6 Statement of Effects

11.6.1 Road proposals as part of a major development are often perceived as having a negative effect on air quality. However, on balance, considering all peak periods across the whole study area, the proposed off-site highway works will result in an overall improvement in the operation of the existing highway network on and around the BUV. This will result in improved traffic flows which will relieve congestion, resulting in improved operation of vehicles that will produce less emissions and reduce overall vehicle pollution levels.

11.6.2 The transport related benefits of the BUV proposals will further reduce local dependency on the car. This includes particular emphasis on improving local bus services and providing safe and secure pedestrian and cycle links both within the site and connecting to the central area of Bilston and the nearby public transport interchange. There exists the further possibility of providing a dedicated Metro station for BUV thus providing for longer distance travel to complement existing rail services. These measures will further encourage a lesser dependency on the car.

11.6.3 Finally, the mixed residential and employment uses proposed on the site will help to minimise car-borne trips on the adjacent highway network by providing the opportunity for employees to live close to their place of work. In addition, the new local community and retail facilities to be provided to serve the new residential dwellings will further help to minimise car-borne trips.

11.6.4 Predictions of NO_2 concentrations show that it is likely that the introduction of the scheme will result in Government National Air Quality Objective level of 40ug/m^3 being met in the opening year.

TABLE 1: NATIONAL AIR QUALITY OBJECTIVES

Pollutant	Objective	Measured as	To be achieved by
Benzene	16.25µg/m^3	Running annual mean	31 December 2003
	5.00µg/m^3	Annual mean	31 December 2010
1,3 - Butadiene	2.25µg/m^3	Running annual mean	31 December 2003
Carbon Monoxide	10.0mg/m^3 (10ppm)	Running 8 hour mean	31 December 2003
Lead	0.5µg/m^3 0.25µg/m^3	Annual mean Annual mean	31 December 2005 31 December 2008
Nitrogen Dioxide	200µg/m^3 (105ppb) Not to be exceeded more than 18 times a year.	1 hour mean	31 December 2005
	40µg/m^3 (21ppb)	Annual mean	31 December 2005
Particles (PM_{10})	50µg/m^3 Not to be exceeded more than 35 times a year.	24 hour mean	31 December 2004
	40µg/m^3	Annual mean	31 December 2004
Sulphur Dioxide	266µg/m^3 (100ppb) Mean not to be exceeded more than 35 times a year	15 minute	31 December 2004
	350µg/m^3 (132ppb) Not to be exceeded more than 24 times a year	1 hour mean	31 December 2004
	125µg/m^3 (47ppb) Not to be exceeded more than 3 times a year	24 hour mean	31 December 2005