



# Air Quality Action Plan for Worthing Air Quality Management Area No.2

Prepared by Worthing Borough Council

In fulfilment of Part IV of the Environment Act 1995  
Local Air Quality Management  
November 2015

## Executive Summary

Part IV of the Environment Act 1995 requires local authorities that have designated an Air Quality Management Area (AQMA) to complete an Air Quality Management Plan detailing how air quality will be improved.

In 2010, Grove Lodge (A27 Upper Brighton Road) was declared an AQMA as levels of Nitrogen Dioxide (NO<sub>2</sub>) above the national annual mean objective of 40µg/m<sup>3</sup> were measured in the area. At that stage, a draft Air Quality Action Plan was drawn-up.

Additional monitoring showed that levels at Lyons Farm and Grove Lodge remained above the national annual mean objective. A Further Assessment of air quality in and around the Grove Lodge AQMA confirmed that levels of NO<sub>2</sub> were predicted to continue to exceed the objective in the area around Lyons Farm, Grove Lodge (A27) and Offington Corner (A27/A24 junction). Consequently, following a period of consultation, the AQMA was extended and the 'Worthing Borough Council Air Quality Management Area No.2' came into force on 15th December 2014.

Emissions associated with road traffic are the main source of pollution in the AQMA. Traffic counts show that the majority of movements through the AQMA are by cars, with a smaller proportion by heavy goods vehicles (HGVs) and light goods vehicles (LGVs). Emissions of NO<sub>x</sub> from HGVs and LGVs are, however, significantly higher than those from cars.

Furthermore, these types of vehicle are fuelled by diesel, as are a large proportion of cars (nationally around 50%). The amount of NO<sub>x</sub> emitted by diesel is significantly higher than that from petrol, consequently some of the actions target diesel emissions.

This Action Plan sets out measures devised to try to deliver improvements to air quality by reducing pollution emitted from vehicles and the amount of traffic passing through the AQMA. Being a strategic route linking Kent with Hampshire, this will be a challenging task.

The Plan includes actions specifically targeted at Lyons Farm, Grove Lodge and Offington Corner and measures that will affect the Borough as a whole. Actions have been grouped into five categories:

- Traffic Management and Infrastructure;
- Vehicle Fleet Efficiency;
- Policy Guidance, Development Control and Transport Planning;
- Supporting and Encouraging Sustainable Travel Alternatives (alternatives to private vehicle use);
- Public Information.

Actions under 'Traffic Management and Infrastructure' will involve Highways England, (the A27 is a trunk road under their jurisdiction) and West Sussex County Council who are responsible for the roads feeding onto the A27. Actions include re-assessing traffic light sequencing in the AQMA, A27 highway improvements, safe cycling and walking routes along/around the A27/A24 and 'cut engine, cut pollution'

signs. Worthing Borough Council also wishes to undertake a feasibility study into establishing a Low Emission Zone on the A27.

Other, indirect actions will target reducing emissions from various sources across the Borough that contribute to background pollution levels within the AQMA. These will also help to reduce pollution across the Borough. Feasible options include:

- An HGV/LGV assessment of local fleet operators and possible Eco Stars accreditation for local fleet operators;
- Effective Planning policies, including use of the 'Air Quality Emissions Mitigation Planning Guidance for Sussex';
- Promotion of electric vehicles and associated infrastructure improvements;
- Development of a Worthing Car Club;
- Encouraging alternative transport modes including car share schemes, public transport and alternatives to private cars;
- Development and promotion of school and work travel plans;
- Education and raising awareness – including health and wellbeing promotion;
- Increasing the availability of air quality information and incentivising people to change their travel behaviour.

These will be implemented by either Worthing Borough Council and/or West Sussex County Council, with the help of partner organisations and the public. In some cases implementation has already commenced.

The Action Plan involves a long term programme of implementation, with progress reported through an annual review as part of the Local Air Quality Management process.

## Contents

1. Introduction .....	5
2. Description of the AQMA .....	7
3. Air Quality in the Grove Lodge AQMA .....	9
4. What is the Source of the Pollution? .....	13
5. Required Air Quality Improvements and Conclusions from Monitoring Data .....	18
6. Relevant Air Quality Strategies and Policies.....	18
7. Action Plan Options .....	25
8. Consultation Responses .....	32
9. Next Steps .....	32

## Appendices

- A. Action Plan Matrix
- B. Glossary of Abbreviations
- C. DfT Traffic counts: Annual Average Daily Traffic (AADT) Flow by Vehicle Class (2014) near to Grove Lodge
- D. Original list of measures considered
- E. Consultation Responses
- F. Fall-off calculations for nitrogen dioxide (with distance from the road) for Diffusion tube sites within the AQMA

## **1. Introduction**

### **1.1 Purpose of the Air Quality Action Plan**

The purpose of the Air Quality Action Plan (AQAP) is to outline what may be done to try to reduce nitrogen dioxide (NO<sub>2</sub>) pollution concentrations within the Worthing Air Quality Management Area No.2. This document has been produced by the Environmental Protection Team at Worthing Borough Council, in conjunction with the Sussex Air Quality Partnership, West Sussex County Council (WSCC) and Highways England. The action plan has been prepared in accordance with the Council's Local Air Quality Management obligations under the Environment Act, 1995.

Whilst the Council cannot significantly affect air quality at a macro level, its actions, priorities and leadership can make a difference to local residents and businesses and thereby air quality. It can access funds, lobby for investment and influence others to work towards cost-effective outcomes; use its own land and estate in ways that encourage 'green' and healthier behaviour and signal to the local community about the sort of activity that it wants to encourage through investment, leadership and publicity.

### **1.2 Review and Assessment of Air Quality**

Part IV of the Environment Act 1995 requires local authorities to review and assess air quality on a regular basis. Pollution levels within the local authority area are assessed against air quality objectives which are prescribed in both European and national legislation for the protection of human health and the environment.

Government Policy has changed significantly since the Environment Act was introduced and it is important that local policy is consistent with the bigger picture and in line with existing and emerging national policy. At the time of writing, the situation is fluid with the Government reviewing the air quality regime and a European Union (EU) judgement against the Government with regard to failure to deliver the National Air Quality Objective for NO<sub>2</sub>.

It would appear that the Government intends to trim local authorities' reporting requirements under the regime. As such, despite there being a risk that a more radical overhaul of the regime remains possible, significant change seems unlikely and monitoring and reporting will still be required.

The EU court passed judgement earlier this year with regard to the UK's non-compliance with the NO<sub>2</sub> objective. This matter relates to certain regions within the UK being non-compliant with the EU air quality directive standard for NO<sub>2</sub>. In response, the Government has stated it intends to set out air quality action plans detailing plans for compliance in the regions.

Worthing falls within both the Brighton-Worthing-Littlehampton Agglomeration Zone (UK0010) and the South East non-agglomeration zone (UK0031). Through the actions laid out in this document, Worthing Borough Council seeks to do all that it can to support compliance in these zones at the earliest possible time.

Worthing Borough Council is required to monitor air quality in the area and provide the results to Government. Passive NO<sub>2</sub> diffusion tubes are placed around the

Borough, in particular in areas where it is believed there could be higher levels of pollutants, due, for example, to traffic congestion.

An automatic continuous monitoring site has also been in place at Grove Lodge since 2007 (moved in 2012). This station consists of a NO<sub>x</sub> chemiluminescent analyser situated in a street cabinet by the roadside. This takes measurements every 15 minutes, enabling the data to be related to events such as traffic flow and meteorology. All automatic monitoring data is captured by King's College London (ERG) and validated against site operator's calibration results.

Where monitoring suggests that the air quality objectives are not likely to be met, the local authority is required to designate an AQMA at the relevant locations. The local authority must then draw up an Action Plan setting out the measures it intends to take in an attempt to comply with the air quality objectives within the area covered by the AQMA.

The first AQMA (Worthing Air Quality Management Area no.1) was declared in 2011 around the Grove Lodge roundabout on the A27. As a result of the exceedances at Lyons Farm and following a Detailed Assessment (2013), the AQMA was expanded in 2014 to cover the newly identified areas of exceedance for NO<sub>2</sub>. The new AQMA (Worthing Air Quality Management Area no.2) came into force in December 2014.

This Action Plan sets out the actions intended to try and reduce levels of NO<sub>2</sub> in the area.

Results of nitrogen dioxide monitoring and our reports can be found at:  
<http://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/air-quality-monitoring/>

### **1.3 Air Quality and Public Health**

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) set out a framework to achieve cleaner air to protect human health and the environment. The strategy sets a series of standards and objectives for a range of air pollutants based on associated health effects, based on recommendations made by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO). The 'standards' are pollutant concentrations below which adverse health effects are unlikely, even in sensitive groups within the population. The 'objectives' are the target dates by which the 'standards' must not be exceeded.

The air quality objectives are only applicable where members of the public are likely to be present and different standards are set depending on the length of public exposure. For long term exposure to sensitive receptors, such as residential properties, hospitals, schools etc., the objective for NO<sub>2</sub> is based on an annual mean. For short term exposure where the public are likely to be present for an hour or more, the objective is based on hourly averaging periods.

The human lung has the internal surface-area of a tennis court and the air we breathe is in contact with that surface-area of our body. At relatively high concentrations, NO<sub>2</sub> acts as an irritant causing inflammation of the airways and by affecting the immune cells in the lungs, can increase susceptibility to respiratory infections. However, concentrations of NO<sub>2</sub> in ambient (outdoor) air are generally

much lower than those associated with such effects. There is a growing body of evidence for the impact of air pollution on our health, with Public Health England (PHE) suggesting that particulate matter is a contributory factor in 5% of deaths in the Worthing Borough area and 29,000 deaths nationally (Estimating Local Mortality Burdens Associated with Particulate Air Pollution, Public Health England, April 2014).

Evidence suggests that ambient concentrations of NO<sub>2</sub> can increase the sensitivity of asthmatics to allergens, therefore increasing the likelihood of asthma attacks. Longer term exposure to NO<sub>2</sub> can increase the likelihood of respiratory illnesses in children (Committee on the Medical Effects of Air Pollutants, 2011). A recent study estimated 5,900 deaths in London were associated with long term exposure to NO<sub>2</sub> (Understanding Health Impacts of Air Pollution in London, KCL 2015).

In relation to public health and the National Planning Policy Framework (NPPF), air quality is an important consideration to be weighted through the development management process.

## **2. Description of the AQMA**

Figure 1 shows the extent of the AQMA. It is located just over 2km to the north of Worthing town centre. It is largely linear and follows the A27 between Offington Corner and Lyons Farm. The road between Grove Lodge and Offington Corner is the A24 and A27 combined.

The designated area incorporates the eastern end of Crockhurst Hill from the eastern boundary of Durrington Cemetery, towards Offington Corner Roundabout, Offington Corner Roundabout, Warren Road, 1-3 Warren Farm Place, 1 Links Road, Hill Barn Lane, 17 Mansfield Court on Sanditon Way, Grove Lodge Roundabout, Grove Lodge, 1-2 Grove Lodge Cottages, 22-27 Lamorna Grove, Upper Brighton Road leading onto the Sompting Bypass, up to and including the Downlands Retail Centre, and Lyons Way (Figure 1).

The A27 through the AQMA is a single carriageway trunk road. The area is residential on both sides of the carriageway. Residential properties are located a distance from the carriageway, in most cases over 10 metres. There are however, a few residential properties closer to the carriageway - Grove Lodge Cottages and flats at Downlands Parade Lyons Farm lie four and five metres respectively from the carriageway. Lyons Farm is an out-of-town retail development with a large supermarket, DIY store and other retail establishments. To the rear of the retail park is light industry and a football ground.

To the north of the residential properties lie the South Downs and to the south residential properties. Worthing College is immediately adjacent to the north of Grove Lodge roundabout.

Vehicular traffic is the major source of air pollution in this area. Highways England is responsible for the A27, with all feeder roads and the A24 falling under the jurisdiction of West Sussex County Council.



Figure 1: Worthing Air Quality Management Area No.1





### 3. Air Quality in the Grove Lodge AQMA

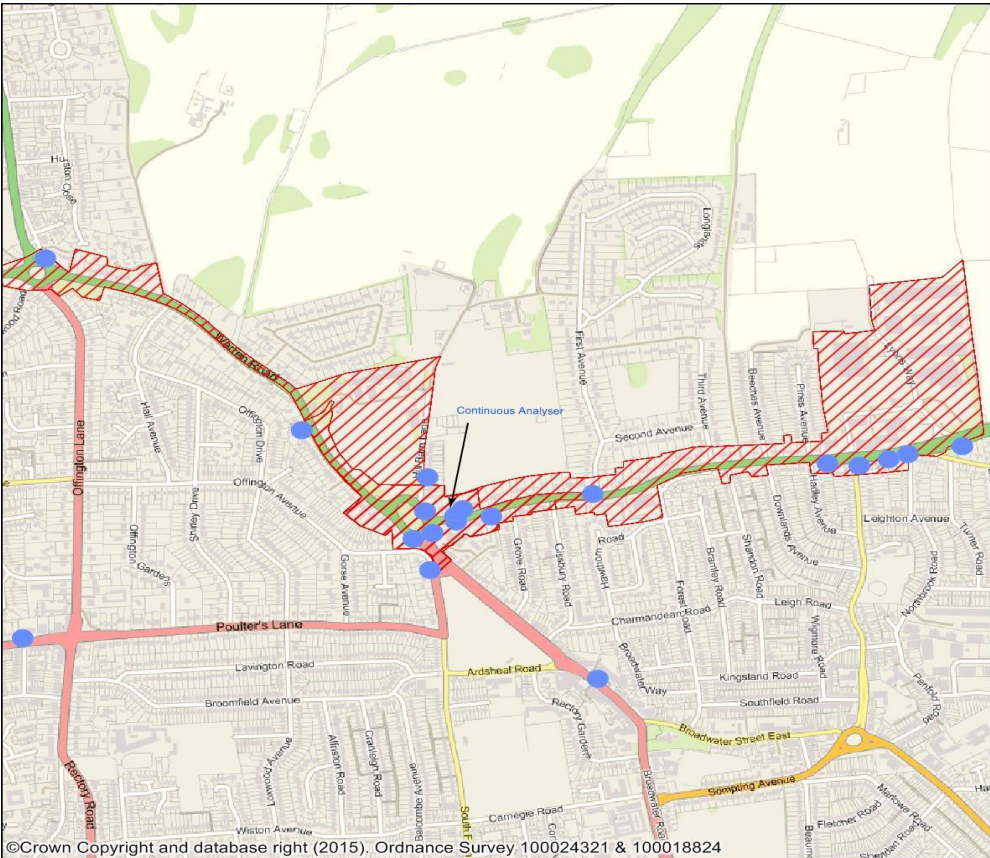
A Detailed Assessment for the area was produced for the Council by Sussex-air in 2013. This found that the exceedances were likely to continue beyond 2013. The report summarised monitoring and modelling data for the area and concluded that the existing AQMA centered on Grove Lodge should be expanded to cover Lyons Farm and Offington Corner. This was on the basis that monitoring and modelling confirmed that levels of NO<sub>2</sub> are predicted to continue to exceed the annual average Air Quality Objective of 40ug/m<sup>3</sup> around the Grove Lodge roundabout, Lyons Farm and Offington Corner on the A27. There were no exceedances of the other measures for NO<sub>2</sub>.

Worthing Borough Council Air Quality Management Area No.2 came into effect on 15 December 2014.

The elevated levels of NO<sub>2</sub> are predominantly a result of the volume and slow moving nature of traffic along the A27. There are several sets of traffic lights at Lyons Farm, where Sompting Road and the retail park access roads join the A27. There are also traffic lights around the Grove Lodge roundabout where the A24 joins the A27. Access to Worthing College also stems from this roundabout.

The location of diffusion tubes and the continuous analyser within and around the AQMA are shown in Figure 2.

**Figure 2: Locations of Continuous Analyser and NO<sub>2</sub> Diffusion Tubes within the AQMA**



Monitoring data for the AQMA (2014) show that the annual average mean objective for NO<sub>2</sub> was being exceeded at five locations, with continuous monitoring data suggesting levels were well in excess of the objective for 2014 of 40µg/m<sup>3</sup>. When projected to sensitive receptor, most results are below the objective. Grove Lodge Cottages, however are above the objective with a façade level of 67.3µg/m<sup>3</sup>.

**Table 1: Monitoring data for sites within the AQMA, 2014 (all diffusion tubes except WT2)**

Site reference	Location	2014 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ )	Façade concentrations (predicted where appropriate) ( $\mu\text{g}/\text{m}^3$ )
Continuous Analyser (A27) [WT2]	Roadside	51	N/A
(UK6) 6N Gainsborough Avenue	Roadside	37.7	27.8
N18A Kinnall Court Upr Brighton Road	Facade	24.5	24.5
N24 152 Upr Brighton Rd House	Facade	25.9	25.9
N25 Warren Ct House	Facade	22.8	22.8
N30A Grove Lodge Cottages	Roadside	<b>73.9</b>	<b><u>67.3</u></b>
N32 Lamppost corner of Upr Brighton Rd/Sompting Rd	Roadside	32.3	26.5
N29 Downlands Parade	Façade	<b>41.6</b>	<b>41.8*</b>
N33 Downlands Parade	Façade	<b>42.8</b>	
N34 Downlands Parade	Facade	<b>41.0</b>	
N35 30 Upr Brighton Road house	Facade	31.3	31.3
N36 Corner of Hillbarn Lane	Roadside	<b>40.3</b>	31.1
N39 SW of Grove Lodge Roundabout	Roadside	33.8	22.5
N41 Down pipe on Lamorna Grove Flats	Facade	27.2	27.2
N43 - 23 Upr Brighton Rd, House	Facade	24.5	24.5

Site reference	Location	2014 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ )	Façade concentrations (predicted where appropriate) ( $\mu\text{g}/\text{m}^3$ )
N44 A New NO <sub>2</sub> analyser, 21 Upr Brighton Rd	Roadside	<b>43.5</b>	30.1*
N44 B New NO <sub>2</sub> analyser, 21 Upr Brighton Rd	Roadside	<b>43.2</b>	
N44 C New NO <sub>2</sub> analyser, 21 Upper Brighton Rd	Roadside	<b>43.0</b>	
N45 11 Hill Barn Lane	Facade	19.0	19.0
N46 junction South Farm Rd/Offington Ave	Roadside	25.2	21.8
N53 Offington Corner	Roadside	<u>33.5</u> (7 months only)	25.7

\* The average of three tubes

In **bold**, exceedance of the NO<sub>2</sub> annual mean AQS objective of  $40\mu\text{g}/\text{m}^3$

In *italics*, 'borderline' (within  $4\mu\text{g}/\text{m}^3$  of the objective)

Underlined, annual mean  $> 60\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the NO<sub>2</sub> hourly mean AQS objective

## 4. What is the source of the Pollution?

4.1 Vehicular traffic is the main source of pollutant emissions at Grove Lodge/Lyons Farm. It is therefore imperative to have accurate traffic information regarding volume, speed and the type of vehicles using the local road network.

The Department for Transport (DfT) periodically undertake traffic counts in the Grove Lodge area and record total (combined) traffic volumes and different vehicle categories.

Sussex-air carried out a further assessment for Worthing Borough Council in 2013, based on 2010 traffic data. This found that in 2010 the Grove Lodge AQMA and the surrounding road network had an Annual Average Daily Traffic (AADT) flow of around 25,500 (DfT) vehicle movements.

Table 2 shows the annual average daily traffic (AADT) flow, broken down by vehicle class that passed through the Grove Lodge roundabout in 2010. Figures for 2014 show a broadly similar pattern with an increase in LGV's and small decreases in cars and HGV's (see Appendix D).

**Table 2. Annual Average Daily Traffic (AADT) Flow by Vehicle Class (2010) at Grove Lodge (Sussex-air)**

Road	Mcycl e	Car	LGV	Bus	RHG V 2X	RHG V 3X	RHG V 4+X	AH GV 3or 4X	AH GV 5X	AH GV 6+X
A2032	137	15331	1920	78	273	34	13	5	7	4
A2031	52	8460	1476	36	320	13	24	2	5	9
A24 North	167	19732	2440	140	304	18	49	26	21	20
A24 South	200	21130	2654	221	178	25	20	28	24	14
A24/A27	293	28782	3216	103	687	162	67	54	82	350
A27 South	473	34329	5627	132	825	123	81	79	173	155
A27 North	175	21563	4468	89	566	108	80	51	80	156

**Key:**  
 MCYCLE - motorcycles  
 CAR - cars, small vans  
 TAXI - taxis  
 LGV - light goods vehicles (medium to large vans)  
 BUS - buses and coaches  
 RHGV - rigid heavy good vehicles (2-4+ axles)  
 AHGV - articulated heavy good vehicles (3-6+ axles)

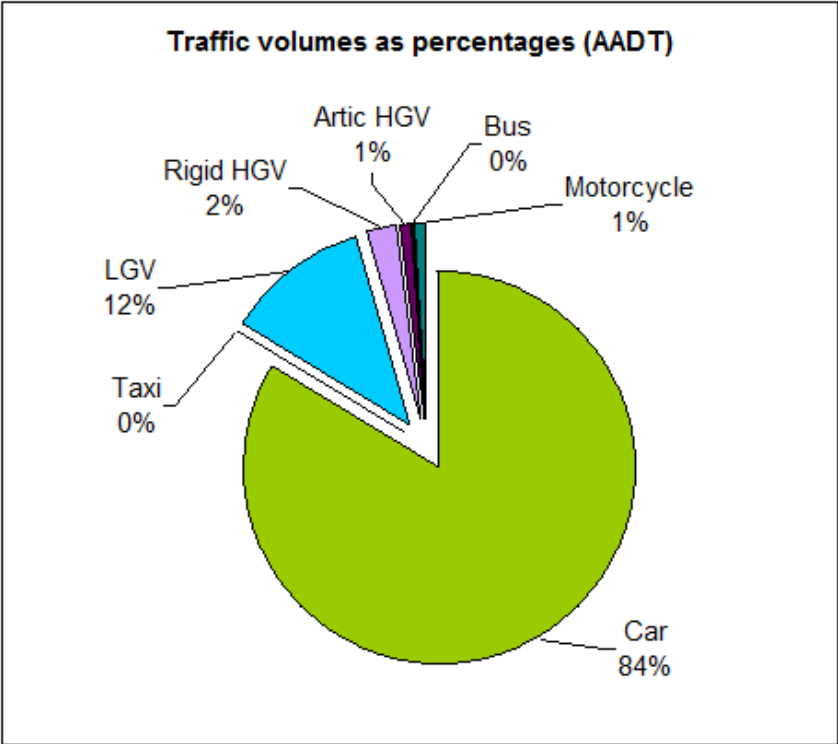
## 4.2 Percentage of traffic passing through Grove Lodge

The proportion of each vehicle category as an average percentage of total traffic flows for all vehicle movements across the intersection is illustrated in Figures 3a and

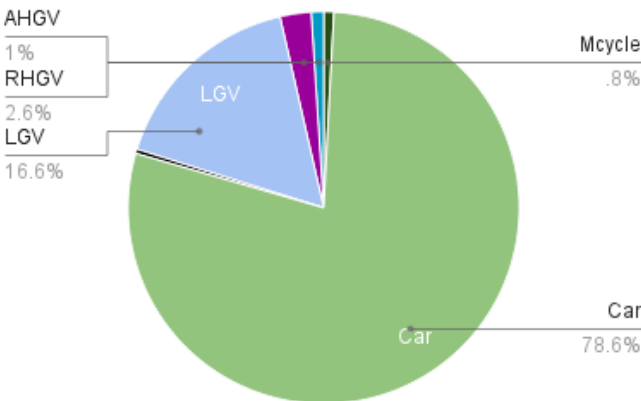
b. This shows the average for all roads at Grove Lodge and the surrounding road network.

For both 2010 and 2014 the majority of traffic movements were by cars, followed by LGVs (vans) and rigid HGVs (note 0% indicates a total less than 1%).

**Figure 3a: Percentage of vehicle types at Grove Lodge, Worthing (2010)**



**Figure3b: Percentage of vehicle types at Grove Lodge, Worthing (2014)**





### 4.3 Source apportionment

Modelling of air quality by Sussex-air provided information on the concentrations of pollutants to which people and the local environment are exposed. In addition, the modelling determined the proportion of emissions from various sources, known as 'source apportionment'.

Source apportionment provides information on what emissions are coming from which types of vehicles and can assist in targeting actions within the Action Plan. The primary emission source for NO<sub>2</sub> is oxides of nitrogen (NOx) from vehicle exhausts.

Cars are the predominant emitter of NOx (48%) at this location and made up 84% of the total traffic at this location (based on 2010 data). Although a smaller proportion of traffic movements were by HGV's, LGV's and buses, their relative emissions of NOx are significantly higher:

- HGV proportion of NOx emissions = 30%;
- Bus proportion of NOx emissions = 5%;
- LGV proportion of NOx emissions = 16%.

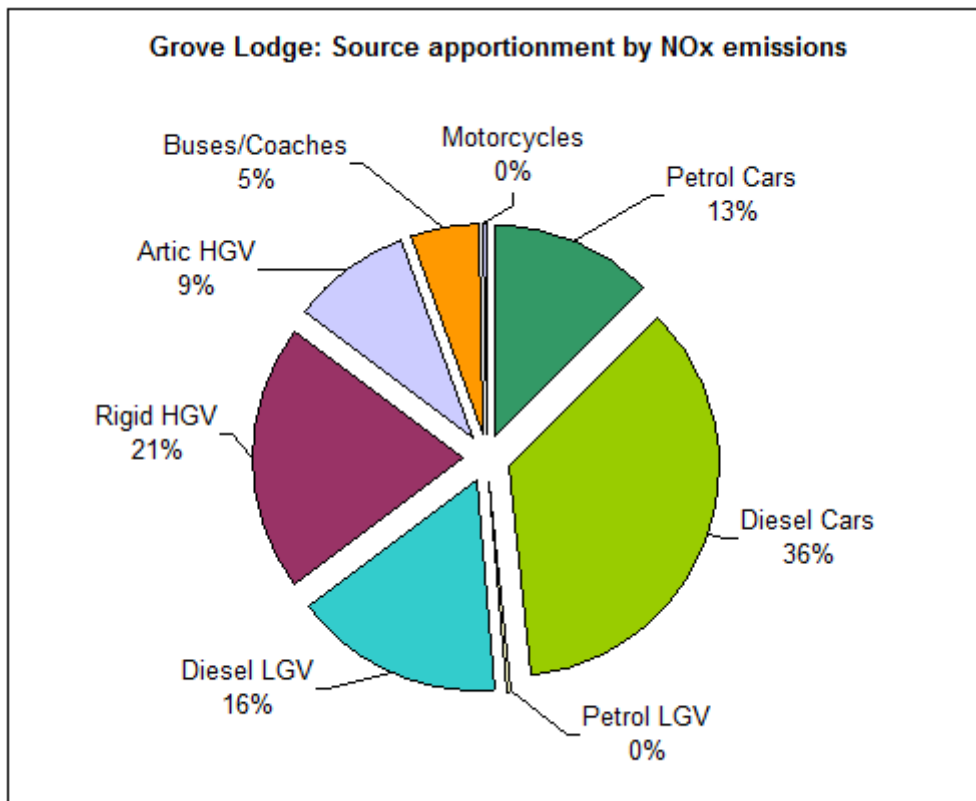
It should be noted that all these vehicle types are fuelled by diesel. In addition, a large proportion of cars (nationally at least 50%) are diesel powered. The amount of NOx emitted by diesel vehicles is significantly greater than that from petrol vehicles.

Table 3 and Figure 4 shows the contribution of each vehicle class to the total annual average NOx emissions in 2010.

**Table 3. Annual traffic flow and average annual NOx emission in 2010**

Vehicle type	AADT %	Emission NOx (tonne/year)	%
Car	84%	16310.2	48%
LGV	12%	5574.6	16%
Rigid HGV	2%	6948.4	21%
Mcycle	1%	60.6	0%
Artic HGV	1%	3115.4	9%
Bus	0%	1805.9	5%
Total		33815.1	

**Figure 4. Road Traffic NOx Emissions by Vehicle Class in 2010**



#### 4.4 Sources of nitrogen dioxide (NO<sub>2</sub>) contribution

Table 4 presents the estimated proportion of “modelled” NO<sub>2</sub> concentration contribution from the various source sectors at the facade of Grove Lodge Cottages. This is based on modelled concentration values (which takes NOx concentrations and converts them to NO<sub>2</sub>).

**Table 4. Estimated “modelled” NO<sub>2</sub> concentrations as source contributions in 2010 (at Grove Lodge Cottages) and AADT**

Source	Modelled NO <sub>2</sub> Conc. (µg/m <sup>3</sup> )	Conc. %	AADT %
Car	15.7	30%	84%
LGV	5.4	10%	12%
Rigid HGV	6.7	13%	2%
Mcycle	0.1	0%	1%
Artic HGV	3.0	6%	1%
Bus	1.7	3%	0.5%
Background	32.5	63%	-
<b>Total</b>	<b>51.7µg/m<sup>3</sup></b>		

Estimated concentrations at the worst case (monitored) location, using Table 4's NO<sub>2</sub> contribution ratio, are presented in Table 5, below.

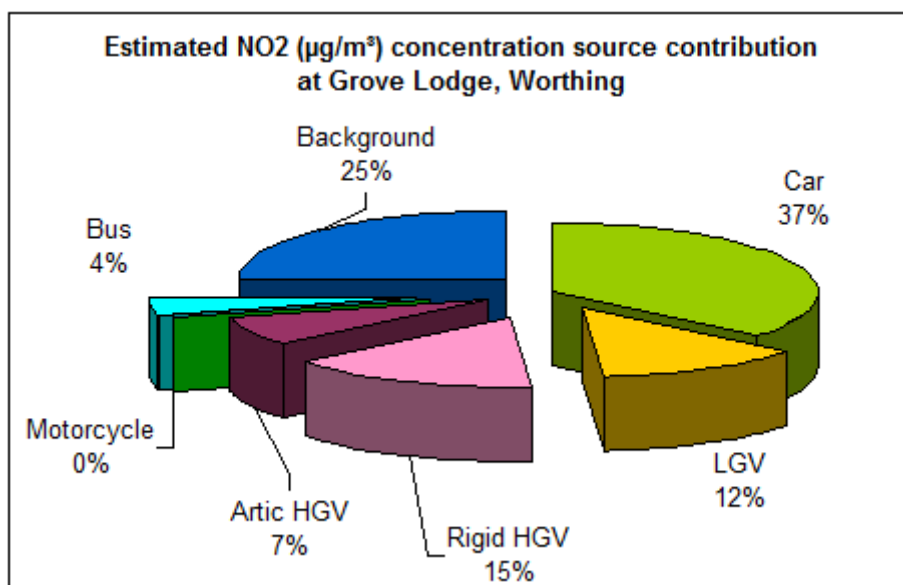
**Table 5. Estimated NO<sub>2</sub> concentrations as source contributions in 2010 (at N30A Grove Lodge Cottages) and AADT**

Source	Measured proportion conc. (µg/m <sup>3</sup> )	Conc. %	AADT %
Car	27.6	36%	84%
LGV	9.4	12%	12%
Rigid HGV	11.8	15%	2%
Mcycle	0.1	0%	1%
Artic HGV	5.3	7%	1%
Bus	3.1	4%	0.5%
Background	19.2	25%	-
<b>Total</b>	<b>76.5µg/m<sup>3</sup></b>		

This demonstrates:

- background NO<sub>2</sub> accounts for an estimated 25% of NO<sub>2</sub> concentrations;
- cars account for 36% of the (estimated) NO<sub>2</sub>;
- LGV's are contributing 12% of the (estimated) NO<sub>2</sub>;
- HGV's (rigid and articulated) contribute 22% of the (estimated) NO<sub>2</sub>.

**Figure 5. Estimated NO<sub>2</sub> concentrations as source contributions in 2010 (at N30A Grove Lodge Cottages)**



## 5. Required Air Quality Improvements & Conclusions from monitoring data

The worst case façade level within the AQMA is at Grove Lodge Cottages -  $67\mu\text{g}/\text{m}^3$ . At Lyons Farm the worst façade level is at Downlands Parade -  $42\mu\text{g}/\text{m}^3$ . It would therefore seem sensible to use these levels as a baseline from which to target improvements in this action plan.

### 5.1 Action Planning

It was hoped that modelling results would be available to illustrate the changes in traffic required in order to achieve compliance with the national objective of  $40\mu\text{g}/\text{m}^3$ . At the time of publishing however, these results were not available and have therefore been included as an action within the action plan. It can be stated with some certainty that since the level at Grove Lodge Cottages is substantially higher than the annual mean objective, only a significant reduction in either vehicle emissions or the volume of traffic will result in the annual mean objective being met.

## 6. Relevant Strategies and Policies

There are a number of local, regional and national plans and strategies that are relevant to air quality action planning and these may contribute to improvements in air quality across Worthing. The following paragraphs aim to explain how they dovetail with this Air Quality Action Plan.

### 6.1 National Draft Air Quality Plans

The Government has, at the time of writing, published draft plans which set out actions being planned or implemented at local, regional and national levels to meet the annual and hourly EU limit values for  $\text{NO}_2$  in the shortest possible time.

Worthing falls within the South East Zone and the Brighton-Worthing-Littlehampton Agglomeration Zone. The plans detail  $\text{NO}_2$  exceedances within the zones and include details of local air quality measures that have been implemented, will be implemented or are being considered for implementation within these zones.

Worthing Borough Council responded to a request from Defra earlier this year for action plan information. The information was submitted following consultation with our colleagues at West Sussex County Council and Highways England. The information essentially confirmed the action plan points listed later in this document.

The Draft National Action Plans can be viewed at: <http://uk-air.defra.gov.uk/library/no2ten/>.

In addition emissions testing is currently being questioned in light of the recent VW emissions scandal and real world emissions testing is being considered. The emissions performance of vehicles on the road is worse than laboratory emissions tests and it is these lab test factors that have been used to predict air quality impacts in the past. So any changes to emissions testing will have an impact on predicted future compliance with the national objectives.

## 6.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in 2012. It sets out the Government's planning policies and how they are to be applied.

Sustainable transport forms a key part of the NPPF. In particular, paragraph 30 encourages solutions that support reductions in greenhouse gases and reduce congestion and encourages Local Planning Authorities to “*support a pattern of development which, where reasonable to do so, facilitates the use of sustainable modes of transport*”.

Paragraph 32 requires developments that generate significant amounts of movement to be accompanied by a Transport Statement or Transport Assessment. Decisions should take account of whether the proposals include satisfactory sustainable transport opportunities as well as determining whether cost effective improvements can be provided as part of the development in order to limit its impact on the transport network.

Plans and decisions should ensure that developments that generate significant movement are located where the need to travel will be minimised (i.e. in the most sustainable locations) and that use of sustainable transport modes can be maximised. This includes ensuring that vital infrastructure such as schools and shops are in a reasonable walking distance, for example.

## 6.3 Worthing Local Development Framework

The Local Development Framework (LDF) is a portfolio of documents which together aim to guide development within Worthing. Collectively these documents set out the Council's planning policies for meeting the community's economic, environmental and social needs where this affects the development and use of land.

The Worthing Core Strategy was adopted in April 2011 and is the key document in the Local Development Framework, setting out the overall vision and strategy for place-making and providing context for all subsequent Local Development Documents.

The Strategy includes seven Strategic Objectives which provide a concise expression of the priorities for the Local Development Framework. Two of these directly impact upon air quality:

Strategic Objective 1: Protect the Natural Environment and Address Climate Change.

Strategic Objective 7: Improve Accessibility. One of the key outcomes is that local air quality is improved.

In addition Policy 19, Sustainable Travel, also impacts.

Due to national changes to the planning system, a full review of the Council's adopted Core Strategy and the development of a new Local Plan is now underway. The Local Plan will cover Worthing Borough excluding the area within the South

Downs National Park. This presents a further opportunity to respond to the current air quality issues.

#### **6.4 The A27 Feasibility Study**

The A27 corridor feasibility study was one of six studies undertaken by the DfT to assess problems and identify potential solutions to tackle some of the most notorious and longstanding road ‘hot spots’ in the country. The aim of the study was to identify the opportunities and understand the case for future investment solutions on the A27 corridor, particularly at Arundel and Worthing, which are deliverable, affordable and offer value for money. In terms of geographic scope, the study considered the A27, from its junction with the M27 in the west (between Cosham and Portsmouth), and its junction with the A259 at Pevensey in the east.

The study concluded that *“there is a variety of short and long distance trips along the route, but few travelling end- to end along the A27. The towns and cities attract additional traffic during the morning and evening peak hours and there are also seasonal increases in traffic. So, our aim is to address congestion at key hotspots, the delays for road users, separation of communities – notably in Arundel, Worthing and Lancing – air pollution, and an above average number of accidents.”*

The Government announced investment along the A27 worth around £350 million as part of the Road Investment Strategy in December 2014. This includes the A27 in Worthing -

- *Worthing and Lancing improvements - improvements to the capacity of the road and junctions along the stretch of single carriageway in Worthing and narrow lane dual carriageway in Lancing. The extent and scale of the improvements, including the option of full dualling, are to be agreed in consultation with West Sussex County Council and the public.*
- *Development of sustainable transport measures at Arundel, Worthing, Lancing and East of Lewes.*

It was established that the proposals in the investment package will require further work, engagement and consultation in order to reach agreement on the specific details of the proposals. Delivery will require the successful completion of the necessary statutory planning process and the continued development of business cases and demonstration of value for money. It is vital that Worthing Borough Council feeds into this process.

#### **6.5 The West Sussex County Council Local Transport Plan (LTP 2011-2026)**

West Sussex County Council is a key partner in the delivery of the Action Plan. Their Local Transport Plan sets the strategy for guiding future investment in West Sussex highways and transport infrastructure and sets a framework for considering transport infrastructure requirements associated with future development across the county.

The long term strategy most relevant to air quality is outlined in the following:



Section 1.2.4: Improving Safety, Health & Security – providing a transport network that feels, and is, safer and healthier to use.

- To reduce the negative impacts of transport on public health;
- To encourage and enable physically active travel such as walking and cycling through behaviour change initiatives and provision of information and education.

### **Reduce the negative impacts of transport on public health**

The transport network can affect public health by contributing to poor air quality and noise issues and by affecting travel behaviour which can lead to inactivity and obesity. The County Council has pledged to reduce the negative impacts of transport on public health by:

- Implementing actions in the AQAPs for new, and existing, AQMAs at Shoreham, Chichester, Worthing, and Storrington;
- Providing information for air quality monitoring and forecasting;
- Encouraging healthy travel behaviour through school travel, healthy schools and other behaviour change initiatives such as School Travel Planning and Travelwise;
- Including new infrastructure in an Infrastructure Plan which encourages and promotes healthy behaviour such as walking and cycling.

### **Encourage and enable physically active travel through behaviour change initiatives**

Where transport infrastructure is in place, there are a range of behaviour change activities and initiatives which have been shown to increase its use. The County Council will continue to do this by:

- Using school travel planning to coordinate a range of behaviour change activities, skills training and investment priorities to encourage physically active travel behaviour in young people;
- Introducing or supporting innovative behaviour change initiatives such as Bikeit and Easit where there are clear benefits and funding is available;
- Promoting walking and cycling through school and workplace travel plans and through promotion of national events such as walk to school events, walking buses, bike week and Travelwise week.

The strategy includes implementation plans for each of the District and Borough Councils in West Sussex. The plan for Worthing emphasises the need to ensure that all new schemes and development contribute and support in some way the following:

- Increasing use of sustainable modes of transport;
- Improving network efficiency in order to reduce emissions and delays;
- Improving safety for all road users;
- Reducing the impact of HGVs on the local community, but in such a way that will support the local economy;

- Reducing the need to travel.

The key issues identified include:

- Due to the geography and density of the developed area, physical improvements to the highway network, which require space outside the existing highway boundary, are challenging to deliver;
- Road congestion during peak periods affects many parts of the highway network throughout the Borough, disrupting journey times and causing poor air quality. Particular problems are on main routes into the town centre (A259 and A24) and along the A27, where the lack of safe crossing points causes community severance between High Salvington and Findon Valley;
- Level crossings on the West Coastway contribute to the levels of congestion, especially during peak periods, disrupting journey times and increasing traffic pollution;
- In order to avoid congestion and maintain journey times HGVs are diverting onto unsuitable residential roads causing concerns over safety;
- Increased transport movements within the Borough are detrimentally affecting air quality, particularly at the AQMA on the A27 and at other sites where NO<sub>2</sub> levels are close to being exceeded;
- The current provision of pedestrian and cycling facilities across the town are unable to support and maintain sustainable travel. Much of the network is disjointed and suffers from inadequate signage, too few crossing points and poor surfacing.

The main aims identified for Worthing which are relevant to this Action Plan, are:

- All new development should be designed to promote 'local living', for example shops, jobs and homes all being within easy reach of each other;
- All new development should provide secure cycle parking to meet the needs of the development and be within close proximity to public transport;
- Parking provision at new residential developments should provide enough spaces to accommodate the expected number of vehicles at the site or provide measures such as car clubs, which reduce the number of vehicles to match the space available. Working with Highways England and other partners to develop and deliver a package of major improvements to the A27 at Worthing and Lancing to reduce congestion, improve safety and community cohesion;
- Making the best use of the existing road network, using intelligent transport systems and improving public transport to improve the way the network is managed and reduce congestion;
- Working with Network Rail and our rail operators to investigate ways that will reduce the delays caused by level crossings;
- Working with rail partners to improve access to stations and integration with other modes of transport, particularly through the Southern station travel plan process for Worthing Station;
- With the rail industry, explore opportunities to provide faster services and additional modern capacity along the West Coastway which retain a suitable balance of stopping services along the route;
- Encouraging HGVs to use the advisory lorry route network while maintaining access to areas which businesses need to access;

- Continuing to manage existing AQMA's by developing and implementing AQAP's jointly with Worthing Borough Council and Highways England (A27), while managing traffic and development pressures to avoid declaration of further AQMAs. Reduce emissions of NO<sub>2</sub>, other air pollutants and greenhouse gases, by providing electric vehicle recharging points in partnership with Worthing Borough Council and parking providers;
- Encouraging sustainable travel by improving the existing cycle and pedestrian network through improved signage, connecting routes where appropriate and repairing and maintaining surfaces;
- Improving pedestrian accessibility throughout the Borough by enhancing existing pedestrian crossings, and providing new pedestrian crossing facilities at identified key locations;
- Promoting sustainable transport choices through projects such as Safer Routes to School;
- Developing and implementing schemes which contribute to the completion of the Worthing cycle network, particularly routes along the seafront;
- Develop park and ride sites if suitable locations can be identified which offer good value for money and fit with the Borough Council's parking strategy for the town. Increase public transport capacity and quality, particularly on key north-south and east-west arterial routes. Improve the comfort of public transport, and also improve its image through provision of information and marketing.

The full plan can be accessed through this link:

<https://www.westsussex.gov.uk/about-the-council/strategies-plans-and-policies/roads-and-travel-plans-and-policies/transport-plan/>

## 6.6 South Downs National Park

The AQMA shares a boundary with the South Downs National Park. The National Park Authority has published a draft local plan for comment. Chapter 10 specifically refers to air quality and Development Management Policy SD58 relates to Air Quality. The parts of the policy that impact on our AQAP are:

*“2. Development proposals that by virtue of their location, nature or scale could impact on an AQMA will be required to:*

*a) Have regard to any relevant AQAP and to seek improvements in air quality through implementation of measures in the AQAP; and (b) Provide mitigation measures where the development and/or associated traffic would adversely affect any declared AQMA.*

*3. Development proposals that comply with other relevant policies, will be permitted where they:*

*a) Provide mitigation measures where the development and/or its associated traffic could lead to a declaration of a new or extended AQMA, (b) Ensure that the development will not have a negative impact on the surrounding area in terms of its effect on health, the natural environment or general amenity, taking into account cumulative impacts, (c) Promote opportunities for walking, cycling and public transport and congestion management to reduce traffic levels in areas of reduced air quality, particularly in town or village centre locations, and promote the opportunity for cycling through the provision of cycleways, and (d) Secure best practice methods*

*to reduce levels of dust and other pollutants arising from the construction of development and/or from the use of the completed development.”*

## **6.7 Adur & Worthing Public Health Plan**

This Air Quality Action Plan is embedded within the Adur & Worthing Public Health Plan and strengthens the links between poor air quality and its effect on health and wellbeing. Air Quality is included in the list of priorities within the plan:

Priority 2: Create and develop healthy and sustainable places and communities

- *Reduce the negative impact of air pollution on health by developing and delivering our Air Quality Action Plans to reduce traffic,*
- *promote alternatives to conventional motor vehicles and improve air quality;*

Outcomes (related to air quality) - What will reduce?

- Traffic congestion;
- Hospital admissions as a result of poor air quality;
- Cardiovascular and respiratory related hospital admissions

Priority 3: Strengthen the role and impact of ill-health prevention

- *Monitor air pollutants to ensure local air quality is improving and not causing ill health.*

## 7. Action Plan Options

This chapter details the various options considered to improve air quality in the Air Quality Management Area (AQMA).

The Air Quality Action Plan (AQAP) must reflect the changing local environmental and economic conditions alongside national conditions. New developments will nearly always add to the number of cars on the local road network and whilst we are not anti-car, we must seek to encourage and enable growth in alternatives to conventional fossil fuelled vehicles whilst balancing this with economic growth. A focus on increased walking and cycling is required, bringing associated health benefits. With the UK Government having recently been found to be in breach of EU legislation and regional air quality action plans being drawn-up, we have attempted to make our plan as broad as possible to allow for possible changes to the regime.

The causes of the air quality exceedances in the AQMA have been attributed solely to road traffic. No significant contributions from industrial or point sources were identified within the District. The options investigated therefore focus on targeting traffic levels and emissions.

The Council has considered the overall sustainability of each available option in order to assess not only its ability to alleviate air pollution problems, but also its potential economic and social impact. In particular direct and indirect effects, either negative or positive, have been assessed in order to quantify the likely costs associated with each option.

The reduction in traffic volume required to achieve the annual mean objective for NO<sub>2</sub> is unlikely to be met without significant and controversial changes to the A27. The policies and programmes set out in the preceding chapter will not deliver sufficient reductions in emissions from road traffic to meet the objectives for air quality improvements. The Council is obliged to consider all possible measures and options available to further improve local air quality. Some of these will be specific to the AQMA others will be for the wider area, including Borough and County-wide measures.

It should be noted that neighbouring Local Authorities also have AQMA's and associated Action Plans. These can indirectly affect the Worthing AQMA (for example Storrington in Horsham District and Shoreham-by-Sea in Adur District).

Action plan options have been divided into a number of broad categories:

- A. Traffic Management & Infrastructure;
- B. Vehicle Fleet Efficiency;
- C. Policy Guidance, Development Control and Transport Planning;
- D. Supporting and Encouraging Sustainable Travel Alternatives (Alternatives to private vehicle use);
- E. Public Information & Education.

These are discussed in more detail in the following paragraphs and summarised in Appendix 3. The likely contribution to air quality improvements has been estimated in percentage terms in Appendix 3. Modelling which should provide more detail on the

likely impact of most proposed measures was not available at the time of writing and has therefore been included as an action plan measure.

Actions can be further separated into direct and indirect actions. Direct actions are those specifically targeting the AQMA. These consist almost entirely of actions within the Traffic Management & Infrastructure category.

Indirect actions are those that are likely to benefit both the AQMA and the wider geographic area of Worthing (and in some cases Adur). The air within the AQMA is a result of road traffic emissions and background pollution concentrations. The source apportionment work shows that background concentrations are responsible for about 25% of the NO<sub>x</sub> in the area. Indirect actions will target reducing emissions from various sources that make up background pollution levels across the whole Borough. They should also help within the AQMA, but their focus is on the wider geographical area of Worthing and West Sussex.

Indirect actions to improve air quality have been categorised into:

- Vehicle Fleet Efficiency;
- Policy Guidance, Development Control and Transport Planning ;
- Supporting and Encouraging Sustainable Travel Alternatives/Alternatives to private vehicle use;
- Public Information & Education.

Highways England is responsible for the A27 and West Sussex County Council (WSSCC) is responsible for the A24 and the roads that join the A27. Successful delivery of the actions in this plan, particularly the direct ones, will therefore depend on partnership working between both Authorities. Worthing Borough Council will have responsibility for delivering some of the indirect actions, especially those in relation to planning. Partnership working with other Sussex authorities will also be required to ensure a more joined-up approach to the delivery of actions, in particular those relating to strategic planning and infrastructure (e.g. bus and rail routes).

Source apportionment showed that HGV's and LGV's, whilst making up a small proportion of the traffic through the AQMA, contribute a significant amount to the NO<sub>x</sub> and NO<sub>2</sub> emissions in the area. These vehicle types use diesel as their source of fuel. In addition a large proportion of cars are diesel powered - the amount of NO<sub>x</sub> emitted by diesel cars is significantly higher than that emitted by petrol cars.

Many actions will therefore have a focus on diesel vehicles and particularly, but not exclusively, HGV's and LGV's.

It should be noted that many of the listed measures may have already been implemented, be on-going or require further development.

It is also important to note that the actions depend on sufficient funding being available to enable delivery. This applies at local, County and National level.



## **A. Traffic Management & Infrastructure (Direct Actions)**

- I. A27 Highway Improvements
- II. Re-assess traffic light sequencing in AQMA
- III. Cut Engine, Cut Pollution Signs
- IV. LEZ Feasibility
- V. Safe cycling and walking routes along/around the A27/A24

### ***I. A27 Highway Improvements***

Improving the highway is probably the action that will produce the single biggest improvement to air quality in the AQMA. Slow moving traffic is the main cause of poor air quality so any changes to the A27 resulting in improvements to the flow of traffic will result in improving the air quality. Highways England is responsible for any changes to the A27. As mentioned in Chapter 7, the DfT has recently undertaken a feasibility study into improvements to the A27. In December 2014, the Government announced investment along the A27 worth approximately £350 million as part of the Road Investment Strategy. This includes improvements to the capacity of the road and junctions along the stretch of single carriageway in Worthing. The extent and scale of the improvements, including the option of full dualling, are to be agreed in consultation with WSCC and the public. The development of sustainable transport measures is also being assessed.

We are currently awaiting further work, engagement and consultation in order to reach agreement on the specific details of the proposals. It is vital that Worthing Borough Council feeds into this process.

### ***II. Re-assess traffic light sequencing in AQMA.***

Highways England, in conjunction with WSCC, is responsible for assessing the traffic light sequencing at the Grove Lodge roundabout and the two sets of lights at Lyons Farm. Adjustments to the existing SCOOT system may be possible to improve traffic flow and minimise stationary waiting time. Synchronisation of the lights at Lyons Farm and Grove Lodge is important here as one will affect the other. This would need to be considered in the context of the A27 Highway Improvements

### ***III. Cut Engine, Cut Pollution Signs***

WSCC has erected signs at level crossings and other AQMA's in West Sussex advising drivers to switch off their engines whilst stationary. Similar signs could be considered for the traffic lights at junctions in the AQMA, particularly at Lyons Farm where vehicles are stationary for a prolonged period due to the complex nature of the junctions. As they are non-prescribed signs their erection will require approval from Highways England and WSCC, but could be a simple way of trying to reduce emissions from the tailpipe.

### ***IV. Low Emission Zone Feasibility Study***

A study into whether a Low Emission Zone (LEZ) should be introduced in Worthing. Clearly with the A27 being a major strategic trunk road, any such designation would require careful consideration. The aim of the LEZ study would be to work out how it

would work, what vehicles it would cover (HGVs, LGVs, all vehicles, diesel only, etc.), the potential costs, benefits, barriers, air quality impacts, emissions reductions and timescales for implementing a LEZ. The study would also look at what spatial extent a LEZ should cover – options include only the AQMA along the A27, the whole Borough, an LEZ in association with neighbouring authorities such as Brighton & Hove, or those along the A27 with AQMA's (Chichester).

The government, in their recent draft air quality action plan, suggested a network of Clean Air Zones may be introduced, a concept similar to LEZ's.

This option is dependent on securing sufficient funding.

#### ***V. Safe cycling and walking routes along/around the A27/A24***

This option will need cooperation between WSCC, Highways England, Worthing Borough Council and the South Downs National Park Authority, working in partnership with public transport operators, local businesses and charities (such as Sustrans and Living Streets). Additional cycle paths have already been provided as part of the Worthing College development. Other safe cycling and walking routes need to be provided on adjacent travel routes, on other school routes (e.g. Northbrook College) and on routes to the South Downs. The routes then need publicising (see action point 5).

### **B. Vehicle Fleet Efficiency**

#### ***HGV/LGV assessment***

Source apportionment showed that HGVs and LGVs, whilst making up a small percentage of traffic through the AQMA, contribute a significant amount to the NO<sub>x</sub> and NO<sub>2</sub> emissions in the area. We therefore propose to undertake an assessment of local fleet operators to determine where these vehicles originate, their numbers and their type. We can then work with operators to determine how to reduce their emissions – for example if an Eco Stars accreditation programme would be beneficial, alternative fuel stations, etc.

#### ***Eco Stars for local fleet operators***

The ECO Stars Fleet Recognition Scheme is a free scheme aiming to help fleet operators improve efficiency, reduce fuel consumption and emissions and make cost savings. Following the local HGV/LGV fleet assessment, we propose to consider setting up a local Eco Stars scheme and encourage local operators to sign up to the scheme. This may work more effectively in partnership with neighbouring local authorities.

#### ***Council(s) Fleet Efficiency***

Worthing Borough Council operates a fleet of over 150 vehicles, including HGVs and vans. Many of these are diesel powered and travel across the Adur and Worthing districts daily. We will look at reducing emissions from our fleet through a

replacement programme which looks at alternatives with lower emissions, in conjunction with the replacement cycle.

WSSC also delivers fleet related services across Worthing (e.g. school transport, Adults' and Children's services Fire and Rescue). New fleet operational models are being considered by the County Council which include looking at the role of car clubs in place of County Council owned/leased pool cars, as well as electric vehicles. Worthing Borough Council and WSSC could liaise over fleet review plans to explore synergies.

## **C. Policy Guidance, Development Control and Transport Planning**

### ***Planning policies***

Planning plays a vital role in improving air quality through policies included within the Local Development Framework. This ensures that planning applications may be considered in respect of their effect on air quality and how they are likely to affect nearby sensitive receptors.

Documents making up the Local Development Framework (LDF) set out the Council's planning policies. The Worthing Core Strategy includes Strategic Objectives which provide a concise expression of the priorities for the LDF. Two of these directly impact upon air quality:

*Strategic Objective 1- Protect the Natural Environment and Address Climate Change; Strategic Objective 7- Improve Accessibility.* One of the key outcomes is that local air quality is improved.

As a member of Sussex-air, Worthing Borough Council helped create a planning guidance document, 'Air Quality Emissions Mitigation Planning Guidance for Sussex'. This guidance aims to benefit developers and planners to account for adverse impacts on air quality from developments. The guidance also considers the cumulative effect of developments in the same locality. It is our aim to ensure it is referenced when considering relevant planning applications (and in pre-application discussions) and will consider embedding it into the planning process in Worthing.

Travel Plans for large developments are secured through the planning process, in association with WSSC.

## **D. Supporting & Encouraging Travel Alternatives (Alternatives to private vehicle use)**

### ***Electric vehicles and infrastructure***

The Council, in association with its partners at WSSC and Sussex-air, will continue to encourage and promote the use of electric and hybrid vehicles and support further expansion of the public charging points around the Borough.

## ***Worthing Car Club***

Car clubs have been shown to be effective in reducing private car use in towns across the UK. A Borough-wide car club, perhaps in conjunction with Adur District Council, could help to reduce short trips across the Borough. A long term aim would be to link up with car clubs in other local authorities in Sussex to allow trips across greater distances. Worthing Borough Council would lead on this project.

## ***Car sharing***

WSCC promote car sharing schemes with businesses and with the public to reduce the number of car journeys, including those through the AQMA. Promotion of car share sites such as [www.westsussexcarshare.com](http://www.westsussexcarshare.com) and MyPTP will continue.

## ***Encourage alternative transport modes***

*Public Transport.* WSCC, Worthing Borough Council and local public transport operators (bus and rail) can implement this option to help people use transport methods other than private cars. This can be achieved through identifying popular travel routes, encouraging transport companies to provide transport and incentives to use them and for the Council to help advertise them. WSCC have a journey planner on their website which can be promoted.

WSCC and Worthing Borough Council continue to seek improvements to access to railway stations. This includes new cycling facilities (e.g. increased provision of cycle racks), new cycle routes, the provision of real time passenger information for local bus services and improved parking facilities.

*Cycling and walking.* WSCC and Adur & Worthing Wellbeing promote walking and cycling routes to encourage the community to walk or cycle as an alternative to private car use. This is achieved through the West Sussex Cycle Journey Planner - <http://cyclejourneyplanner.westsussex.gov.uk/>, funding cycle challenges, Bike Week activities, providing Bikeability training to school children, and offering cycle training to adults. WSCC and Worthing Borough Council also seek to provide new infrastructure for cyclists and pedestrians, particularly through the provision of new developments and bids for grant funding.

## ***Workplace and School Travel plans.***

- Worthing Borough Council will periodically review and improve its own staff travel plan to help reduce the amount of traffic on the roads from Council staff. The Council already promotes flexible working and the majority of staff have laptops allowing home working;
- WSCC has its own Staff Travel Plan and all WSCC employees have laptops and home/flexible working is positively encouraged;
- WSCC and Worthing Borough Council will encourage state schools, local independent schools and local businesses to establish and implement travel plans to help reduce traffic on the roads, especially passing through the AQMA. Travel planning for businesses, schools and individuals is offered through the County Council. Home working is promoted through the development of Travel Plans. 98% of schools in West Sussex have Travel

- Plans and WSCC continue to roll out Safer Routes to School improvements through their annual capital programme;
- We will work with WSCC and Worthing College to review their travel plan in order to reduce their impact on the Grove Lodge roundabout.

## **E. Public Information & Education**

### ***Increase air quality information to public***

Worthing Borough Council can improve the amount and quality of air quality information available to the public, schools and business. This could include an increase in the quality of information on the impacts of poor air quality on health. This can aid decision making on lifestyle choices that may affect the environment and air quality. An increase in the amount of local air quality monitoring results will also be considered.

### ***Health and Wellbeing promotion***

This Action Plan is embedded within the Adur & Worthing Public Health Plan. This strengthens the links between air quality and health and wellbeing. We aim to work with our colleagues in Wellbeing to help deliver and publicise cycling and walking initiatives, such as Bike to Work Week.

We also aim to increase the provision of information about the health effects of air pollutants to those who are susceptible to respiratory ailments so informed decisions about their lifestyle can be made, which may reduce the amount of medical appointments due to improved self-management of respiratory ailments.

Sussex Air provide an air-Alert service that sends alert messages to vulnerable people in Sussex informing them when poor air quality is predicted in their area. The alerts are sent to home phones via voice message, to mobile phones via text and via email. This will be publicised on relevant websites (Councils, GP surgeries, etc.) and via leaflets.

### ***Increase information on sustainable/active travel modes***

WSCC provides a number of helpful websites and leaflets on sustainable/active travel modes (e.g. car sharing, cycling and public transport) and a multi-modal journey planner Travel West Sussex - [www.travelwestsussex.co.uk](http://www.travelwestsussex.co.uk) and <http://cyclejourneyplanner.westsussex.gov.uk/>.

The Borough Council can actively promote the use of these tools through their websites and leaflets, working in partnership with our Wellbeing team.

## **8. Consultation & Stakeholder Engagement**

A draft version of this Action Plan was subject to a 4 week public consultation in October 2015, through publication on the Council's website. The consultation was publicised on the front page.

The Draft Action Plan was also circulated to

- West Sussex County Council
- Highways England
- South Downs National Park Authority
- Neighbouring local authorities – Adur District Council (internally), Arun District Council, Brighton and Hove City Council and Horsham District Council
- Sussex-air and all partnership Authorities (East and West Sussex County Councils, Sussex city, district and borough councils, Environment Agency, Sussex and Surrey Health Protection Agency).

The responses received are contained in Appendix E.

## **10. Next steps**

We have already commissioned Sussex-air to undertake modelling of the listed actions in order to provide estimates for the likely reductions in NO<sub>2</sub>.

We will continue to work with all our partners to deliver the actions.

We have convened a working group to help in the delivery process – the Adur and Worthing Air Quality Action Planning Group – which consists of representatives from key partners in Worthing Borough Council, West Sussex County Council Highways and Highways England. Membership is open to relevant parties and several meetings have already taken place.

The consultation responses have been noted and where applicable the action plan has been amended. The comments will be shared with the working group and taken into account in the delivery of this action plan.

This will be a live document, co-ordinated by the Adur and Worthing Action Planning Group and progress on delivery will be reviewed on a quarterly basis. The leadership for this will be through the Cabinet Member for Environment and the Director for Communities.



## Appendix A.

## Action Plan Matrix

	Measure	Responsible/ Lead Authority	Effects on AQMA	Target Date <sup>1</sup> (implementation)	Effect on AQ <sup>2</sup>	Cost (estimated) <sup>3</sup>	Feasible?
	<b>TM</b>						
1	Re-assess traffic light sequencing in AQMA	HE; WSCC	Reduced queuing; Shorter stationary times; reduced NO <sub>2</sub> emissions	Ongoing	Medium	Low	Yes
2	A27 Highway Improvements	HE	Improved traffic flows; Shorter stationary times; reduced NO <sub>2</sub> emissions	2021	High	High	Yes
3	Cut Engine, Cut Pollution Signs - Drivers are encouraged to switch off engines whilst stationary	HE; WSCC	Reduced pollution (NO <sub>2</sub> ) from queuing traffic	2016	Low-Medium	Low	Yes
4	Safe Cycling and Walking Routes	HE; WSCC	Reduced vehicles on road	Ongoing	Low-Medium	Medium	Yes
5	LEZ Feasibility	WBC	Reduced vehicles on road	2016/17	High (if implemented)	Medium	Yes
	<b>PG</b>						
6	Embed Air Quality Emissions Mitigation Planning Guidance for Sussex into the planning process	WBC	Reduce impacts on AQMA	2014/15	Low - Medium	Low	Yes
7	Planning Policies	WBC; WSCC	Reduce impacts on AQMA; Promote alternative modes of travel and prevent any increase in congestion as a result of development	Ongoing	Low - Medium	Low	Yes
8	Travel plans for significant/major developments	WSCC; WBC	Reduce impacts on AQMA; reduce vehicle numbers	Ongoing	Low - Medium	Low	Yes
	<b>STA</b>						

9	eV vehicles and infrastructure	WBC; WSCC	Reduced NO <sub>2</sub> emissions	Ongoing	Low - Medium	High	Yes
10	Worthing Car Club	WBC	Reduced vehicles on road	2016/17	Low - Medium	Medium	Yes
11	Car Sharing	WSCC; WBC	Reduced vehicles on road	Ongoing	Low	Low	Yes
12	Encouraging alternative transport modes	WSCC; WBC	Reduced vehicles on road	Ongoing	Low	Low	Yes
13	Public Transport - bus & rail, improvements; Railway Stations (cycling facilities/ routes, provision of real time passenger information for local bus services, and improved parking facilities)	WSCC	Reduced vehicles on road	Ongoing	Low	Low	Yes
14	Cycling & Walking promotion - West Sussex Cycle Journey Planner, funding cycle challenges , Bike Week activities, Bikeability training to schools, training for adults.	WSCC	Reduced vehicles on road; increase in walking and cycling	Ongoing	Low	Medium	Yes
15	WBC Staff Travel planning	WBC	Reduced vehicles on road	Ongoing	Low	Low	Yes
16	WSCC Staff Travel Planning			Ongoing	Low	Low	Yes
17	School Travel Plans	WSCC	Reduced vehicles on road; reduced impacts in AQMA	Ongoing	Low	Low	Yes
18	Business Travel Plans - sustainable travel amongst employees and for business travel.	WBC		Ongoing	Low	Low	Yes
19	Worthing College Travel Plan Review	WBC; WSCC	Reduce impacts on AQMA/reduce NO <sub>2</sub> emissions; reduce vehicle numbers	2015/16	Low - Medium	Low	Yes
	<b>VFE</b>						
20	HGV/LGV assessment	WBC	Reduced NO <sub>2</sub> emissions	2016/17	N/A	Medium	Yes
21	Ecostars for Local Fleet Operators	WBC	Reduced NO <sub>2</sub> emissions	2016/17	Low - Medium	High	Yes
22	Improve emissions from the Council's vehicle fleet	WBC	Reduced NO <sub>2</sub> emissions	Ongoing	Low	High	Yes
	<b>PI</b>						

23	Increase availability of AQ information in relation to impacts on Public Health	WBC	Reduced vehicles on road; increase in walking and cycling	2015	Low	Low	Yes
24	Increase and improve availability of WBC Air Quality Monitoring results	WBC	Reduced vehicles on road/reduce NO <sub>2</sub> emissions	2015	Low	Low	Yes
25	Health & Wellbeing Promotion including embedding in Adur & Worthing Public Health Plan	WBC; WSCC	Reduced vehicles on road; increase in walking and cycling	2015	Low	Low	Yes
26	Leaflets to promote sustainable/active travel modes (e.g. car sharing, cycling, public transport)	WBC; WSCC	Reduced vehicles on road/reduce NO <sub>2</sub> emissions; increase in walking and cycling	Ongoing	Low	Low	Yes
27	Promotion of air-Alert	WBC	Reduced vehicles on road	Ongoing	Low	Low	Yes
28	WSCC website and multi-modal journey planner (Travel West Sussex)	WSCC; WBC	Reduced vehicles on road/reduce NO <sub>2</sub> emissions; increase in walking and cycling	2015	Low	Low	Yes
29	<b>Modelling and Assessment of Actions in Action Plan</b>	WBC	N/A	2015	N/A	N/A	N/A

<sup>1</sup> Work may begin on planning before this date

<sup>2</sup> Estimates of likely effects on AQ within the AQMA. The Modelling and Assessment we are awaiting (point 29) will provide us with more reliable estimates that will be in line with Defra guidance.

<sup>3</sup> These are only estimates of likely costs.

**Notes:**

For this matrix the effect on AQ in the AQMA has been categorised as follows: Low: <0.5 – 1.0 µgm<sup>-3</sup>; Medium: 1.0 – 2.0 µgm<sup>-3</sup>; High AQ: >2.0 µgm<sup>-3</sup>. (Please Note the bandings recommended by Defra will be used once the further modelling has been completed).

Costs: Low: <£50k); Medium: £50k - £200k; High: >£200k)

Low scoring options are still considered feasible, even though they may have a very low impact on improving air quality within the AQMA as they may have AQ benefits in other areas of the Borough or benefit other areas such as promoting more active lifestyles.

**Key:**

- TM Traffic Management & Infrastructure
- PG Policy Guidance, Development Control & Transport Planning
- STA Supporting and Encouraging Sustainable Travel Alternatives
- VFE Vehicle Fleet Efficiency
- PI Public Information

## Appendix B.

## Glossary of Abbreviations

AADT	Annual Average Daily Traffic
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
Defra	Department for Environment, Food and Rural Affairs
eV	Electric Vehicles
HE	Highways England
HGV	Heavy Goods vehicles greater than 7.5 tonnes in weight
HDV	Heavy Duty Vehicles (HGVs and Buses)
LAQM	Local Air Quality Management
LGV	Light Goods vehicle
SCOOT	Split Cycle Offset Optimisation Technique
NPPF	National Planning Policy Framework
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Nitrogen oxides
SAQP	Sussex Air Quality Partnership
WBC	Worthing Borough Council
WSCC	West Sussex County Council
µg/m <sup>3</sup>	Micrograms per cubic metre

**Appendix C      Department for Transport Traffic counts: Annual Average Daily Traffic (AADT) Flow by Vehicle Class (2014) near to Grove Lodge**

Location description	Count Point id	Road	Start Junction	End Junction	M'cycle	Car	Bus	LGV	RHGV 2X	RHGV 3X	RHGV 4+X	AHGV 3or4X	AHGV 5X	AHGV 6+X
A2032 Poulters Lane	27603	A2032	A2031	A24	118	15318	81	2410	289	49	21	2	5	4
A2031 Offington Lane	46284	A2031	A2032	A24	58	9507	82	1319	62	11	11	5	3	3
A24 Findon Road	78241	A24	A2031	Bost Hill, Findon Valley	170	17675	111	2762	167	26	51	21	11	21
A24 Broadwater Road	16261	A24	A2031	A2032	130	17691	235	2581	178	31	14	20	16	14
A24/A27 Warren Road	56246	A24/A27	A2031	A24	282	26509	123	5585	601	116	149	38	160	147
A27 Upper Brighton Road	26302	A27	A24	Sompting Rd	466	23301	60	5698	533	133	120	47	167	166
A27 Arundel Road	78242	A27	Hollyacres	A24	269	19670	177	4663	498	137	125	35	154	162

## Appendix D: Original list of measures considered

Measure	Type
Re-assess traffic light sequencing in AQMA	TM
Worthing Car Club	STA
LEZ Feasibility	TM
Embed AQ Emissions Mitigation Planning Guidance for Sussex into the planning process	PG
Improve emissions from the Council's vehicle fleet	VFE
WBC Staff Home Working	STA
HGV/LGV assessment	VFE
eV charging infrastructure	STA
Bus fleet improvements	STA
A27 Highway Improvements	TM
Travel Plans secured through the planning process for all significant development sites in West Sussex	STA
Home working promoted through development of Travel Plans and the County Council's own Staff Travel Plan. All WSCC employees have laptops and home/flexible working is positively encouraged	STA
Personalised journey plans to be provided to employees by Living Streets through the 'Walk To' LSTF project	STA
98% of schools in West Sussex have Travel Plans. We continue to roll out Safer Routes to School improvements through our annual capital programme	STA
Wherever possible the County Council provides new infrastructure for cyclists. It also promotes cycle routes through the West Sussex Cycle Journey Planner (CycleStreets website and app), funding cycle challenges (e.g. Horsham and Chichester), Bike Week activities (e.g. Dr Bike sessions, provision of literature & high visibility items etc.), providing Bikeability training to school children, and offering cycle training to adults. Bike It schemes have also been operating in Crawley, Chichester and Horsham in recent years to embed a cycling culture in local schools.	STA
Living Streets'Walk To School Outreach and 'Walk To' projects (LSTF)	STA
Promotion of LEV's	STA
WSCC website (Travelwise pages) and new multi-modal journey planner (Travel West Sussex)	PI
Leaflets to promote sustainable/active travel modes (e.g. car sharing, cycling, public transport)	PI
Ecostars for Local Fleet Operators	VFE

Increase availability of AQ information	<b>PI</b>
Health & Wellbeing Promotion	<b>STA</b>
Reduce AQ impact of WBC staff travel	<b>STA</b>
Air Quality Monitoring	<b>PI</b>
Promotion of <a href="http://www.westsussexcarshare.com">www.westsussexcarshare.com</a> and Bike Week events	<b>STA</b>
Transport network infrastructure improvements for new development	<b>TM</b>
Drivers are encouraged to switch off engines whilst stationary in rail level crossing queues in urban areas across the county	<b>TM</b>
New infrastructure for cyclists and pedestrians	<b>TM/STA</b>
Improvements to access to Railway Stations (including new cycling facilities and routes, provision of real time passenger information for local bus services, and improved parking facilities)	<b>STA</b>
Encouraging bus travel	<b>STA</b>
Developing and promoting bids for Sustainable Transport Packages through the Local Enterprise Partnership Local Growth Fund	<b>STA</b>
Speed management initiatives such as 20mph zones where these are supported by the community,	<b>TM</b>
Taxi Fleet Emission Improvements	<b>LET</b>
Business Travel Plan Networks to promote sustainable travel amongst employees and for business travel.	<b>STA</b>



## Appendix E Consultation Responses

### *From Adur & Worthing Planning Policy*

#### **6.2 (pg 18)**

Good summary of the NPPF but would recommend deleting the last sentence (copied below) as the Core Strategy was adopted prior to the NPPF

*The Worthing Local Plan has been prepared with the requirements of the NPPF in mind.'*

#### **6.3 (pg 19)**

Again gives a good overview. However it is the policies within the Plan that stem from the strategic objectives rather than the objectives themselves that are relevant in terms of achieving outcomes. I would keep the short para highlighting that there are 2 relevant objectives but not copy them in full as the emphasis should be on the policy.

In terms of Policy 19 if you want to include this in full I'd recommend that this is printed in the same format as in the Core Strategy.

Within the 2nd para of 6.3 there is a sentence re the new Local Plan. I would recommend moving this to the end of this section (after Policy 19) and reword as follows:

*Due to national changes to the planning system, a full review of the Council's adopted Core Strategy and the development of a new Local Plan is now underway. The Local Plan will cover Worthing Borough excluding the area within the South Downs National Park. This presents an opportunity to respond to the current air quality issues.*

### **C. Planning Policies (pg 30)**

Well written summary

#### **Action Plan Matrix** (lines 7 and 8)

I would query the extent to which planning policies and travel plans for significant/major developments can achieve a reduction in vehicle numbers. With additional housing even achieving no increase in vehicle numbers is incredibly challenging and not always feasible. For this reason I'd suggest changing the cells under 'Effects on AQMA' to read:

*Reduce impacts on AQMA;*

*Promote alternative modes of travel and prevent any increase in congestion as a result of development*

### *From West Sussex County Council Highways*

#### **A27 Highway Improvements:**

We agree that this is the action that will produce the single biggest improvement to air quality in the AQMA. Tackling the A27 AQMA issues through Worthing should be central to the design considerations for scheme development by Highways England.

#### **Low Emission Zone Feasibility Study:**

We recognise that it is important that consideration is given to all potential options to manage air quality issues within the AQMA. However, we have concerns about any Low Emission Zone (LEZ) being proposed for the A27 through Worthing due to the critical role of this trunk road in serving strategic traffic flows along the south coast, and the role of the road in supporting the regional economy. The A27 is part of the West Sussex Lorry Route Network and any LEZ could result in the diversion of vehicles to other inappropriate local routes. The option of undertaking a LEZ study needs to be seen in the overall strategic context of the significant A27 highways improvements being considered by Highways England.

#### **Re-assessing traffic light sequencing in the AQMA:**

We understand that the traffic signals at Grove Lodge Roundabout are currently running on the SCOOT traffic signal system, whilst the junctions and Grove Lodge are also operated by a linked SCOOT system. The signals do not currently operate using MOVA (Microprocessor Optimised Vehicle Actuation system) as stated in the draft AQAP. We understand that a number of improvements to the staging sequence and timings of the existing signals have been made since the signals were installed. Any proposals for significant short-term changes to system of signal

operation will need to be considered in dialogue with Highways England and in the context of the A27 Highway Improvements being considered by Highways England.

**Cut Engine, Cut Pollution Signs:**

These signs have been erected at level crossings and in other AQMAs in West Sussex, and in principal we do not have concerns about the signs being used in other locations where further scoping shows that they may produce a benefit. However, these signs are non-prescribed signs, and the potential and permission for installing these signs around this section of the A27 needs to be further discussed with the Highways Agency and the County Council.

**Department for Transport Traffic Counters (Page 13, paragraph 2):**

The linked document below provides further clarification as to the Road Traffic Estimates produced by the Department for Transport (DfT):

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/230525/road-traffic-notes-definitions.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/230525/road-traffic-notes-definitions.pdf). Our understanding is that the traffic count information provided by the DfT for these sites is largely collected by annual single 12 hour counts (7am to 7pm) by trained enumerators, rather than automatic traffic counters as implied by the reference in the draft AQAP. The County Council also maintains its own network of Automatic Traffic Counters and further information is available at <https://www.westsussex.gov.uk/roads-and-travel/traffic-management/traffic-counts/>.

**National Draft Air Quality Action Plans – Section 6.1**

It may be helpful to refer to the international level actions around ‘real driving emissions’ test procedures being pursued by the European Commission as also referenced in the National Draft Air Quality Action Plans, as well as local, regional and national level initiatives.

**HGV/LGV assessment, page 29**

This includes reference to the potential of routing away HGVs and LGVs from the AQMA. As noted in our comments in reference to the potential LEZ study, we would have concerns about diversion of vehicles to other inappropriate local routes.

**Council Fleet Review, page 29**

It would be helpful to include reference to the County Council in this section which also delivers fleet related services across Worthing (e.g. school transport, Adults’ and Children’s services, Fire and Rescue). New fleet operational models are also being considered by the County Council which also include looking at the role of car clubs in place of County Council owned/leased pool cars, as well as electric vehicles, which could have benefits for air quality and also for the wider community. It will be helpful for Worthing Borough Council and West Sussex County Council to liaise over fleet review plans to explore synergies, including in relation to the new Worthing Car Club proposed in the draft AQAP (p. 30).

**Supporting & Encouraging Travel Alternatives**

Travel behaviour change promotional activities have an important role to play in influencing travel choices with more sustainable travel choices placing less pressure on the air quality issues. However, it is currently unclear what funding and resources are likely to be available to the County Council in future to intensify work in this area. Any funding available through DEFRA air quality grants to undertake related travel planning activities could be important and we would welcome engagement with Worthing Borough Council to explore such funding opportunities going forward.

**Public Information & Education initiatives, page 31-32**

In addition to the reference to the County Council within the section ‘Increase information on sustainable/active travel modes’, there are other partner organisations such as Sustrans and Living Streets who could be referenced in this section. The County Council has worked previously with these organisations in relation to Local Sustainable Transport Fund projects to offer cycling and walking related behaviour change programmes for schools and workplaces, and these organisations could be involved in future initiatives, should funding opportunities arise.

**Travel West Sussex Online Journey Planner and West Sussex Cycle Journey Planner, pages 31 and 32**

It may be helpful to include web link references to these journey planning tools [www.travelwestsussex.co.uk](http://www.travelwestsussex.co.uk) and <http://cyclejourneyplanner.westsussex.gov.uk/>.

*From Brighton & Hove City Council*

With austerity resource may not be available to implement the measures set out in the action plan. Our best chance could be joint grant bids and private sector projects. A wider freight management plan could be applicable to more than one AQMA across the agglomeration.

It will of course help to have good up to date traffic data that targets the specific AQMA locations. The proportion of cars on the road that are diesel may in fact be >50%. Agree that source apportionment makes the distinction between petrol and diesel cars because emission discrepancies between them are considerable. Actual background contributions may be lower than stated for some part of the AQMA i.e. more emphasis on NOx from road traffic. Traffic counts and emission are important. Also of some influence: road width, topography, distance from kerb to façade and the extent to which the building canopy envelopes emission and inhibits dispersion.

Is there resource in place to implement the school educational elements of the AQAP?

Could Worthing have more car free developments?

Encourage no combustion in developments near AQMA i.e. electric heating systems or ultralow NOx boilers

Try to avoid ground floor residential adjacent to confined or trafficked roads

Seek green planting and buffer zones or front gardens between residential and traffic

Lobby Highways Agency to make nitrogen dioxide compliance on the trunk road their priority. Lobby DfT / EU for more stringent vehicle emission tests and controls. Lobby DfT for a cap on bus and rail fares and more trains on weekends, later trains and express services.

Mention bio gas transport fuel from Anaerobic digestion with carbon saving and low NOx.

Involve Directorate of Health more in AQAP. Report to JSNA and or reports on the state of public health.

Consider Equalities Impact Assessment for the AQAP and link with a Community Insight Report i.e. how does health indices vary in the AQMA compared to Worthing-Adur averages and all of England.

In addition to LEZ Defra is talking about the concept of Clean Air Zones. BHCC has submitted a bid that involves Sussex Air and the agglomeration to look into a feasibility study. BHCC has submitted bid (£ half a million) to the 2015 Clean Bus Transport Fund with Go Ahead and Sussex Bus. Also bid with Big Lemon and OLEV for electrical buses. Worthing, W.Sussex and Portsmouth could look at future bids with Compass bus and Stagecoach.

### *From Highways England*

The date for the A27 major improvement implementation is 2021 not 2019

The proposal to improve traffic signal linking indicates a high improvement – the lights are already linked to some extent and optimise the traffic queues on all arms, whilst there may be some further improvement to be had I am not sure the impact could be classed as high.

## Appendix F:

### Fall-off calculations for nitrogen dioxide (with distance from the road) for Diffusion tube sites within the AQMA

Calculation:

$$CZ = ((C_y - C_b) / (-0.5476 \times \ln(D_y) + 2.7171)) \times (-0.5476 \times \ln(D_z) + 2.7171) + C_b$$

Where:

$C_z$  is the total predicted concentration ( $\mu\text{g}/\text{m}^3$ ) at distance  $D_z$ ;

$C_y$  is the total measured concentration ( $\mu\text{g}/\text{m}^3$ ) at distance  $D_y$ ;

$C_b$  is the background concentration ( $\mu\text{g}/\text{m}^3$ );

$D_y$  is the distance from the kerb at which concentrations were measured; and

$D_z$  is the distance from the kerb (m) at which concentrations are to be predicted.

$\ln(D)$  is the natural log of the number  $D$ .

#### **6N Gainsborough Avenue (UK06)**

Local background concentration for  $\text{NO}_2$  (2014) =  $15.03\mu\text{g}/\text{m}^3$

Closest background grid square reference source = 515500,105500

Location of diffusion tube = 515191,105121

$$C_y = 37.7\mu\text{g}/\text{m}^3$$

$$C_b = 15.03\mu\text{g}/\text{m}^3$$

$$D_y = 2\text{m}$$

$$D_z = 13\text{m}$$

$$\underline{CZ = \mu\text{g}/\text{m}^3}$$

#### **N30A Grove Lodge Cottages**

Local background concentration for  $\text{NO}_2$  (2014) =  $17.25\mu\text{g}/\text{m}^3$

Closest background grid square reference source = 514500,104500

Location of diffusion tube = 514210,104952

$$C_y = 73.9\mu\text{g}/\text{m}^3$$

$$C_b = 17.25\mu\text{g}/\text{m}^3$$

$$D_y = 2.5\text{ m}$$

$$D_z = 4\text{ m}$$

$$\underline{CZ = \mu\text{g}/\text{m}^3}$$

#### **N36 Corner of Hillbarn Lane**

Local background concentration for  $\text{NO}_2$  (2014) =  $17.25\mu\text{g}/\text{m}^3$

Closest background grid square reference source = 514500, 104500

Location of diffusion tube = 514123, 104969

$C_y = 40.3 \mu\text{g}/\text{m}^3$

$C_b = 17.25 \mu\text{g}/\text{m}^3$

$D_y = 2 \text{ m}$

$D_z = 11 \text{ m}$

**CZ =  $\mu\text{g}/\text{m}^3$**

### ***N39 SW of Roundabout at Grove Lodge***

Local background concentration for  $\text{NO}_2$  (2014) =  $17.50 \mu\text{g}/\text{m}^3$

Closest background grid square reference source = 514500, 104500

Location of diffusion tube = 514098, 104898

$C_y = 33.8 \mu\text{g}/\text{m}^3$

$C_b = 17.25 \mu\text{g}/\text{m}^3$

$D_y = 4 \text{ m}$

$D_z = 46 \text{ m}$

**CZ =  $22.5 \mu\text{g}/\text{m}^3$**  (Note: treat result with caution as receptor more than 20m further from kerb than monitoring).

### ***N44A/B/C Average $\text{NO}_2$ Analyser***

Local background concentration for  $\text{NO}_2$  (2014) =  $17.25 \mu\text{g}/\text{m}^3$

Closest background grid square reference source = 514500, 104500

Location of diffusion tube = 514185, 104963

$C_y = 41.3 \mu\text{g}/\text{m}^3$

$C_b = 17.250 \mu\text{g}/\text{m}^3$

$D_y = 4 \text{ m}$

$D_z = 21 \text{ m}$

**CZ =  $30.1 \mu\text{g}/\text{m}^3$**

### ***N32 Corner Upr Brighton Rd/Sompting Rd***

Local background concentration for  $\text{NO}_2$  (2014) =  $17.25 \mu\text{g}/\text{m}^3$

Closest background grid square reference source = 515500, 105500

Location of diffusion tube = 515086, 105092

$C_y = 32.3 \mu\text{g}/\text{m}^3$

$C_b = 15.03 \mu\text{g}/\text{m}^3$

$D_y = 3 \text{ m}$

$D_z = 11 \text{ m}$

**CZ =  $\mu\text{g}/\text{m}^3$**

### ***N46 junction South Farm Rd/Offington Ave***

Local background concentration for NO<sub>2</sub> (2014) = 17.25µg/m<sup>3</sup>  
Closest background grid square reference source = 514500,104500  
Location of diffusion tube = 514129, 104828

Cy = 25.2µg/m<sup>3</sup>  
Cb = 17.24µg/m<sup>3</sup>  
Dy = 3m  
Dz = 16m

**CZ = 21.8µg/m<sup>3</sup>**

### ***N53 Offington Corner***

Local background concentration for NO<sub>2</sub> (2014) = 15.5µg/m<sup>3</sup>  
Closest background grid square reference source = 513500 105500  
Location of diffusion tube = 513276, 105626

Cy = 33.5µg/m<sup>3</sup>  
Cb = 15.5µg/m<sup>3</sup>  
Dy = 7m  
Dz = 26m

**CZ = 25.7µg/m<sup>3</sup>**