3 The Effectiveness of Possible Interventions

3.1 Scenario testing

The LBRuT having declared an AQMA is required to produce an action plan following the production of its Stage 4 report. The purpose of the action plan is to allow it to work towards the AQS objectives that have been identified as being likely to be exceeded for the relevant years.

To test the effectiveness of possible measures to improve air quality within the AQMA a scenario test has been considered. This reflects the fact that road transport is the main source of emissions (as discussed above in section 2).

The possible intervention tested for this Stage is based on a low emissions scenario. This reflects the possibility that specific vehicles will be excluded from a specific geographic area, based on a Low Emission Zone (LEZ). The intention is that the most polluted vehicles are removed thus reducing emissions in the area of interest. This is intended to lead to an improvement in air quality, based on the two pollutants, i.e. NO_2 and PM10.

To test this scenario a series of assumptions have been made. Those vehicles that have been modelled in the scenario are those given below. The assumptions have been made in agreement with both the LBRuT and the GLA and are tested on the basis of their potential at this stage, rather than because they are to be included in any LEZ subsequently introduced.

The LEZ specification investigated will include only the following categories of vehicle and prohibit all other categories outside of these:

- Petrol cars – Euro III and Euro IV
- Diesel cars - Euro III and Euro III (with particle trap)
- Petrol taxis – Euro III
- Diesel LGVs - Euro III
- HGVs Rigid - Euro III, Euro III (with particle trap) and Euro II (with particle trap)
- HGVs Articulated - Euro III, Euro III (with particle trap) and Euro II (with particle trap)
- Non LT buses - Euro III, Euro III (with particle trap) and Euro II (with particle trap)
- LT buses - Euro III, Euro III (with particle trap) and Euro II (with particle trap)

3.2 Results of scenario test

The results of the modelling for the scenario test undertaken are given in Table 13, Table 14 and Table 15 with the results representing the predicted concentrations at

the same locations as used for the earlier source apportionment (see Table 2 and Figure 3). The results for NO_2 are also mapped in Figure 4.

Table 13 Predicted 2005 concentrations (ppb) of NO_2 at the identified locations

Location	Base case	With LEZ	Improvement (ppb)	Improvement (%)
1	22.2	19.5	2.7	12.2
2	25.0	22.4	2.5	10.2
3	24.4	21.7	2.6	10.8
4	21.4	19.0	2.4	11.1
5	24.5	21.6	2.9	11.7
6	19.7	17.7	2.0	10.4
7	22.5	20.3	2.2	9.7
8	22.1	19.4	2.7	12.1
9	20.2	17.8	2.3	11.6
10	21.6	19.7	1.8	8.6

Table 14 Predicted 2005 concentrations (ppb) of NO_x at the identified locations

Location	Base case	With LEZ	Improvement (ppb)	Improvement (%)
1	42.1	33.3	8.8	21.0
2	64.1	50.7	13.4	20.9
3	60.8	47.5	13.3	21.9
4	46.4	36.2	10.2	22.0
5	66.3	49.8	16.5	24.8
6	39.6	32.5	7.1	18.0
7	55.7	44.3	11.3	20.4
8	53.3	40.6	12.7	23.8
9	42.9	33.4	9.5	22.1
10	47.2	39.7	7.6	16.0

Table 15 Predicted number of days exceeding the AQS daily PM10 mean of 50μg/m^3 at the identified locations

Location	Base case	With LEZ	Improvement (ug/m3)	Improvement (%)
1	29.8	22.0	7.8	26.2
2	35.9	24.1	11.8	32.9
3	37.5	24.1	13.4	35.9
4	31.1	22.6	8.5	27.3
5	35.7	24.2	11.5	32.1
6	29.0	21.7	7.2	25.0
7	33.3	23.1	10.2	30.7
8	31.8	22.9	8.9	27.9
9	30.7	22.3	8.3	27.2
10	30.1	22.1	8.0	26.7

The results in the three tables above confirm the expected reduction in concentrations as a result of the continuing uptake of technology. For this scenario all locations would meet the above the AQS objective for PM10, even using 1996 meteorology.

For NO_2 however the predicted improvement is insufficient to ensure that all locations will meet the AQS annual mean objective. The predicted improvement varies between 1.8 and 2.9 ppb (i.e. between approximately 9 and 12% improvement). This is sufficient for locations 1, 4, 6, 7, 8, 9 and 10. Similarly for locations 3 and 5 the margin predicted to exceed is only 0.7ppb.

3.3 Commentary on possible interventions

The relationship between NO_x and NO_2 is one of a number of critical factors relevant to understanding the outcomes from the scenario tests undertaken. This relationship, which is location dependent, provides the understanding between the photochemical processes that lead to the formation of NO_2 from NO_x. This relationship is non linear which means that a reduction of the primary emission (i.e. NO_x) does not lead to a corresponding reduction in the secondary pollutant. (Appendix A further describes this relationship).

The results and the contour plots produced from the scenario test undertaken highlights that to achieve the annual mean AQS objective at all the locations identified further interventions would be needed.

Figure 4 Annual mean nitrogen dioxide (ppb) for 2005 (based on 1999 meteorology) with LEZ scenario