

**Cambridge
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Scenario Testing for
Hillingdon, Hounslow and Spelthorne

Final Report

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C E R C

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1. Summary

An air quality modelling study was carried out for Hillingdon, Hounslow and Spelthorne and is described in the report *Air quality modelling for West London: Hillingdon, Hounslow, Spelthorne and Slough*, 27th August 2002. A source apportionment study for emissions of NO_x and PM₁₀ (*Source apportionment for Hillingdon, Hounslow and Spelthorne*, 17th December 2002) showed that emissions from major roads and from Heathrow Airport are of primary concern in the area.

This earlier work, and the scenario testing study described in this report, form part of the Stage 4 Review and Assessment of Air Quality.

This report describes an investigation of the impact on NO₂ concentrations of three emission reduction scenarios. The Emissions Inventory Toolkit, EMIT, has been used to set up the revised emissions scenarios, which have been modelled using the air quality model ADMS-Urban. All sources of emissions and model parameters are as detailed in the earlier reports.

The scenarios investigated here involve reductions in emissions from major roads and from aircraft, as these are the two source groups having the greatest impact on NO₂ concentrations in the area. Modelling has therefore been carried out for a “do-nothing” scenario and for the following three scenarios, all for 2005:

- Scenario 1: Reduction of 50% in airborne aircraft emissions;
- Scenario 2: Reduction of 30% in traffic flows in Hillingdon, Hounslow and Spelthorne; and
- Scenario 3: Low Emission Zone (EURO II).

For each scenario, concentrations of NO_x and NO₂ have been predicted at each of eleven receptor points at various locations within Hillingdon.

The predicted reduction in annual average NO₂ concentrations due to Scenario 1 ranges from 1% at Whitehall Infant School and Masson Avenue to 8% at Mendip Close, Bomber Close and Pingleston Close.

The predicted reduction in annual average NO₂ concentrations due to Scenario 2 ranges from 3% at Coleridge Way, Botwell Primary School, Mendip Close and Bomber Close to 7% at Heathrow Close and the AURN site.

The predicted reduction in annual average NO₂ concentrations due to Scenario 3 is zero at Coleridge Way, Mendip Close and Whitehall Infant School and 1% at all other receptor locations.

2. Introduction

Cambridge Environmental Research Consultants Ltd (CERC) has been commissioned by the London Boroughs of Hillingdon and Hounslow and the Borough of Spelthorne to carry out a scenario testing study for the area covered by the three boroughs using EMIT and ADMS-Urban. This report describes an investigation of the impact on NO₂ concentrations of three emission reduction scenarios.

An air quality modelling study was carried out for Hillingdon, Hounslow and Spelthorne and is described in the report *Air quality modelling for West London: Hillingdon, Hounslow, Spelthorne and Slough*, 27th August 2002. A source apportionment study for emissions of NO_x and PM₁₀ (*Source apportionment for Hillingdon, Hounslow and Spelthorne*, 17th December 2002) showed that emissions from major roads and from Heathrow Airport are of primary concern in the area.

This earlier work, and the scenario testing study described in this report, form part of the Stage 4 Review and Assessment of Air Quality.

3. Emission Reduction Scenarios

The source apportionment study for emissions of NO_x and PM₁₀ (*Source apportionment for Hillingdon, Hounslow and Spelthorne*, 17th December 2002) showed that emissions from major roads and from Heathrow Airport are of primary concern in the area.

The source apportionment results show that the maximum contribution to the total emissions of NO_x from within Hillingdon is from Heathrow Airport, which contributes 58%. The major contribution to annual average NO_x concentrations at many locations within Hillingdon is from major roads. However, Heathrow Airport is the major contributor at some locations.

The maximum contribution to the emissions of NO_x from Heathrow Airport is from airborne aircraft, which contribute 66%. At most locations within Hillingdon, the major contribution to NO_x concentrations resulting from the airport emissions is from airborne aircraft.

Modelling has therefore been carried out for a “do-nothing” scenario and for the following three scenarios:

- Scenario 1: Reduction of 50% in airborne aircraft emissions;
- Scenario 2: Reduction of 30% in traffic flows; and
- Scenario 3: Low Emission Zone (EURO II).

All emissions data and other parameters are as for the previous studies carried out for this area. All scenarios have been modelled for the year 2005, which is the year by which the Air Quality Strategy Objective values for NO₂ are required to be achieved.

3.1 Receptor Locations

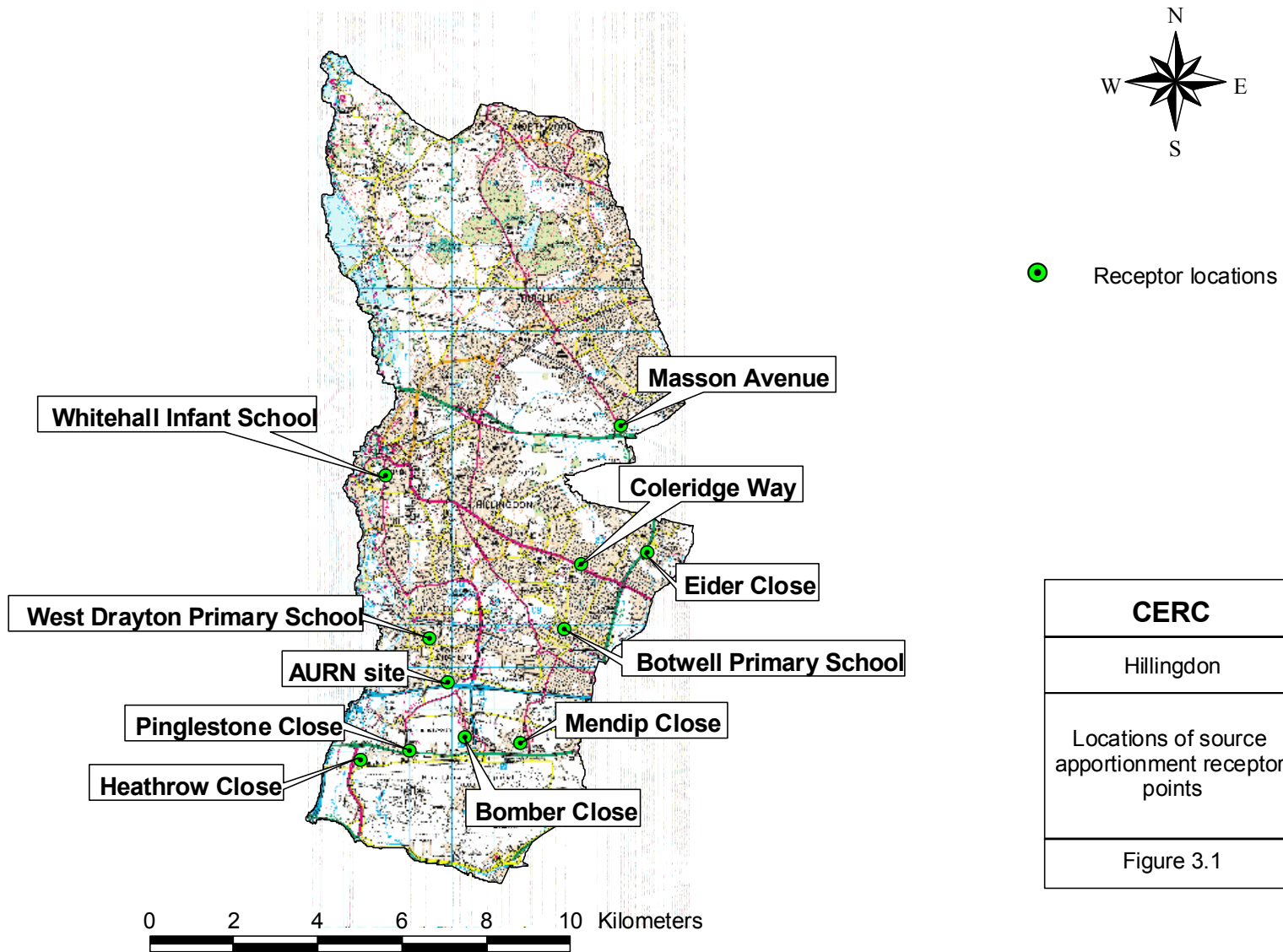
For each scenario, annual average concentrations of both NO_x and NO₂ have been predicted at each of eleven receptor points, for comparison with results from the “do nothing” scenario.

The receptor point locations are the same as those used for the source apportionment exercise, shown in Figure 3.1. Details of these receptor locations are given in Table 3.1, together with the total annual average NO₂ concentrations predicted at each of the locations for the “do nothing” scenario in the year 2005.

It can be seen from Table 3.1 that, for the “do nothing” scenario, the annual average NO₂ concentrations are predicted to exceed the AQS objective value of 40µg/m³ at seven of the eleven receptor points considered.

Table 3.1: Source apportionment receptor point locations within Hillingdon

ID	Description	Location	Annual average NO₂ concentration (µg/m³)
1	Masson Avenue	511019, 184714	39.3
2	Eider Close	511642, 181709	40.4
3	Coleridge Way	510073, 181410	35.4
4	Botwell Primary School	509681, 179870	40.5
5	Mendip Close	508640, 177199	47.0
6	Bomber Close	507307, 177301	45.0
7	Pinglestone Close	505996, 177006	45.6
8	Heathrow Close	504842, 176789	42.1
9	West Drayton Primary School	506473, 179674	37.7
10	AURN site	506900, 178620	51.9
11	Whitehall Infant School	505432, 183532	36.8



4. Emission Reduction Scenario Results

For each scenario, annual average concentrations of both NO_x and NO₂ have been predicted at each of the eleven receptor points presented in Section 3.1, for comparison with results from the “do nothing” scenario. The predicted reduction in concentrations, in µg/m³ and as a percentage, is also presented in each case. Note that the reductions in NO₂ concentrations are smaller than those for NO_x because of the NO_x chemistry taking place. The predicted NO_x and NO₂ concentrations for the “do nothing” and each emission reduction scenario are shown in Figures 4.1 and 4.2.

4.1 Scenario 1: Reduction of 50% in airborne aircraft emissions

The predicted annual average concentrations of NO_x and NO₂ for Scenario 1 are presented in Tables 4.1a and 4.1b, respectively.

Table 4.1a: Predicted annual average NO_x concentrations for “do nothing” and Scenario 1

	Annual average NO _x concentration (µg/m ³)			
	Existing	Scenario 1	Difference	% reduction
Masson Avenue	54.9	53.8	1.0	2
Eider Close	58.0	56.5	1.5	3
Coleridge Way	47.0	45.3	1.7	4
Botwell Primary School	55.5	53.1	2.4	4
Mendip Close	68.5	60.2	8.3	12
Bomber Close	65.1	57.8	7.3	11
Pinglestone Close	67.7	59.9	7.8	12
Heathrow Close	62.4	57.7	4.7	8
West Drayton Primary School	51.1	48.9	2.1	4
AURN site	96.6	93.6	3.0	3
Whitehall Infant School	49.7	48.9	0.8	2

Table 4.1b: Predicted annual average NO₂ concentrations for “do nothing” and Scenario 1

	Annual average NO ₂ concentration (µg/m ³)			
	Existing	Scenario 1	Difference	% reduction
Masson Avenue	39.3	38.8	0.5	1
Eider Close	40.4	39.6	0.7	2
Coleridge Way	35.4	34.4	1.0	3
Botwell Primary School	40.5	39.2	1.3	3
Mendip Close	47.0	43.1	4.0	8
Bomber Close	45.0	41.3	3.7	8
Pinglestone Close	45.6	41.9	3.7	8
Heathrow Close	42.1	39.8	2.3	5
West Drayton Primary School	37.7	36.5	1.2	3
AURN site	51.9	50.8	1.1	2
Whitehall Infant School	36.8	36.4	0.4	1

The predicted reduction in annual average NO₂ concentrations due to Scenario 1 ranges from 1% at Whitehall Infant School and Masson Avenue to 8% at Mendip Close, Bomber Close and Pingleston Close.

4.2 Scenario 2: Reduction in traffic flows by 30%

The predicted annual average concentrations of NO_x and NO₂ for Scenario 2 are presented in Tables 4.2a and 4.2b, respectively.

Table 4.2a: Predicted annual average NO_x concentrations for “do nothing” and Scenario 2

	Annual average NO _x concentration (µg/m ³)			
	Existing	Scenario 2	Difference	% reduction
Masson Avenue	54.9	49.6	5.3	10
Eider Close	58.0	52.6	5.3	9
Coleridge Way	47.0	44.9	2.2	5
Botwell Primary School	55.5	52.8	2.7	5
Mendip Close	68.5	65.1	3.4	5
Bomber Close	65.1	61.3	3.7	6
Pingleston Close	67.7	62.5	5.2	8
Heathrow Close	62.4	56.1	6.3	10
West Drayton Primary School	51.1	47.8	3.2	6
AURN site	96.6	81.1	15.5	16
Whitehall Infant School	49.7	46.7	3.1	6

Table 4.2b: Predicted annual average NO₂ concentrations for “do nothing” and Scenario 2

	Annual average NO ₂ concentration (µg/m ³)			
	Existing	Scenario 2	Difference	% reduction
Masson Avenue	39.3	36.9	2.5	6
Eider Close	40.4	38.2	2.2	5
Coleridge Way	35.4	34.3	1.1	3
Botwell Primary School	40.5	39.3	1.3	3
Mendip Close	47.0	45.8	1.2	3
Bomber Close	45.0	43.5	1.5	3
Pingleston Close	45.6	43.6	2.0	5
Heathrow Close	42.1	39.3	2.8	7
West Drayton Primary School	37.7	36.0	1.6	4
AURN site	51.9	48.6	3.4	7
Whitehall Infant School	36.8	35.4	1.5	4

The predicted reduction in annual average NO₂ concentrations due to Scenario 2 ranges from 3% at Coleridge Way, Botwell Primary School, Mendip Close and Bomber Close to 7% at Heathrow Close and the AURN site.

4.3 Scenario 3: Low Emission Zone (EURO II)

For the purposes of this modelling a Low Emission Zone (LEZ) has been set up from which certain vehicle types are excluded. All vehicles (excluding private cars) with engines which do not meet the standard of EURO II with particulate traps have been excluded from Hillingdon and Hounslow. The total number of vehicles has been assumed to remain the same.

The predicted annual average concentrations of NO_x and NO₂ for scenario 3 are presented in Tables 4.3a and 4.3b, respectively.

Table 4.3a: Predicted annual average NO_x concentrations for “do nothing” and Scenario 3

	Annual average NO _x concentration (µg/m ³)			
	Existing	Scenario 2	Difference	% reduction
Masson Avenue	54.9	54.4	0.5	1
Eider Close	58.0	57.1	0.8	1
Coleridge Way	47.0	46.7	0.3	1
Botwell Primary School	55.5	55.1	0.4	1
Mendip Close	68.5	68.0	0.5	1
Bomber Close	65.1	64.5	0.5	1
Pinglestone Close	67.7	66.9	0.8	1
Heathrow Close	62.4	61.4	1.0	2
West Drayton Primary School	51.1	50.6	0.5	1
AURN site	96.6	94.0	2.6	3
Whitehall Infant School	49.7	49.4	0.3	1

Table 4.3b: Predicted annual average NO₂ concentrations for “do nothing” and Scenario 3

	Annual average NO ₂ concentration (µg/m ³)			
	Existing	Scenario 2	Difference	% reduction
Masson Avenue	39.3	39.1	0.2	1
Eider Close	40.4	40.0	0.3	1
Coleridge Way	35.4	35.2	0.2	0
Botwell Primary School	40.5	40.3	0.2	1
Mendip Close	47.0	46.8	0.2	0
Bomber Close	45.0	44.8	0.2	1
Pinglestone Close	45.6	45.3	0.3	1
Heathrow Close	42.1	41.7	0.4	1
West Drayton Primary School	37.7	37.4	0.3	1
AURN site	51.9	51.4	0.5	1
Whitehall Infant School	36.8	36.7	0.1	0

The predicted reduction in annual average NO₂ concentrations due to Scenario 3 is zero at Coleridge Way, Mendip Close and Whitehall Infant School and 1% at all other receptor locations.

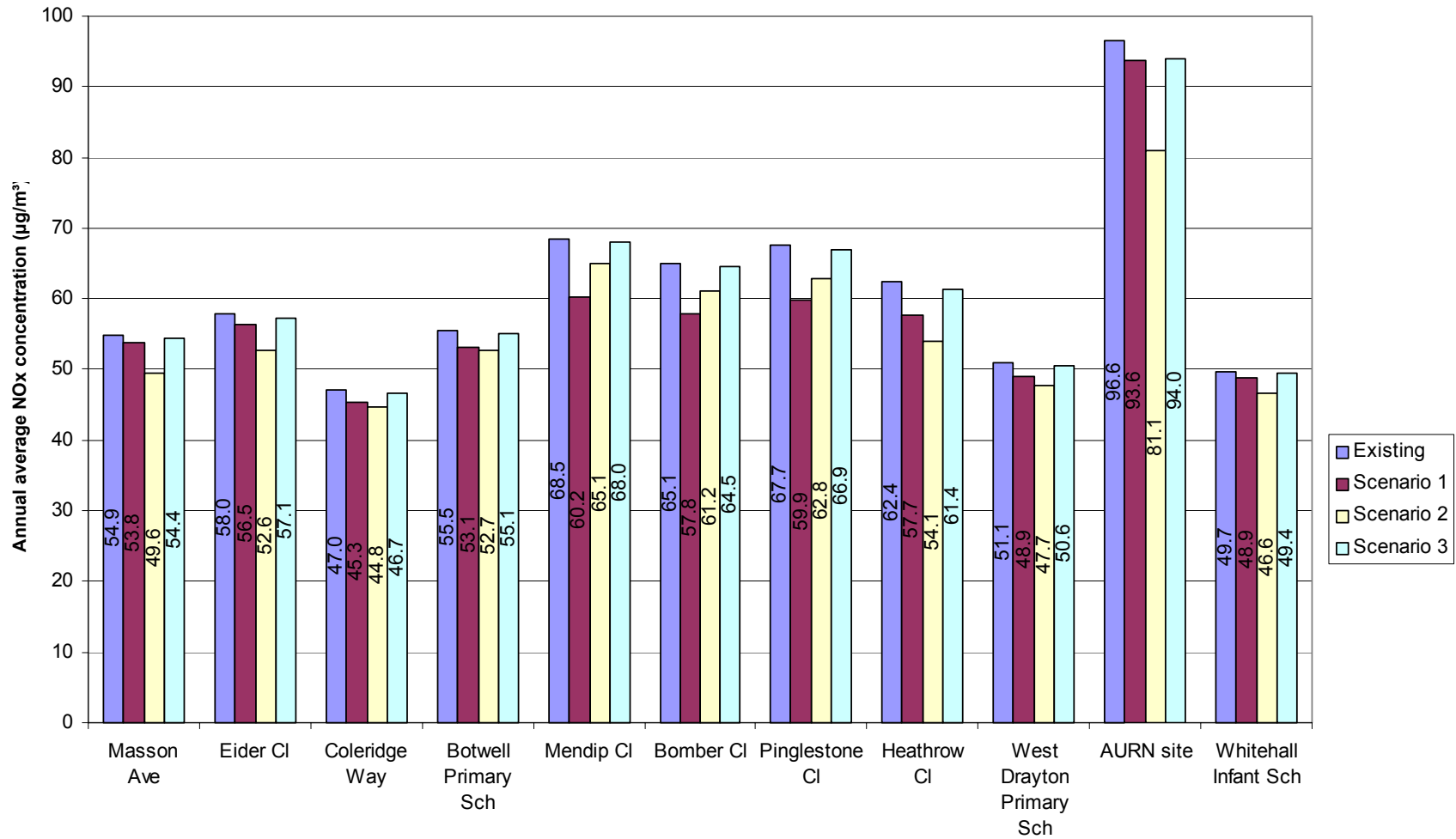


Figure 4.1. Predicted annual average NOx concentrations for existing situation and Scenarios 1, 2 & 3

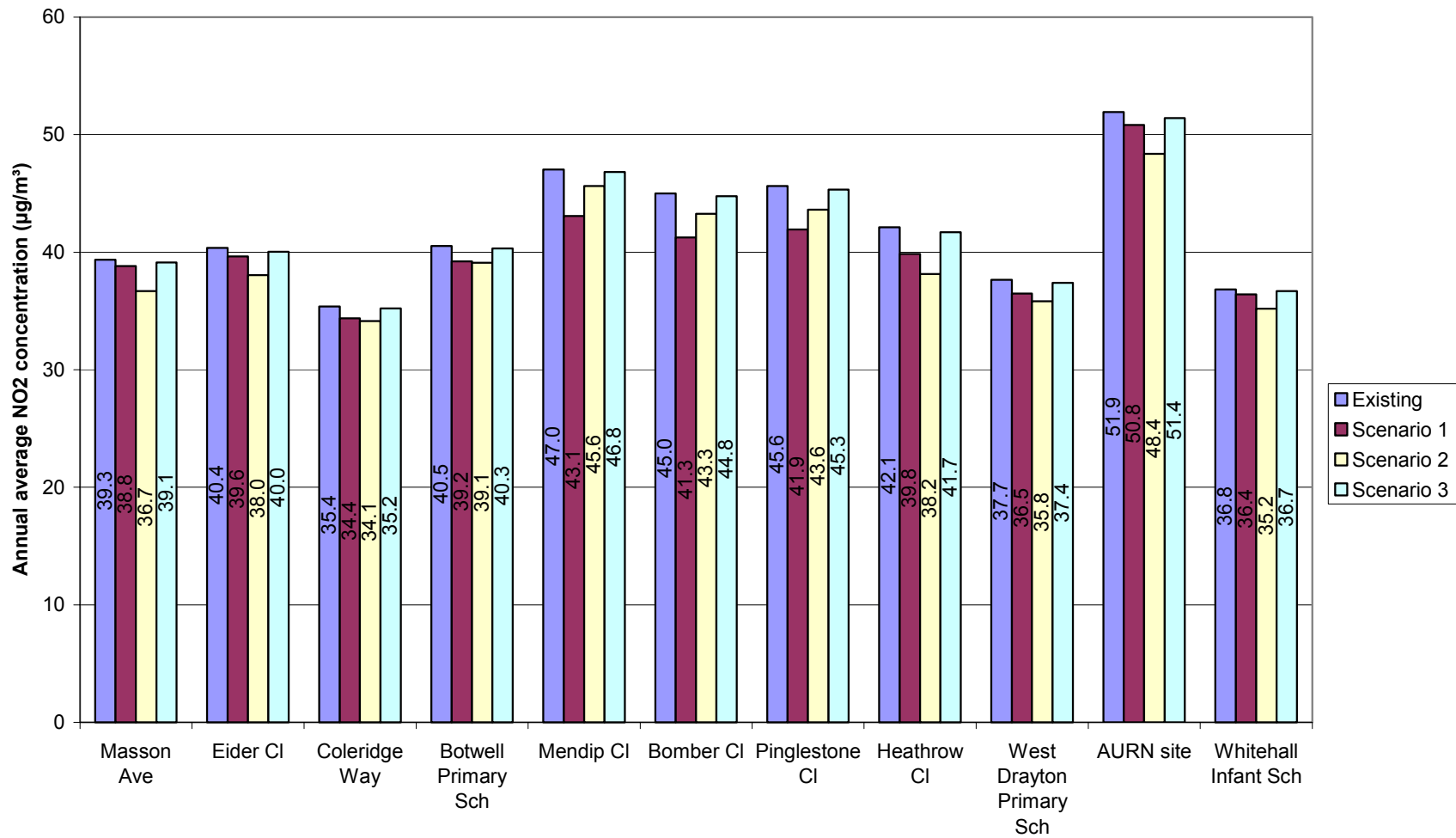


Figure 4.2. Predicted annual average NO2 concentration for existing situation and Scenarios 1, 2 & 3

10. Discussion

An air quality modelling study was carried out for Hillingdon, Hounslow and Spelthorne and is described in the report *Air quality modelling for West London: Hillingdon, Hounslow, Spelthorne and Slough*, 27th August 2002. A source apportionment study for emissions of NO_x and PM₁₀ (*Source apportionment for Hillingdon, Hounslow and Spelthorne*, 17th December 2002) showed that emissions from major roads and from Heathrow Airport are of primary concern in the area.

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