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6.4 Environmental Statement
Appendix 5.4 Air Quality
Baseline Data

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**The Infrastructure Planning
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and Procedure) Regulations 2009**

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**6.4 Environmental Statement
Appendix 5.4 Air Quality Baseline Data**

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1 Baseline data

1.1 Local air quality monitoring

- 1.1.1 Measurements of nitrogen dioxide (NO₂) concentrations in the study area (i.e. within 200m of the Affected Road Network (ARN)) were undertaken using passive monitoring diffusion tubes at 22 locations in the base year 2016. Results of local monitoring are available from the air quality Annual Status Reports (ASRs) from South Gloucestershire Council¹, Swindon Borough Council², West Berkshire Council³, Wiltshire Council⁴, Cheltenham Borough Council⁵, Cotswold District Council⁶, Gloucester City Council⁷, Stroud District Council⁸, Tewkesbury Borough Council⁹ and West Oxfordshire District Council¹⁰. Monitoring of PM₁₀ is not currently undertaken in the study area. Details of the local authority monitoring sites are presented in Table 1-1.
- 1.1.2 A summary of diffusion tube monitoring results for local air quality monitoring sites in the study area is presented in Table 1-2, for annual mean NO₂ concentrations from 2014 to 2019. Any NO₂ annual mean concentrations, shown in the table, exceeding the 40µg/m³ air quality objective are highlighted in bold. Concentrations of annual mean NO₂ exceeding the objective have been recorded in 2014- 2019 in the study area. The exceedances were at roadside locations in Cheltenham and the Birdlip roundabout (location of the Air Balloon Air Quality Management Area (AQMA)) in the Cotswolds.
- 1.1.3 Cotswold District Council had maintained an automatic monitor for NO₂ at the Air Balloon public house, Birdlip until early 2014. However, due to technical issues there was no monitoring data available from this automatic analyser to report after 2013.
- 1.1.4 Concentrations recorded by diffusion tubes at the scheme location by the Air Balloon roundabout were recorded as exceeding the air quality objective for annual mean NO₂ between 2014-2019. The highest concentration recorded of 61µg/m³ is well above the objective of 40µg/m³, however it is at a roadside location which is not representative of relevant exposure.

Table 1-1 Details of local authority monitoring sites

Local authority and ID	Site name	Site classification	National grid reference		In AQMA (Y/N)
			X	Y	
Cheltenham 6.1	56 Church Road	Roadside	394577	219728	Y
Cheltenham 18	81 London Road	Roadside	395660	221670	Y
Cotswold T8/N@1S1	Cirencester – London Road (Wagon/Horses)	Kerbside	402735 ^a	201962 ^a	N
Cotswold T11/N@1S1 /NAS39	Birdlip – Air Balloon	Kerbside	393446 ^a	216118 ^a	Y
Cotswold T12	Birdlip – Air Balloon 1	Kerbside	393459 ^a	216124 ^a	Y
Cotswold T13	Birdlip – Air Balloon 2	Kerbside	393459 ^a	216124 ^a	Y
Cotswold T16	Stow Lodge	Kerbside	403943	202961	N
Cotswold N@1S12/NAS28	Opp 8 Burford Road	Roadside	403124	202245	N
Cotswold N@1S4/NAS33	Tetbury Road, Cirencester	Roadside	401064	201044	Y
Cotswold N@1S8/NAS29	62 Grove Lane, Cirencester / Abbey Way j/w Spitalgate	Roadside	402305	202519	Y
Cotswold N@1S9/NAS32	Hammond Way, Cirencester	Kerbside	402309	201765	Y
Cotswold N@1S10/NAS31	Lewis Lane, Cirencester	Roadside	402480	201772	Y
Gloucester 3	35 Buscombe Gardens	Roadside	387670	217250	N
Gloucester 4	12 Caravan Site	Urban background	387250	216530	N
Stroud 3	Brookthorpe – North View	Roadside	383410	212570	N
Stroud 31	Upton St Leonards – 50 Woodland Green	Kerbside	386301	215294	N
Tewkesbury 14N	69 Sussex Gardens	Urban background	387915	217389	Y
Tewkesbury 15N	Comus Bamforlong	Urban background	389714	221845	N
Tewkesbury 16N	15 Withybridge Gardens	Urban background	390461	225544	N
Tewkesbury 52N	43 Stocken Close	Roadside	387570	216935	N
Tewkesbury 54N	Woodside House - Crickley Hill	Urban centre	393106	215913	N
Swindon S10	Meadow Way	Roadside	419347	180975	N

Note: Coordinates are based on 2017 ASR. The location of this diffusion tube has been moved according to the 2018 ASR.

Table 1-2 Local authority monitoring results

Local authority and ID	Site name	Annual mean NO ₂ (µg/m ³)					
		2014	2015	2016	2017	2018	2019
Cheltenham 18	London Road	41.8	41.4	39.6	38.4	37.3	37.6
Cotswold T8/N@1S1	Cirencester – London Road (Wagon/Horses)	29.8	23.8	30.4	25.7	22.6	n/a
Cotswold T11/N@1S1 /NAS39	Birdlip – Air Balloon	61.5	59.1	61.2	61.4	54.1	50.9
Cotswold T12	Birdlip – Air Balloon 1	40.3	40.5	39.8	n/a	n/a	n/a
Cotswold T13	Birdlip – Air Balloon 2	41.4	39.4	39.2	n/a	n/a	n/a
Cotswold T16	Stow Lodge	32.2	31.7	33.3	n/a	n/a	n/a
Cotswold N@1S12 / NAS28	Opp 8 Burford Road	n/a	n/a	n/a	23.2	15.6	29.8
Cotswold N@1S4 / NAS33	Tetbury Road, Cirencester	n/a	n/a	n/a	24.6	21.8	21.6
Cotswold N@1S8 / NAS29	62 Grove Lane, Cirencester / Abbey Way j/w Spitalgate	n/a	n/a	n/a	34.8	29.8	29.9
Cotswold N@1S9 / NAS32	Hammond Way, Cirencester	n/a	n/a	n/a	21.0	18.1	17.2
Cotswold N@1S10 NAS31	Lewis Lane, Cirencester	n/a	n/a	n/a	22.6	20.9	20.6
Gloucester 3	35 Buscombe Gardens	27.9	25.5	27.9	24.0	23.7	24.3
Gloucester 4	12 Caravan Site	22.6	20.4	22.7	19.6	19.4	17.4
Stroud 3	Brookthorpe – North View	25.1	25.9	27.6	21.7	n/a	n/a
Stroud 31	Upton St Leonards – 50 Woodland Green	22.9	24.6	27.1	21.4	22.5	18.7
Tewkesbury 14N	69 Sussex Gardens	26.3	25.4	26.8	24.9	n/a	n/a
Tewkesbury 15N	Comus Bamforlong	27.9	28.5	25.6	26.4	n/a	n/a
Tewkesbury 16N	15 Withybridge	27.8	26.5	29.0	26.0	n/a	n/a
Tewkesbury 52N	43 Stocken Close	25.5	25.1	26.2	25.9	n/a	n/a
Tewkesbury 54N	Woodside House - Crickley Hill	n/a	n/a	30.6	24.2	n/a	n/a
Swindon S10	Meadow Way	31.1	30.4	30.1	28.4	n/a	n/a
Cheltenham 6.1	56 Church Road	n/a	20.5	n/a	n/a	n/a	n/a
n/a: monitoring data not available							

1.2 Scheme-specific monitoring

- 1.2.1 Highways England carried out monitoring of NO₂ using diffusion tubes at 22 monitoring sites from January 2016 to June 2016. Twenty-one of the sites were located where humans maybe exposed to a change in concentrations.
- 1.2.2 Since data capture is less than 75% at any location (i.e. 9 months), monitored results have been annualised, to determine a representative annual mean concentration for comparison with the annual mean NO₂ objective.
- 1.2.3 The results have been bias adjusted following Department for Environment, Food & Rural Affairs (Defra) guidance. The bias adjustment and annualisation was carried out by consultants on behalf of Highways England for the Environmental Impact Assessment (EIA) Scoping Report¹¹ and has been used for this assessment. The details of the monitoring locations are shown in Table 1-3. The annualised and bias-adjusted results are presented in Table 1-4.
- 1.2.4 Most of the monitoring sites measured NO₂ concentrations that were below the annual mean objective. The only monitoring site that recorded an exceedance for the annual mean NO₂ objective was at the house opposite the Air Balloon public house within the Birdlip AQMA. The annual mean NO₂ concentration recorded was 41.7µg/m³.

Table 1-3 Scheme specific monitoring

Site name	Location	Site classification	National grid reference	
			X	Y
A417AB_001_1215	Birdlip	Roadside	393205	214125
A417AB_002_1215	Road off A417 towards	Roadside	393802	215431
A417AB_003_1215	The Willows, near Crickley Hill	Roadside	393030	215876
A417AB_004_1215	House opposite The Air Balloon Pub	Roadside	393458	216121
A417AB_005_1215	A436	Roadside	394269	216375
A417AB_006_1215	Ullenwood Cottages, Greenway Lane	Roadside	394413	216847
A417AB_007_1215	B4070 Ridgeway Close	Roadside	392618	214415
A417AB_008_1215	Shurdington Road near roundabout	Roadside	390439	216678
A417AB_009_1215	Shurdington Road (Henley Bank Lane)	Roadside	390397	216488
A417AB_010_1215	62 Court Road	Roadside	389182	216837
A417AB_011_1215	End of Cedar Road	Roadside	388598	217247
A417AB_012_1215	73 Sussex Gardens	Roadside	387925	217384
A417AB_013_1215	13 Hucclecote Road	Roadside	388356	216802
A417AB_014_1215	Churchdown Lane	Roadside	387623	217636
A417AB_015_1215	14 Millfields	Roadside	387454	217908
A417AB_016_1215	Hucclecote Road side of 177 Sussex Gardens	Roadside	388124	216931
A417AB_017_1215	Shurdington Road	Roadside	390599	216877
A417AB_018_1215	Near Shab Hill	Urban Background	394270	215829
A417AB_019_1215	Dog Lane Sign	Roadside	391469	216107
A417AB_020_1215	76 Mill Lane	Roadside	390190	216546
A417AB_021a_1215*	Triplicate co-location, The Air Balloon Pub (Automatic Monitor)	Roadside	393431	216092
A417AB_022_1215	1 Oak Drive	Roadside	388908	217014

* Automatic monitor refers to a local authority automatic monitor. However, it was not in operation at the time of the scheme specific monitoring survey

Table 1-4 Scheme specific monitoring results

Site name	Location	2016 Annualised NO ₂ (µg/m ³)
A417AB_001_1215	Birdlip	7.7
A417AB_002_1215	Road off A417 towards	8.3
A417AB_003_1215	The Willows, near Crickley Hill	29.1
A417AB_004_1215	House opposite The Air Balloon Pub	41.7
A417AB_005_1215	A436	19.0
A417AB_006_1215	Ullenwood Cottages, Greenway Lane	9.3
A417AB_007_1215	B4070 Ridgeway Close	16.9
A417AB_008_1215	Shurdington Road near roundabout	18.7
A417AB_009_1215	Shurdington Road (Henley Bank Lane)	11.4
A417AB_010_1215	62 Court Road	13.4
A417AB_011_1215	End of Cedar Road	14.9
A417AB_012_1215	73 Sussex Gardens	20.4
A417AB_013_1215	13 Hucclecote Road	19.4
A417AB_014_1215	Churchdown Lane	22.6
A417AB_015_1215	14 Millfields	20.4
A417AB_016_1215	Hucclecote Road side of 177 Sussex Gardens	18.0
A417AB_017_1215	Shurdington Road	26.5
A417AB_018_1215	Near Shab Hill	7.3
A417AB_019_1215	Dog Lane Sign	12.9
A417AB_020_1215	76 Mill Lane	13.5
A417AB_021a_1215	Automatic Monitor, The Air Balloon Pub (triplicate co-location)	34.2
A417AB_021b_1215	Automatic Monitor, The Air Balloon Pub (triplicate co-location)	33.9
A417AB_021c_1215	Automatic Monitor, The Air Balloon Pub (triplicate co-location)	35.8
A417AB_022_1215	1 Oak Drive	12.1

1.3 Background pollution concentrations

- 1.3.1 Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of sources, such as roads and industrial processes. Defra has produced estimated background air pollution data for each 1km by 1km OS grid square for each local authority area in the UK¹². Background maps are available for 2017 and projected through to 2030.
- 1.3.2 Estimated background air pollution data for 2017 for NO₂ and PM₁₀ for the local authorities within the ARN are presented in Table 1-5. The table shows the maximum, minimum and average concentrations for the grid squares in the following local authorities:
- Cheltenham Borough Council
 - Cotswold District Council
 - Gloucester City Council
 - South Gloucestershire District Council
 - Stroud District Council
 - Swindon Borough Council
 - Tewkesbury Borough Council
 - West Berkshire Council
 - West Oxfordshire District Council
 - Wiltshire Council
- 1.3.3 As the table shows, none of the background concentrations are above the relevant annual Air Quality Strategy (AQS) objective concentration for NO₂ or PM₁₀ (40µg/m³).

Table 1-5 Predicted background pollutant concentrations for 2017

Local Authority	Annual mean NO ₂ concentration (µg/m ³)			Annual mean PM ₁₀ concentration (µg/m ³)		
	Max	Min	Average	Max	Min	Average
Cheltenham Borough Council	17.5	7.7	12.2	14.6	12.0	13.1
Cotswold District Council	11.7	5.8	6.9	16.3	11.5	13.2
Gloucester City Council	18.1	8.1	13.3	15.3	12.1	13.6
South Gloucestershire District Council	26.1	5.9	11.4	17.2	10.7	13.2
Stroud District Council	18.9	5.8	8.5	15.8	10.8	12.4
Swindon Borough Council	20.2	7.9	12.1	17.7	12.8	14.5
Tewkesbury Borough Council	22.7	5.9	8.9	16.8	11.5	13.0
West Berkshire Council	22.7	8.3	11.1	17.1	12.4	14.2
West Oxfordshire District Council	12.3	6.4	7.9	16.7	12.3	14.2
Wiltshire Council	19.0	4.9	7.9	16.6	11.3	13.1

- 1.3.4 A comparison has been undertaken between the Defra background concentrations and monitored background concentrations from local authority and scheme specific sites. There is limited background monitoring in the study area. Most of the background monitoring available in the 10 neighbouring local authorities are at urban background locations and are not representative of the study area.

- 1.3.5 A comparison of the monitored background data at rural background monitoring sites and the Defra mapped concentrations has been carried out as shown in Table 1-6.
- 1.3.6 All of the monitored background concentrations are well below the annual mean air quality objective for NO₂ and the absolute difference in µg/m³ between monitored and modelled is small. The Defra predicted background concentrations have been used for the air quality assessment.

Table 1-6 Comparison between Defra modelled background concentration and local background monitoring

Site ID	Grid square		Local authority	Local authority monitored NO ₂ 2016 (µg/m ³)	Defra background NO ₂ 2017 (µg/m ³)	Difference (µg/m ³)	% change
	X	Y					
Elmbridge Road Junior School	385500	218500	Gloucester City Council	15.2	18.1	2.9	18.8
Gloucester Guildhall	383500	218500	Gloucester City Council	18.6	17.3	-1.3	-7.2
Frethern Cl, Burford	425500	211500	West Oxfordshire	10.7	8.4	-2.3	-21.8
Orchard Rise	425500	211500	West Oxfordshire	9.6	8.4	-1.2	-12.9
Near Shab Hill	394500	215500	Scheme specific monitor	7.3	8.4	1.1	15.2

End notes and References

- ¹ South Gloucestershire Council, 2019 Air Quality Annual Status Report (ASR)
- ² Swindon Borough Council, 2018 Air Quality Annual Status Report (ASR) (for 2017 monitoring year)
- ³ West Berkshire Council, 2019 Air Quality Annual Status Report (ASR)
- ⁴ Wiltshire Council, 2017 Air Quality Annual Status Report (ASR)
- ⁵ Cheltenham Borough Council, 2020 Air Quality Annual Status Report (ASR)
- ⁶ 2020 Air Quality Annual Status Report (ASR) for Cotswold District Council
- ⁷ Gloucester City Council, 2019 Air Quality Annual Status Report (ASR)
- ⁸ Stroud District Council, 2020 Air Quality Annual Status Report (ASR)
- ⁹ Tewkesbury Borough Council, 2018 Air Quality Annual Status Report (ASR)
- ¹⁰ 2019 Air Quality Annual Status Report (ASR) for West Oxfordshire District Council
- ¹¹ A417 Missing Link Scoping Report <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010056/TR010056-000009-A417%20-%20Scoping%20Report.pdf>
- ¹² Defra background maps <https://uk-air.defra.gov.uk/data/laqm-background-home>