Havering Air Quality Annual Status Report for 2018
Date of publication: July 2019

This report provides a detailed overview of air quality in the London Borough of Havering during 2018. It has been produced to meet the requirements of the London Local Air Quality Management statutory process[1].

1 LLAQM Policy and Technical Guidance 2016 (LLAQM.TG(16)). https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/working-boroughs

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Report Reference number	HAVASR_2019
Date	July 2019

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Abbreviations

AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
BEB	Buildings Emission Benchmark
CAB	Cleaner Air Borough
CAZ	Central Activity Zone
EV	Electric Vehicle
GLA	Greater London Authority
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LLAQM	London Local Air Quality Management
NRMM	Non-Road Mobile Machinery
PM_{10}	Particulate matter less than 10 micron in diameter
$PM_{2.5}$	Particulate matter less than 2.5 micron in diameter
TEB	Transport Emissions Benchmark
TfL	Transport for London

Table A. Summary of National Air Quality Standards and Objectives

Pollutant	Objective (UK)	Averaging Period	Date[1]
Nitrogen dioxide - NO_2	200 µg m^{-3} not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
	40 µg m^{-3}	Annual mean	31 Dec 2005
Particles - PM_{10}	50 µg m^{-3} not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
	40 µg m^{-3}	Annual mean	31 Dec 2004
Particles - $PM_{2.5}$	25 µg m^{-3}	Annual mean	2020
	Target of 15% reduction in concentration at urban background locations	3 year mean	Between 2010 and 2020
Sulphur Dioxide (SO_2)	266 µg m^{-3} not to be exceeded more than 35 times a year	15 minute mean	31 Dec 2005
	350 µg m^{-3} not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	125 µg m^{-3} mot to be exceeded more than 3 times a year	24 hour mean	31 Dec 2004

Note: [1] by which to be achieved by and maintained thereafter

1. Air Quality Monitoring

1.1 Locations

Table B. Details of Automatic Monitoring Sites for 2018

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Monitoring technique
HV1	Rainham	553127	182506	Roadside	Y	3	10	3	NO_2, PM_{10}, $PM_{2.5}$	Chemiluminescent; TEOM, FDMS
HV3	Romford	551108	188257	Roadside	Y	3	8	3	NO_2, PM_{10}	Chemiluminescent; FDMS

Table C. Details of Non-Automatic Monitoring Sites for 2018

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor? (Y/N)
HAV2, HAV5, HAV6	Mercury Gardens	551488	188993	Urban Centre	Y	1	3	2	NO_2	N

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor? (Y/N)
HAV1, HAV7, HAV8	Waterloo Road	551108	188257	Urban Centre	Y	3	8	2	NO_2	Y
HAV3	Nelson Road	551726	183462	Urban Background	Y	3	1	2	NO_2	N
HAV4	Langtons	553724	187560	Urban Background	Y	N/A	N/A	2	NO_2	N
HAV9, HAV10, HAV11	Alexandra Road	551629	188296	Urban Centre	Y	3	1	2	NO_2	N
HAV12	Main Road GPPS	552096	189619	Roadside	Y	4	1	2	NO_2	N
HAV13, HAV14, HAV15	A12 Junction with North Street	550607	189685	Roadside	Y	5	5	2	NO_2	N
HAV16, HAV17, HAV18	Rom Valley Way	551414	187802	Roadside	Y	N/A	1	2	NO_2	N
HAV19, HAV20, HAV21	Collier Row	549837	191109	Kerbside	Y	3	0.5	2	NO_2	N
HAV22, HAV23, HAV24	Ravensbourne School	553707	190817	Urban Background	Y	N	1	2	NO_2	N

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor? (Y/N)
HAV25	Wincanton Road	553727	193161	Urban Background	Y	N	3	2	NO_2	N
HAV26	Adj. 109 Cross Road	549532	189777	Urban Background	Y	3	1	2	NO_2	N
HAV27, HAV28, HAV29	Rush Green Road	550942	187420	Kerbside	Y	5	0.5	2	NO_2	N
HAV30	Marlborough Road	549318	189384	Urban Background	Y	3	1	2	NO_2	N
HAV31	Danes Road	550197	187908	Industrial	Y	4	1	2	NO_2	N
HAV32, HAV33, HAV34	Gallows Corner	553410	190558	Kerbside	Y	4	0.5	2	NO_2	N
HAV35	Church Road	554204	193795	Urban Background	Y	3	1	2	NO_2	N
HAV36	Bedford Park Entrance	551755	193022	Rural	Y	N	1	2	NO_2	N
HAV37	Colchester Road	555723	191750	Kerbside	Y	3	0.5	2	NO_2	N
HAV 38	Myrtle Road	553434	191656	Roadside	Y	N	1	2	NO_2	N
HAV39	Rise Park Boulevard	551616	190622	Roadside	Y	3	1	2	NO_2	N
HAV40	Main Road	553174	190306	Roadside	Y	9	1	2	NO_2	N
HAV41	Main Road	552517	189826	Roadside	Y	8	1	2	NO_2	N

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor? (Y/N)
HAV42	Mawney School	550623	188890	Kerbside	Y	2	1	2	NO_2	N
HAV43	Upminster School	556072	186539	Roadside	Y	2	2	2	NO_2	N
HAV44	Ardleigh Green School	553952	189731	Kerbside	Y	5	1	2	NO_2	N
HAV45	St. Marys School RC	552327	187422	Kerbside	Y	10	1	2	NO_2	N
HAV46	Rainham Village School	552441	182337	Kerbside	Y	1	1	2	NO_2	N
HAV47	Campion School off A127	554730	189487	Roadside	Y	7	2	2	NO_2	N
HAV48	Parkland School	550602	189990	Urban Background	Y	N	1	2	NO_2	N
HAV49	Newton's School	550722	183294	Roadside	Y	2	1	2	NO_2	N
HAV50	Blewitts Cottages	551526	182672	Kerbside	Y	12	0.5	2	NO_2	N
HAV51	St. Edwards School	551180	189432	Urban Background	Y	N	1	2	NO_2	N
HAV52	Opp. Harold Wood Stn.	554741	190626	Roadside	Y	0	2	2	NO_2	N
HAV56	Rainham Tesco	552047	182357	Kerbside	Y	1	1	2	NO_2	N

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure (m)	Distance to kerb of nearest road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor? (Y/N)
HAV57	Romford Taxi Rank	551420	188526	Urban Centre	Y	1	0.1	2	NO_2	N
HAV58, HAV59, HAV60	Battis	551397	188509	Urban Centre	Y	1	0.1	2	NO_2	N
HAV61	Wennington Road	553719	180987	Urban Background	Y	N	1	2	NO_2	N

The locations of the above sites are shown on maps included in Appendix C.

1.2 Comparison of Monitoring Results with AQOs

The results presented are bias-adjusted and annualised. Distance adjustment data are provided in Table L of Appendix A.

Table D. Annual Mean NO_2 Ratified and Bias-adjusted Monitoring Results (µg m^{-3})

Site ID	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µg m^{-3})						
				2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018
HV1	Automatic	-	99	-	30.2	35.3	32	34	34.3	30
HV3	Automatic	-	83	36.2	34	**57.5**	35	38	**40**	38
HAV 2, 5, 6	Diffusion Tube	-	100	**56.6**	**55.8**	**54.0**	**51.7**	**55.9**	**51.1**	**47.9**

Site ID	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µg m^{-3})						
				2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018
HAV 1, 7, 8	Diffusion Tube	-	94	**46.5**	**44**	**40.6**	39.0	**40.7**	**40.3**	39.6
HAV 3	Diffusion Tube	-	100	30.5	28.6	32.9	28.3	29	31.7	26.5
HAV 4	Diffusion Tube	-	83	22.1	19.5	24.5	20.1	26	20.1	17.3
HAV 9, 10, 11	Diffusion Tube	-	97	-	-	33.3	30.7	33.1	29.6	29
HAV 12	Diffusion Tube	-	100	-	-	36.8	37.4	**43**	**41.6**	36.6
HAV 13, 14, 15	Diffusion Tube	-	97	-	-	39.1	39.4	**41.7**	**40.5**	38.7
HAV 16, 17, 18	Diffusion Tube	-	100	-	-	34.2	34.7	36.5	39.8	34.8
HAV 19, 20, 21	Diffusion Tube	-	100	-	-	**45.6**	**44.8**	**44.8**	**49.2**	**40.4**
HAV 22, 23, 24	Diffusion Tube	-	100	-	-	25.8	26.6	28.3	30.4	25.3
HAV 25	Diffusion Tube	-	100	-	-	23.3	22.9	24.7	26.6	22.1
HAV 26	Diffusion Tube	-	100	-	-	21.1	22.7	23.8	27.3	21.4
HAV 27, 28, 29	Diffusion Tube	-	97	-	-	**47.8**	**47.6**	**52.3**	**54.1**	**51.4**
HAV 30	Diffusion Tube	-	100	-	-	21.8	24.8	24	29.1	21.6
HAV 31	Diffusion Tube	-	100	-	-	26.1	27.1	29.1	30.6	26.4
HAV 32, 33, 34	Diffusion Tube	-	94	-	-	**51.6**	**55.0**	**53.2**	**52.9**	**50.3**
HAV 35	Diffusion Tube	-	100	-	-	23.4	24.2	27.7	27.2	26.2
HAV 36	Diffusion Tube	-	100	-	-	15.7	21.1	21.8	23.9	18.3
HAV 37	Diffusion Tube	-	100	-	-	**49.8**	**48.2**	**55.3**	**55.3**	**48.0**
HAV 38	Diffusion Tube	-	100	-	-	22.2	21.5	24.8	25.3	22.2
HAV 39	Diffusion Tube	-	100	-	-	31.1	33.3	31.3	38.8	29.0
HAV 40	Diffusion Tube	-	100	-	-	**48.1**	**49.5**	**45.1**	**52.1**	**49.2**
HAV 41	Diffusion Tube	-	100	-	-	**43.0**	**45.0**	**46.2**	**49.6**	**40.9**
HAV 42	Diffusion Tube	-	100	-	-	32.3	31.4	31.7	31.6	30.8

Site ID	Site type	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µg m^{-3})						
				2012 [c]	2013 [c]	2014 [c]	2015 [c]	2016 [c]	2017 [c]	2018
HAV 43	Diffusion Tube	-	92	-	-	35.0	38.2	35.9	35.6	32.2
HAV 44	Diffusion Tube	-	100	-	-	37.7	37.1	37.9	36.7	34.4
HAV 45	Diffusion Tube	-	100	-	-	37.2	35.7	**40.7**	37.7	35.6
HAV 46	Diffusion Tube	-	92	-	-	32.9	31.3	34.5	33	32.2
HAV 47	Diffusion Tube	-	100	-	-	**48.5**	**42.0**	**46.5**	**42.3**	36.8
HAV 48	Diffusion Tube	-	92	-	-	27.3	28.4	30.7	37.8	25
HAV 49	Diffusion Tube	-	58	-	-	29.1	26.8	27.9	28	34.3
HAV 50	Diffusion Tube	-	100	-	-	38.3	**41.1**	**42.2**	**46.1**	**39.8**
HAV 51	Diffusion Tube	-	100	-	-	26.5	24.3	24.1	24.9	23.4
HAV 52	Diffusion Tube	-	100	-	-	37.5	34.3	37.3	**47.8**	**41.1**
HAV 53, 54, 55	Diffusion Tube	-	-	-	-	25.3	22.9	23.6	*[d]	*[d]
HAV 56	Diffusion Tube	-	92	-	-	**49.9**	**40.4**	**48.1**	**44.1**	**45.7**
HAV 57	Diffusion Tube	-	92	-	-	63.1	**59.0**	**62.9**	**61**	**64.7**
HAV 58, 59, 60	Diffusion Tube	-	97	-	-	84.7	75.2	**69.1**	**71.7**	**71.4**
HAV 61	Diffusion Tube	-	100	-	-	-	-	-	-	27.5

Notes: Exceedance of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in **bold**.
NO_2 annual means in excess of 60 µg m^{-3}, indicating a potential exceedance of the NO_2 hourly mean AQS objective are shown in bold and underlined.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%
[d] AQMS not in operation (Air quality monitoring was carried out at this site in order to investigate an air quality complaint. Following monitoring for 3 years it was decided to decommission this monitoring site). New locations will be decided following consultation with the GLA.

1.3 Results

For the vast majority of the monitoring sites (37 of the 40) a decrease in NO_2 concentrations has been identified, in comparison with the 2017 concentrations. For 18 of these sites the decrease can be considered significant (over 5 $\mu g/m^{-3}$). The NO_2 annual mean concentrations for four monitoring sites, which were exceeding the annual mean objective, were below the objective for the first time since 2016:

- HAV12 (Main Road): this site was exceeding the annual mean objective since 2016. The NO_2 annual mean concentration for 2018 was below the objective and this is the lowest concentration which has been recorded since 2014.
- HAV13, 14, 15 (A12 Junction with North Street): this site was exceeding the annual mean objective since 2016. The NO_2 annual mean concentration for 2018 was below the objective and this is the lowest concentration which has been recorded since 2014.
- HAV47 (Campion School off A127): this site was consistently exceeding the annual mean objective since 2014. The NO_2 annual mean concentration for 2018 was below the objective and is the lowest concentration which has been recorded since 2014.
- HAV50 (Blewitts Cottages): this site was exceeding the annual mean objective and showed an increasing trend since 2015. The NO_2 annual mean concentration for 2018 was marginally below the objective.

A small increase has been identified for only three sites (HAV49 Newton's School, HAV56 Rainham Tesco, HAV57 Romford Taxi Rank), however this hasn't resulted to new exceedances of the national annual mean objective. Those locations which have breached the limit remain in heavily trafficked areas.

In the Annual Status Report for 2017 a significant increase in NO_2 for four sites was identified, in particular HAV39 (Park Rise Boulevard), HAV40 (Main Road), HAV48 (Parklands school), HAV52 (opp. Harold Wood Station). For the sites HAV39, HAV40 and HAV48 the 2018 annual mean concentrations reduced to the previous average levels (i.e.2014-2016), as such, last year's change cannot be considered an increasing trend. With regard to HAV52, while the 2018 concentration reduced significantly (over 7 $\mu g/m^{-3}$), it is still exceeding the 2014-2016 average levels. The site will be kept under review and assessment in the following years.

Table E. NO_2 Automatic Monitor Results: Comparison with 1-hour Mean Objective

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Number of Hourly Means > 200 µg m^{-3}						
			2012[c]	2013 [c]	2014[c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
HV1	N/A	99	N	0	0	0	0	0	0
HV3	N/A	83	0	0	0	0	0	**1**	0

Notes: Exceedance of the NO_2 short term AQO of 200 µg m^{-3} over the permitted 18 days per year are shown in **bold**.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

The hourly mean objective of 200 µg m^{-3} was exceeded only once at the HV3 monitoring site in 2017, which is significantly less than the permitted 18 days per year. No exceedances have been identified at the HV1 monitoring site.

Table F. Annual Mean PM10 Automatic Monitoring Results (g m-3)

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µg m^{-3})						
			2012[c]	2013 [c]	2014[c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
HV1	N/A	97	Not in operation		19	18	19	18	**17**
HV3	N/A	96	23	24	25	24	15	19	20

Notes: Exceedance of the PM_{10} annual mean AQO of 40 µg m^{-3} are shown in **bold**.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

No significant trend (positive or negative) in PM_{10} levels has been identified at both sites throughout the period of operation. PM_{10} levels are well below the annual mean objective of 40 µg m^{-3}.

Table G. PM_{10} Automatic Monitor Results: Comparison with 24-Hour Mean Objective

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Number of Daily Means > 50 µg m^{-3}						
			2012[c]	2013 [c]	2014[c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
HV1	N/A	97	Not in operation		3	3	6	4	1
HV3	N/A	96	11 (37)	6 (37)	11	9	5	N/A[d]	2

Notes: Exceedance of the PM_{10} short term AQO of 50 µg m^{-3} over the permitted 35 days per year or where the 90.4th percentile exceeds 50 µg m^{-3} are shown in **bold**.
Where the period of valid data is less than 85% of a full year, the 90.4th percentile is shown in brackets after the number of exceedances.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

Exceedances of the 24-hour mean remain to be significantly less than the annual objective of 35 exceedances at both sites.

Table H. Annual Mean PM2.5 Automatic Monitoring Results (g m-3)

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean Concentration (µg m^{-3})						
			2012[c]	2013 [c]	2014[c]	2015 [c]	2016 [c]	2017 [c]	2018 [c]
HV1	N/A	97	Not in operation		12	11	12	12	11

Notes: Exceedance of the $PM_{2.5}$ annual mean AQO of 25 µg m^{-3} are shown in **bold**.
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

Annual Mean concentrations remain at a steady level for the 4 years $PM_{2.5}$ has been measured at HV1 and well below the annual mean AQO of 25 µg m^{-3}.

2. Action to Improve Air Quality

2.1 Air Quality Action Plan Progress

Table I provides a brief summary of the London Borough of Havering progress against the Air Quality Action Plan, which was adopted in June 2018.

Table I. Delivery of Air Quality Action Plan Measures

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
Action Policy One: Air Quality Monitoring and Modelling		
1.1	Undertake detailed computer modelling of air quality in Havering.	We have introduced an interactive air quality predictive modelling tool created for us by King's College London. The interactive maps provide further evidence in addition to the Council's air quality monitoring network for planning decisions and support major strategic transport and infrastructure projects for the Council.
1.2	Use AQ Mesh Pods to provide real time air quality measurements for schools to use as part of air quality publicity campaigns and to encourage walking to school.	The pods have been installed outside schools to collect baseline data to support local projects to improve air quality within the vicinity of these, and other, schools. We will be purchasing another pod shortly. Although it is recognised that the accuracy of the AQMesh pods readings is not as high as other monitoring equipment, which has been officially approved by DEFRA, the use of the AQMesh pods gives a picture of air quality and has been found useful for dealing with requests / complaints and keep the public up to date on and local air quality and raise awareness and knowledge. Also getting continuous readings allows us to correlate NO_2 levels with potential causes (e.g. higher NO_2 levels at pick up/drop of times on the school run) and identify areas of poor air quality outside of schools that were previously

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
		unknown.
1.3	Undertake feasibility study into the location and start-up of a new permanent continuous monitoring location.	Section 106 funding of £20,000 has been sourced for this. The location of the monitoring station will be on A1306 in Rainham expanding on the boroughs continuous monitoring programme. Efforts to attain further funding to continue the monitoring once the £20,000 has been spent are being made.
1.4	Expand the current Diffusion Tube Network. Install further diffusion tubes for monitoring of NO_2	The diffusion tube network will be expanded through the installation of 6 additional diffusion tubes. New locations have been agreed internally, with discussions and approval from GLA to take place. The expansion of the diffusion tube network aims to ensure the borough has as representative and accurate knowledge of local air quality, together with highlighting any local hotspots.
1.5	Model likely air quality impact of planned major strategic schemes.	All major strategic developments are required to carry out air quality modelling, as part of a detailed Air Quality Assessment at the planning application stage. Infrastructure is being progressed e.g. station at Beam Park.
Action Policy Two: Public Health and Awareness Raising to encourage Smarter Travel		
2.1	Promote walking and cycling Engage with over 50's forum to form a walking club and organised led rides	The over 50's programme is ongoing. It is run by trained volunteers with support from the Council's Sports Development.
2.2	Continue to use Miles the Mole as an air quality champion and educational prop.	Miles the Mole continues visiting schools as part of the Council's successful air quality campaign which was launched in 2017. In 2018 Miles visited 40 primary schools via Theatre in Education. • Air Quality and Miles the Mole were featured in the School Travel Plan Conference on 1 March 2019. • Presentation slides for school assemblies have been created. • Theatre in Education has been secured for June 2019.

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
		• Schools are currently booking their slots. Miles is expected to visit all 40 Primary schools. • Secondary schools are being encouraged to feature Air Quality in their next YTA programme. • The next edition of Taking Steps Magazine will be on Air Quality. The campaign increases awareness and knowledge of children/staff/parents around air quality and promotes small changes people can make to reduce their contribution to air pollution and reduce their exposure to poor air quality.
2.3	Support Transport for London led initiative to commission a cross borough bus rapid transit study which would include looking at options for improving access to the London Riverside BID.	The Council's Transport Planning team will be reviewing this in March 2020.
2.4	Public Health Input into delivery of AQAP. Director of Public Health to have responsibility for ensuring their Joint Strategic Needs Assessment (JSNA) includes information on Air Quality impacts on the population.	Within the Council the Public Protection and Public Health Services are collaborating on matters relating to air quality. The Director of Public Health is the Chair of the Board monitoring the implementation of Air Quality Action Plan.
2.5	Continue to promote the TfL STARS (Sustainable Travel: Active, Responsible, Safe) accredited travel planning programme with schools to reduce car use on school run	There are 54 STARS accredited schools. 17 at bronze level, 3 at silver, and 34 at gold. This is ongoing working with schools to improve the travel plans. The Campion School has been awarded School of Excellence of the Region. Sustainable travel reduces road traffic, raises awareness of air quality and helps children being more active and healthier.
2.6	Promote Smarter Travel initiatives with	This action has been scheduled for 2019-2020.

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
	businesses and encourage local business to adopt workplace travel plans.	
2.7	Continue to promote airTEXT to make sure vulnerable residents are aware of the tool and how to use it.	This has been promoted via twitter, press releases and magazine articles. The Council has also been promoting the Pollution forecasts received by King's College London. Users of airTEXT receive alerts when air pollution levels are elevated so that they can take simple precautionary measures to help reduce their exposure and the adverse health effects of air pollution.
2.8	Investigate the feasibility of introducing Car Clubs and associated facilities in Havering.	This action has been scheduled for 2019-2020.
2.9	Support the LIP cycle training budget to promote "bike ability" in schools and also to adults and families.	£15,000 were spent on bike ability training in 2018 for Havering school children. 2,049 children were trained to ride their bikes safely and responsibly. Cycle training helps children and adults become more active and enables them to use more sustainable modes of transport.
2.10	Encourage greater use of the Council's staff travelling to work sustainably through adequate provision of cycle infrastructure at Council buildings.	14 Council employees attended the Cycle to Work scheme in 2018. Further review will be carried out in 2019.
2.11	Successful delivery of annual Local Implementation Plan programme to deliver schemes that support the Healthy Streets agenda and provide options for people to travel sustainably.	The Council's Local Implementation Plan (LIP3) has been formally approved by the TfL and will be implemented over the next three years.
2.12	Offer workplace grants to businesses for infrastructure (e.g. cycle parking, lockers and showering facilities)	Queens Hospital trust have received a grant of £3,000 from LIP funding. This is an ongoing action with 3 businesses per year as target.

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
		These grants are expected to encourage staff to walk, cycle, and use public transport, supporting the Mayor's Transport Strategy targets on the number of people travelling sustainably to work.
Action Policy Three: Reducing Emissions from Buildings and Developments		
3.1	Creation of Air Quality Supplementary Planning Guidance (SPG).	A Draft SPG has been created, currently awaiting approval from the Council's Planning Service. The process for formal approval and adoption will then be followed. Havering's local SPG aims to inform developers and consultants regarding the Council's requirements for new developments in relation to air quality and encourage engagement at an early stage .
3.2	Review current planning conditions, in relation to air quality, to ensure they are fit for purpose.	Planning conditions have been reviewed and are in line with the requirements set out in the London Plan and the relevant SPGs. Through appropriate planning controls in place, new development is supported, while ensuring environmental sustainability.
3.3	Adopt and implement planning controls on combined heat and power (CHP) or biomass systems	The Council uses a condition requiring the emissions limits for CHP and Biomass set out in Appendix 7 of the GLA Sustainable Design and Construction SPG.
3.4	Adopt and implement planning controls on air quality neutral development. New major developments will be required to be air quality neutral as a minimum.	Havering requires an AQ Neutral assessment for all major developments. As this is not currently included in the planning validation checklist, we do not always receive the report at the planning application stage. If the report is not included, a condition requiring an AQ Neutral is attached to the planning permission.
3.5	To ensure that new Housing Estate Regeneration Programme for LBH housing developments obtain the commitment from developers to a strategy of future reduction	The Council's development team is committed to reduced carbon foot print and air quality neutral development. Public Protection, Regeneration Services and the appointed consultants and contractors are collaborating on matters relating to air quality to ensure that the Council's new developments meet all relevant requirements.

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
	of reduced carbon foot print and minimal impact on air quality.	
3.6	Adopt and implement planning controls for innovative and recognised green space and planting in new developments. Planning to work with grounds maintenance and parks at design stage for advice on greening and planting	Inter departmental work with the Council's Planning and Grounds Maintenance Services is being progressed.
3.7	Promote and enforce the Smoke Control Areas to reduce the amount of unlicensed burning.	The Council has updated its website with Defra guidance on wood burners and responds to any complaints regarding unlicensed burning. The action aims to reduce emissions from wood burners, PM2.5 in particular.
3.8	Monitoring and implementation of Non Road Mobile Machinery (NRMM)	Havering applies a condition to all major developments, requiring sign-up to the NRMM register and that the emission standards of the relevant Directive are met. Havering has signed up to the NRMM enforcement scheme, under the MAQF Round 3, it is therefore expected that engagement with the contractors will be carried out to ensure that the NRMM equipment used at major construction sites meet the relevant emission standards.
3.9	Promote public sector landlords (homes and public buildings) to take air quality and energy efficiency advice before refits, via the GLA RE:NEW and RE:FIT Programmes.	The Council's Housing stock will be introducing a new SAP target from 2019/20. The current target is 70.32 (on SAP 2009)
3.10	Deliver infrastructure to ensure that Romford, Rainham and Beam Park Housing Zones are accessible by means other than the car and that residents are provided with options to travel sustainably (Including the Beam Parkway Major scheme and Beam Park	The action in being progressed. The Council is going out to tender to appoint a Contractor for the Beam Parkway scheme. The infrastructure includes road improvements to make cycling and walking more attractive to residents. The Beam Park station will also improve accessibility to the south of the borough and is expected to reduce car use and therefore emissions from road traffic.

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
	station)	
3.11	Identify previously unknown and new premises that require permitting under PPC. Determine these properties that require permitting for Pollution Prevention Control (PPC).	No progress has been made in 2018. Further review will be carried out in 2019.
3.12	Signpost business contact and residents to the appropriate boiler scrappage schemes and energy efficiency grants; Promote businesses and residents to take air quality and energy efficiency advice; embed this practice as part of business as usual activity of the department	Warmer Homes Scheme for vulnerable tenants and vulnerable owner occupiers has been scheduled for Autumn 2019 when funding is expected. Guidance is already provided on Havering's website, but the uptake in Havering is currently low. Mailshots are expected to alert vulnerable residents to the funding available, in order to upgrade their boilers or fit first time central boilers.
Action Policy Four: Reducing Emissions from Transport		
4.1	Include requirement for suppliers of large council contracts that they have attained silver or gold FORS accreditation for their organisation and vehicles	The action is being progressed with the Council's Procurement and Waste Teams. In addition to this, the Council's Transport Team is trialling Gas to Liquid fuel as an alternative to diesel for some of its fleet.
4.2	Investigate the feasibility of introducing dedicated drop off zones outside all schools for buses & coaches.	This action has been completed. Following investigation, the Council's Highways and Parking Services have advised that this action is not feasible as keep clear signs up outside all schools.
4.3	Renewal of Taxi Framework, with suppliers complying to the Ultra Low Emission Zone (ULEZ) & exploring ZEC (Zero Emission Capable) Standards	The action is being progressed.
4.4	Provide Smarter Driver Training for all	The action has been completed by the Council's Transport Services and Asset

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
	vocational drivers of the Council's fleet vehicles. Delivered by CPC training and FTA Van excellence accreditation	Management.
4.5	Investigate the feasibility on the delivery of Electric Vehicle Charging Point infrastructure across the borough.	A feasibility study has been undertaken by the Council's Transport Planning regarding building a network of EV charging points. Results from an online consultation are currently being collated and the study is expected to be finalised in 2019 The outcomes of this study will be taken into account, in order to design an Ultra Low Emissions Vehicle infrastructure network that meets the needs and wishes of Havering's residents.
4.6	Review parking charges policy (controlled parking zones	This is being progressed by the Council's Parking Enforcement. Examples include charging on Sundays to park in the town centre, to discourage driving and extension of Controlled Parking Zones by looking at a programme of informal consultations around the 9 stations in the borough.
4.7	Engage with businesses in the borough through business forums to discuss the options for upgrading/retrofitting to accommodate ULEZ requirements.	The Council attended a Business Engagement Forum in 2018 and distributed approximately 1000 Business Packs. The Business Packs provide businesses with information on sustainable travel advice, such as information on emissions zones and charges in London, electric and hybrid vehicles, benefits of cycling and walking to work, aiming to increase sustainable travel.
4.8	Plant greenery and trees (e.g. hedgerows and trees such as ash, common alder, field maple, larch, Norway maple, scots pine and silver birch) along main roads and town centres, which can lead to an improvement in air quality based on available evidence	Hostas and Ferns have been planted in Romford town centre, which is one of Havering's air pollution hotspots / air quality focus areas. More planting is planned in 2019 targeting other hotspots. Planting makes Havering's streets greener, safer and encourage more people to sustainably travel around the borough. It also supports complimentary benefits highlighted in local and regional policies such as improving mental health, combating social inclusion

Measure	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
		and reducing noise pollution from roads.
4.9	Develop Local Implementation Plan to support improvements in local air quality; together with working with TfL to ensure pollution sources outside of local control i.e. buses and commuter traffic are dealt with.	The Council's LIP3 has been formally approved by the TfL and will be implemented over the next three years. With regard to upgrading / replacing TfL buses that are not ULEZ compliant, TfL have informed us that they are working to reduce tailpipe emissions from bus fleet across London and that all buses in Havering will be EURO VI by the end of 2020..
4.10	Undertake feasibility work to examine the air quality implications of re-routing of bus services away from Romford town centre and look options for improving sustainable travel access into Romford town centre.	This action has been scheduled for 2019-2020.
4.11	Continue to routinely check the weighbridges used commercially by (usually large) vehicles	All of the weighbridges tested in LBH on 25/03/2019 were found to be within acceptable tolerances for inspection, this is an unusual but welcome change as in the past there was an average of 30-35% failure rate. This action aims to reduce the number of overloaded vehicles and is expected to lead to a reduction in emissions

3. Planning Update and Other New Sources of Emissions

Table J. Planning requirements met by planning applications in Havering in 2018

Action	Number	Notes
a) Number of planning applications where an air quality impact assessment was reviewed for air quality impacts	4	The number of major planning applications received in 2018 and therefore the number of air quality assessments reduced in comparison with 2017.
b) Number of planning applications required to monitor for construction dust	0	Havering requires dust monitoring, where the site is considered 'Medium' or 'High' risk following dust risk assessment. There were no medium or high risks sites in 2018. Many low risk sites submit a Construction Method Statement, setting out dust control measures (e.g. dust suppression during dry weather conditions), but they are not required to carry out dust monitoring, these sites have therefore not been included.
c) Number of CHPs/Biomass boilers refused on air quality grounds	0	The development proposals did not include CHPs / Biomass boilers.
d) Number of CHPs/Biomass boilers subject to GLA emissions limits and/or other restrictions to reduce emissions	0	Havering uses a condition requiring the emissions limits for CHP and Biomass set out in Appendix 7 of the GLA Sustainable Design and Construction SPG. The development proposals did not include CHPs / Biomass boilers.
e) Number of developments required to install Ultra-Low NO_x boilers	42	Havering requires installation of ultra low NOx boilers (through a condition) for all new developments (one unit or more).
f) Number of developments where an AQ Neutral building and/or transport assessments undertaken	3	Havering requires an AQ Neutral assessment for all major developments. As this is not currently included in the planning validation checklist, we do not always receive the report at the planning application stage. If the report is not included, a condition requiring an AQ Neutral is attached to the planning permission.
g) Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	1	
h) Number of planning applications with S106 agreements including other requirements to improve air quality	1	The S106 agreement required air quality monitoring in the vicinity of the development

Action	Number	Notes
Number of planning applications with CIL payments that include a contribution to improve air quality	0	
i) NRMM: Central Activity Zone and Canary Wharf Number of conditions related to NRMM included. Number of developments registered and compliant. Please include confirmation that you have checked that the development has been registered at www.nrmm.london and that all NRMM used on-site is compliant with Stage IIIB of the Directive and/or exemptions to the policy.	N/A	
ii) NRMM: Greater London (excluding Central Activity Zone and Canary Wharf) Number of conditions related to NRMM included. Number of developments registered and compliant. Please include confirmation that you have checked that the development has been registered at www.nrmm.london and that all NRMM used on-site is compliant with Stage IIIA of the Directive and/or exemptions to the policy.	3 conditions recommended 0 registered (*We have checked the NRMM Register, but have not found the above developments registered*)	Havering applies a condition to all major developments, requiring sign-up to the NRMM register and that the emission standards of the relevant Directive are met. Havering has signed up to the NRMM enforcement scheme, under the MAQF Round 3, it is therefore expected that engagement with the contractors will be carried out to ensure that the NRMM equipment used at major construction sites meet the relevant emission standards.

Brief description of the Planning Process

The Council's Planning Service consults the Public Protection Service on all valid planning applications received, including major developments. Public Protection Officers then review and assess these applications recommending air quality conditions where required. Once a planning consultation response has been sent the progress of the planning application is not monitored by Public Protection (e.g. whether the application has been granted planning permission or not, whether the recommended conditions have been attached or not etc.).

However the Planning Service will, usually, adopt our recommendations and the relevant conditions are attached to the planning decisions. It is then the responsibility of the developer to submit the required documentation in order to discharge the condition. Once an application for discharge of condition has been submitted, Public Protection is consulted again and the submitted

documentation is reviewed and assessed. The condition is discharged once the documentation has been considered sufficient in line with current guidance.

3.1 New or significantly changed industrial or other sources

No new sources identified.

Appendix A Details of Monitoring Site Quality Assurance and Control

A.1 Automatic Monitoring Sites

HV1 and HV3 are representative of roadside exposure within the Borough. All the sites are part of the London Air Quality Network and therefore the standards of QA/QC are similar to those of the government's AURN sites. Regular monthly calibrations are carried out, with subsequent data ratification undertaken by ERG at King's College London. The data has been ratified for 2018 by Kings College London.

Data capture from the NOx analysers at HV1 and HV3 in 2018 were 99% and 83% respectively.

PM_{10} Monitoring Adjustment

PM_{10} at HV3, and PM_{10} and $PM_{2..5}$ at HV1 are measured by FDMS, consequently correction is not necessary.

A.2 Diffusion Tube Quality Assurance / Quality Control

Diffusion Tubes are supplied and analysed by Socotec, Didcot. For 2018 tubes are prepared by spiking acetone: triethanolamine (50:50) onto grids prior to the tubes being assembled. The tubes are desorbed with distilled water and the extract analysed using a segmented flow autoanalyser with ultraviolet detection. The tubes were analysed in accordance with Socotec's standard operating procedure ANU/SOP/1015. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance'. As set out in the practical guidance, the results were initially calculated assuming an ambient temperature of 11^{o}C, the reported values have been adjusted to 20^{o}C to allow for direct comparison with EU limits. As set out in the 2016 - 2018 Summary of Precision Results for Nitrogen Dioxide Diffusion Tube Collocation Studies Socotec Didcot is listed in the table of laboratories with **Good** Precision. In the Summary of Laboratory Performance in AIR NO2 Proficiency Testing Scheme (April 2017 – February 2019). Socotec currently holds a rating of **Satisfactory** laboratory.

The bias adjustment factor for Socotec, for the 50% TEA in Acetone preparation method in 2018, taken from the National Bias Adjustment Factor Spread sheet (v0319final) is 0.76. The bias adjustment factor for the previous years was 0.77.

Factor from Local Co-location Studies (if available)

The London Borough of Havering has a triplicate diffusion tube co-location study at one of the roadside automatic monitoring sites, operational since 2015. The precision and accuracy of the triplicate tubes was checked via the AEA_DifTPAB_v04 sheet provided on the Defra website. Due to Waterloo Road being a high concentration site (roadside site) any bias adjustment factors derived should not be used for any low concentration monitoring sites.

Overall the site had poor overall data capture of 69% and therefore below the 90% threshold required to sufficiently derive a bias adjustment factor. Therefore the local bias adjustment factor has not been used within this report.

Discussion of Choice of Factor to Use

As a local bias adjustment factor was not available, the bias adjustment factor for Socotec, for the 50% TEA in Acetone preparation method, taken from the National Bias Adjustment Factor Spread sheet (March 2019) was used.

A.3 Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

Capture rates for NO_2 at our two continuous monitoring stations were above 75% therefore annualisation was not necessary for 2018. From the diffusion tube sites only one recorded less than 75% data capture, HAV49 Newton's School. Two continuous monitoring sites with data capture greater than 85% were used; B&D Scrattons Farm (91% data capture) and Havering's HV1 (99% data capture). The annualisation results are provided in Table L1.

Table K. Short-Term to Long-Term Monitoring Data Adjustment (HAV49 available Jan-May, Oct & Dec 2018)

Site	Site Type	Annual Mean ($\mu g/m^3$)	Period Mean ($\mu g/m^3$)	Ratio
BG2	Suburban	25.4	28.4	1.12
HV1	Roadside	30	32.4	1.08
			Average	1.10

Distance Adjustment

The data presented overleaf in Table M has been adjusted for distance, using the NO_2 with Distance from Roads Calculator provided by Air Quality Consultants. Local Annual Mean Background NO_2 Concentrations have been identified using the Defra reference background maps from their Website (2018). 2018 NO_2 data for the London Borough of Havering has been used and the nearest background location paired with the monitoring location. This process has been followed only for sites which are not representative of public exposure and where exceedances have been identified.

Table L: Distance Adjustment Data

Site Ref	Location	Distance from DT to Kerb (m)	Distance from Kerb to Receptor (m)	Local Annual Mean Background NO_2 Concentration ($\mu g/m^{-3}$)	Measured Annual Mean NO_2 Concentration ($\mu g/m^{-3}$)	Defra Calculator Predicted Annual Mean ($\mu g/m^{-3}$)	Comments
HAV 2, 5 & 6	Mercury Gardens	2	3	23.3	47.9	**45.6**	Ground Floor Shop Fronts
HAV 1, 7 & 8	Waterloo Road	8	11	23.3	39.6	37.8	-
HAV 19,20 & 21	Collier Row	0.5	3	17.7	40.4	33.2	3 m from 1st floor residential
HAV 27, 28 & 29	Rush Green Road	0.5	5	22.1	51.4	**39.5**	5 m from ground floor residential
HAV 32, 33 & 34	Gallows Corner	0.5	4	25.3	50.3	**41.1**	4 m from building, 1st floor residential
HAV 37	Colchester Road	0.5	3	18.6	48	38.7	3 m from 1st floor residential
HAV 40	Main Road	1	9	23.4	49.2	37.8	9 m from ground floor residential 3 m from shop front

HAV 41	Main Road	1	8	23.4	40.9	33.6	8 m from first floor residential
HAV 50	Blewitts Cottages	0.5	12	23	39.8	30.4	12 m from ground floor residential
HAV 57	Romford Taxi Rank	0.1	1	23.3	64.7	**51.6**	Urban centre, <60 µg/m^3
HAV 58, 59 & 60	Romford Battis	0.1	1	23.3	71.4	**56.2**	Urban centre, <60 µg/m^3

Appendix B Full Monthly Diffusion Tube Results for 2018

Table M. NO2 Diffusion Tube Results

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO_2														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annualised	Annual mean – bias adjusted [c]
HAV 6	-	100	**66.4**	**71.1**	**66.2**	**62.3**	**63.2**	**59.2**	**97.6**	33.1	**60.7**	**57.5**	**63.9**	**60.9**	**63.5**	N/A	***48.3***
HAV5	-	100	**66.4**	**71**	**62.7**	**59.7**	**64.5**	**62.9**	**86.3**	30.1	**58.6**	**51.2**	**69.3**	**60.5**	**61.9**	N/A	***47.1***
HAV2	-	100	**64.9**	**63.9**	**65.5**	**62.9**	**63.5**	**58**	**95.2**	33	**60**	**61**	**69.4**	**64.5**	**63.5**	N/A	***48.2***
HAV7	-	100	**53.7**	**66.5**	**56.3**	**56**	**41.3**	34	**61.5**	25.6	**55.1**	**62**	**70**	**60.5**	**53.5**	N/A	***40.7***
HAV1	-	83	**59.9**	**55.1**	-	-	**41.8**	33.7	**64.7**	23.6	**53.4**	**52.8**	**69.6**	**53.7**	**50.8**	N/A	*38.6*
HAV 8	-	100	**58.4**	**54.6**	**54.8**	**56.4**	39.1	33.6	**68.6**	26.4	**53.9**	**56.4**	**66.4**	**55.5**	**52.0**	N/A	*39.5*
HAV 3	-	100	**42.8**	**44.2**	34.5	36.9	23.6	20.2	39.6	17.3	38.5	30.8	**44.8**	**45.9**	34.9	N/A	*26.5*
HAV 4	-	83	31.4	28.8	24.3	22.8	17.4	14	-	12.7	25	21.2	30	-	22.8	N/A	*17.3*
HAV9	-	100	**51.8**	**42.9**	36.1	37.2	28.3	23.6	**44.9**	21.4	**40.4**	**41.7**	**44.9**	**48**	38.4	N/A	*29.2*
HAV10	-	100	**50.3**	34.5	32.9	40	24.8	24.3	**47.2**	22.4	**42.9**	**39.8**	**40.6**	**51.3**	37.6	N/A	*28.6*
HAV 11	-	92	**48**	**50.2**	32.5	37.2	26.8	23.2	**50.2**	21.4	**42.7**	**40.5**	**49.6**	-	38.4	N/A	*29.2*

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO_2													Annual mean – bias adjusted [c]
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annualised	
HAV 12	-	*100*	**62.6**	**60.2**	**45**	**43.9**	**40.9**	37.8	**56.9**	27.2	**45.8**	**48.2**	**51.1**	**57.8**	**48.1**	N/A	*36.6*
HAV13	-	*100*	**55.9**	**63.3**	**46.2**	**52.9**	**53**	**45.1**	**64.5**	28	**50.4**	**52.7**	**51.5**	**54.2**	**51.5**	N/A	*39.1*
HAV14	-	*100*	**56.5**	**60.1**	**51.7**	**54.4**	**48.9**	**43.7**	**45.1**	27.6	**45.7**	**51.7**	**55**	**57.3**	**49.8**	N/A	*37.9*
HAV15	-	*92*	**58.4**	**63.9**	**49.4**	**49.3**	**49.7**	-	**61.8**	25.2	**49.5**	**51**	**48.2**	**60.9**	**51.6**	N/A	*39.2*
HAV16	-	*100*	**57**	**57.2**	**47.2**	**47.9**	**41.4**	35	**46.9**	24.8	36	**50.6**	**52.8**	**52**	**45.7**	N/A	*34.8*
HAV17	-	*100*	**49.7**	**62.4**	**43.2**	**49.1**	**43**	35.2	**50.9**	24.9	38.7	**50.5**	**50.7**	**56.9**	**46.3**	N/A	*35.2*
HAV18	-	*100*	**55.3**	**58.2**	**39.7**	**46.8**	**40.8**	37.8	**54.6**	26.2	**42.5**	**46.6**	**53.8**	**40.4**	**45.2**	N/A	*34.4*
HAV19	-	*100*	**76.6**	**50.2**	**50.2**	**51.1**	**43.3**	39.2	79.5	25.7	**66.6**	37	**53.7**	**57.6**	**52.6**	N/A	*39.9*
HAV20	-	*100*	**79.4**	**62.2**	**50.4**	**52**	**44.7**	**41.7**	**52.8**	25.3	**62.7**	**43.5**	**53.1**	**58.5**	**52.2**	N/A	*39.7*
HAV21	-	*100*	**84.6**	**53.3**	**53.1**	**55.2**	**43.1**	39.3	**81.6**	29.2	**55**	**45**	**55.3**	**64.3**	**54.9**	N/A	***41.7***
HAV22	-	*100*	**47.2**	29.3	32.8	35	22.3	18.5	38.9	15.5	34.5	32.1	**39.8**	**43.5**	32.5	N/A	*24.7*
HAV23	-	*100*	**52.2**	30.8	38.1	30.9	23.5	21.7	37.3	16.8	34.2	33.2	**42.4**	**46.7**	34.0	N/A	*25.8*
HAV24	-	*100*	**50.6**	31.4	33.7	32.1	23.8	20	39.2	15.7	34.2	33.6	**41.2**	**45.5**	33.4	N/A	*25.4*
HAV 25	-	*100*	**48.2**	28.8	28.5	29	22.6	18.4	34.1	15.2	31	26	33.1	34.7	29.1	N/A	*22.1*

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO_2													
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annualised	Annual mean – bias adjusted [c]
HAV 26	-	*100*	**48.8**	31.1	25.3	27.2	17.8	15.1	32.4	12.1	28.8	21.7	39.1	38.6	28.2	N/A	*21.4*
HAV27	-	*92*	**68.8**	**77**	**60.6**	**68.1**	**70.1**	**49.3**	**94.5**	-	**62.1**	**70.8**	**73.8**	**80.7**	**70.5**	N/A	***53.6***
HAV28	-	*100*	**66.3**	**69.8**	**62.5**	**64.8**	**66.9**	**52**	**91.8**	36.8	**67.5**	**69.5**	**72.3**	**72.6**	**66.1**	N/A	***50.2***
HAV29	-	*100*	**74.3**	**74.2**	**51.7**	**70.5**	**68**	**52.6**	**91.4**	**42.3**	**64.3**	**64.6**	**72**	**68.9**	**66.2**	N/A	***50.3***
HAV 30	-	*100*	**46.9**	23.3	29.1	27.1	19.4	15.1	31.3	11.7	31.4	20.9	**42.3**	**42.1**	28.4	N/A	*21.6*
HAV 31	-	*100*	**47.6**	**45**	34	34.3	25	19.9	37.2	18.3	35.3	33.8	43.1	43.6	34.8	N/A	*26.4*
HAV32	-	*83*	**89.6**	-	-	**73.8**	**52.3**	**48.8**	**98.2**	34.8	**64.1**	**60.3**	**62.4**	**85**	**66.9**	N/A	***50.9***
HAV33	-	*100*	**91**	**63.9**	**75**	**70.7**	**52.5**	**49.6**	**100.4**	35.7	**69.7**	**55.6**	**67.9**	**80.1**	**67.7**	N/A	***51.4***
HAV34	-	*100*	**74.9**	**44.2**	**71.3**	**69.9**	**51.6**	**48.9**	**99.2**	35.6	**68.2**	**62.9**	**66.3**	**76**	**64.1**	N/A	***48.7***
HAV 35	-	*100*	**48.2**	28.5	**41.3**	31.4	30.2	26.5	43.8	19.1	36.1	32.7	38.7	36.9	34.5	N/A	*26.2*
HAV 36	-	*100*	34.8	22.3	26	19	19	15.9	28.8	13	28.5	25	29.4	27.6	24.1	N/A	*18.3*
HAV 37	-	*100*	**96.4**	**47.8**	**67**	**47.1**	**57.8**	**48.7**	**103.1**	36.8	**65.1**	**57.8**	**69.9**	**60.6**	**63.2**	N/A	***48.0***
HAV 38	-	*100*	**47.3**	22.8	33.7	28.5	19.7	18.3	32.7	13.7	29.6	28.4	**40.2**	34.9	29.2	N/A	*22.2*
HAV 39	-	*100*	36.5	**53.6**	34.7	**40.2**	27.7	27.2	**46**	17.3	**43.8**	29.9	**49.7**	**51.9**	38.2	N/A	*29.0*

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO_2														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annualised	Annual mean – bias adjusted [c]
HAV 40	-	100	**88.7**	**71.8**	**61.2**	**64.5**	**59.8**	**52.3**	**84.5**	38.6	**58.6**	**64.2**	**64.1**	**68.1**	**64.7**	N/A	***49.2***
HAV 41	-	100	**60.6**	**64.2**	**48.4**	**55.7**	**53.1**	**50.7**	**64**	31.7	**50.2**	**47.5**	**56.6**	**63.5**	**53.9**	N/A	***40.9***
HAV 42	-	100	**51.2**	**50.7**	**42.2**	**41.4**	31.4	29.5	**51.7**	21.7	38.3	37.9	**40.4**	**50.3**	**40.6**	N/A	*30.8*
HAV 43	-	92	**49.3**	**49.9**	**45.6**	**41.7**	37.3	29.9	**53**	25.5	**46.5**	**41.8**	**45.1**	-	**42.3**	N/A	*32.2*
HAV 44	-	100	**62.2**	**50.9**	**45.7**	**41.9**	37.7	37.1	**56.2**	22.7	**40.2**	**46.1**	**62.2**	**40.6**	**45.3**	N/A	*34.4*
HAV 45	-	100	**57.4**	**59.1**	39.4	**47.9**	**41.6**	**40.8**	**54.6**	24.7	43	46.9	**50.8**	**56.2**	**46.9**	N/A	*35.6*
HAV 46	-	92	**55.2**	**48.7**	**46.2**	**45.3**	32.2	29.6	**55.2**	24.6	39.9	42.3	-	**47.3**	**42.4**	N/A	*32.2*
HAV 47	-	100	**68.8**	**59.5**	**55.6**	**51**	**54**	**44.7**	**66.9**	23.9	36.3	28.1	28	**63.7**	**48.4**	N/A	*36.8*
HAV 48	-	92	-	**48.1**	**36.9**	**33.2**	21	18.8	37	15.7	33.6	31.1	**42.6**	**43.2**	32.8	N/A	*25.0*
HAV 49	-	58	**55.9**	**46**	36.2	**43.9**	**26.4**	-	-	-	-	35.2	-	**44.8**	**41**	**45.1**	*34.3*
HAV 50	-	100	**61.4**	**55.8**	**56.8**	**55.3**	**40.1**	35.4	**63.4**	29.7	**56.9**	**54.7**	**62.5**	**56.2**	**52.4**	N/A	***39.8***
HAV 51	-	100	37.5	**41.8**	28.9	31.5	21	20	35.6	15.6	34	31.4	32.6	38.8	30.7	N/A	*23.4*
HAV 52	-	100	**84.2**	**50.9**	**60.1**	**63.5**	**46.5**	**41.9**	**68.2**	25.1	**47.7**	**49.2**	**55.8**	**55.2**	**54.0**	N/A	*41.1*
HAV 53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site ID	Valid data capture for monitoring period % [a]	Valid data capture 2018 % [b]	Annual Mean NO_2														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data [c]	Annualised	Annual mean – bias adjusted [c]
HAV 54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAV 55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAV 56	-	*92*	-	**55.8**	**62.4**	**62.4**	**53.1**	**52.9**	**90**	35.5	**61.9**	**60.7**	**59.2**	**68.2**	**60.2**	N/A	***45.7***
HAV 57	-	*92*	**78**	**96.5**	**96.2**	**93.5**	**-**	**75.9**	**122.3**	**47.8**	**84.7**	**73.5**	**88.9**	**79.7**	**85.2**	N/A	***64.7***
HAV 58	-	*100*	**85.3**	**102.8**	**84**	**98.1**	**98.4**	**93.4**	**123**	**57.8**	**106**	**83.7**	**94.5**	**91.6**	**93.2**	N/A	***70.8***
HAV 59	-	*92*	**89.3**	**73.3**	**94.3**	**105.8**	**90.7**	**96.8**	**137.7**	**-**	**99.9**	**89.9**	**87.5**	**96.8**	**96.5**	N/A	***73.4***
HAV 60	-	*100*	**95.6**	**92.3**	**91**	**81.4**	**96.6**	**81.4**	**147.2**	**56.2**	**100**	**87.7**	**83.1**	**91.3**	**92.0**	N/A	***69.9***
HAV 61	-	*100*	**46.2**	39.7	**44.2**	37.4	28	23.3	38.6	18.8	35.6	35.5	**44.6**	**41.7**	36.1	N/A	*27.5*

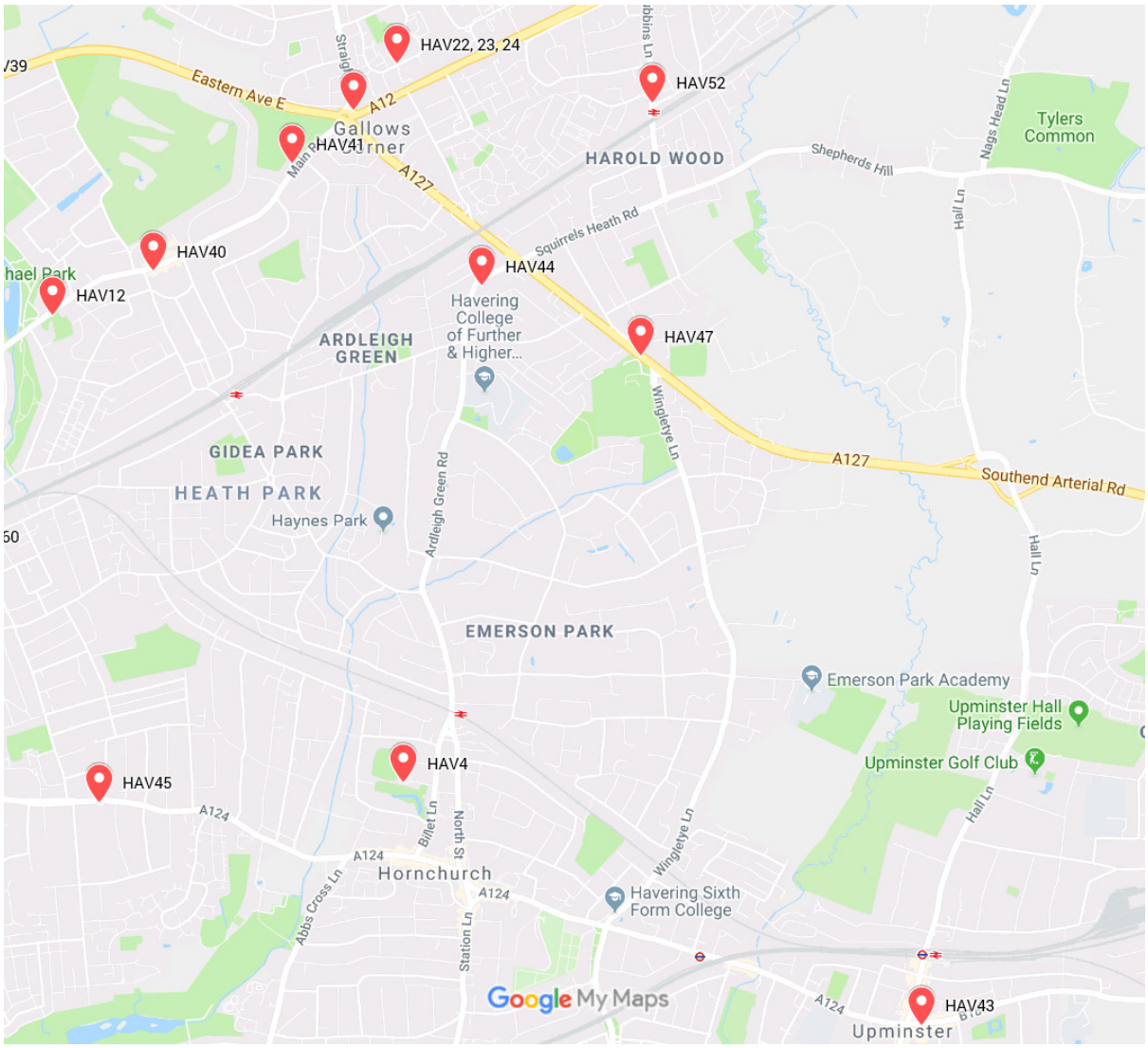
Exceedance of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in **bold**.

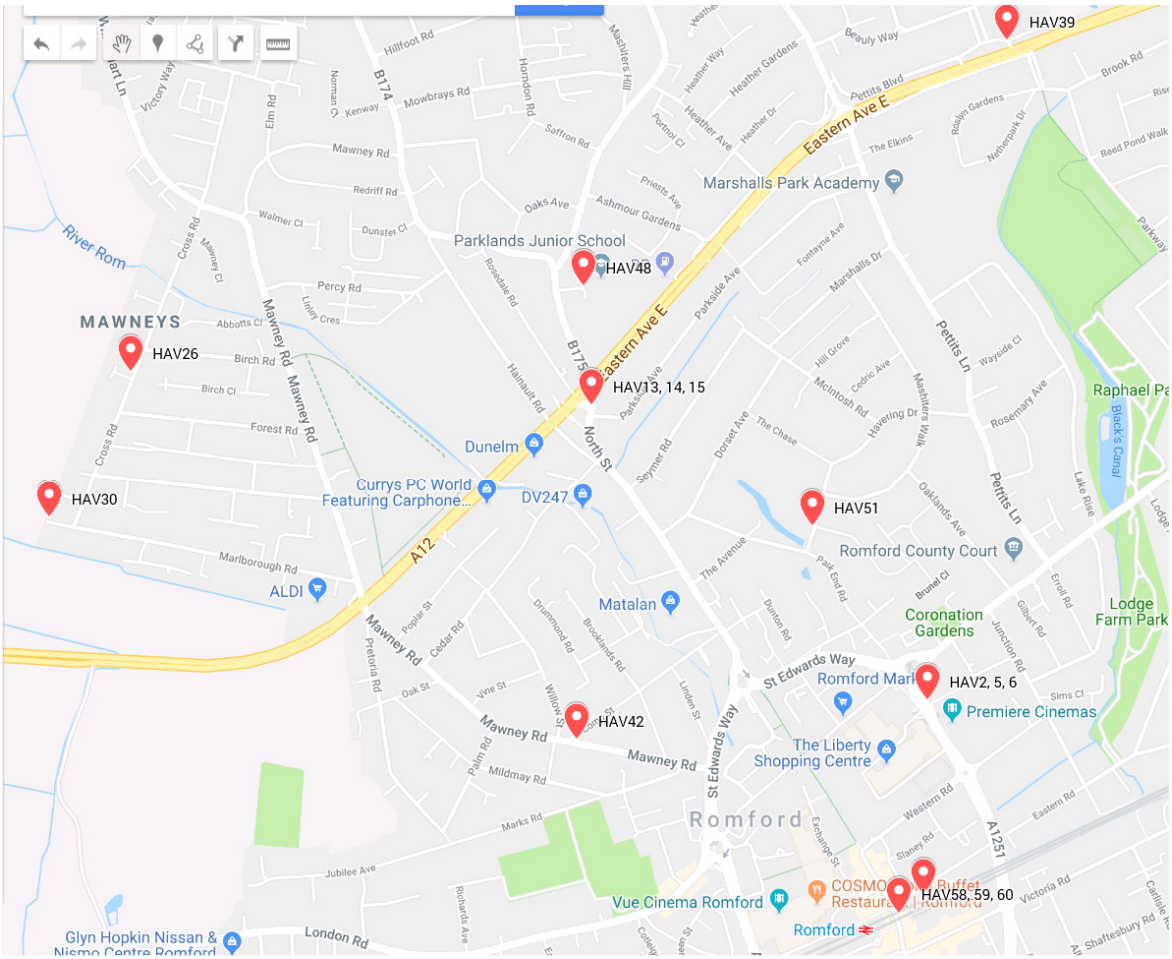
[a] Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

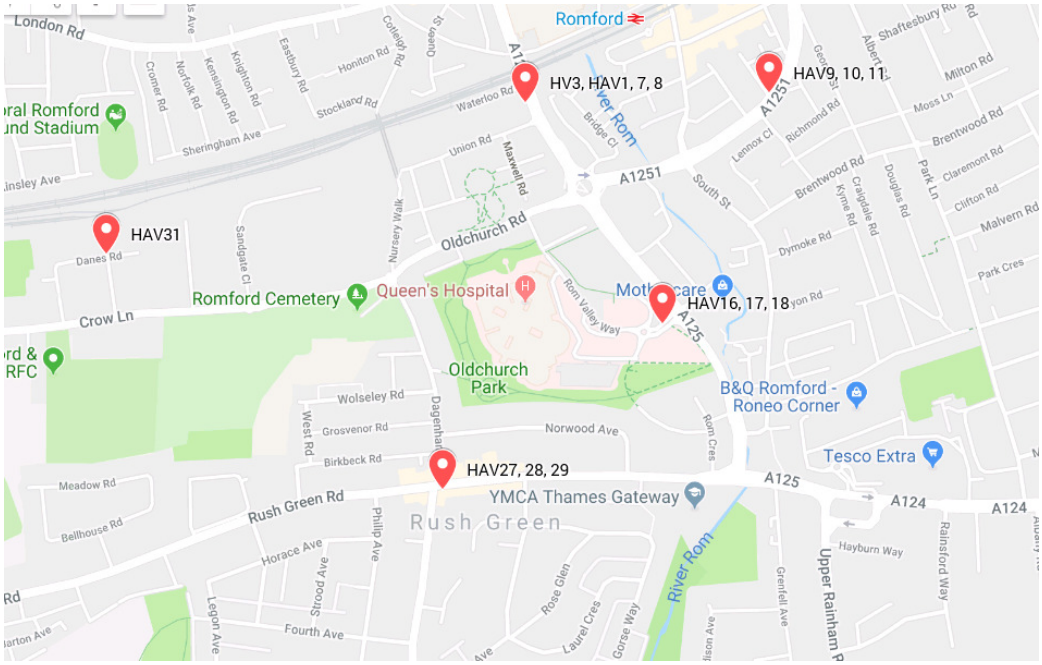
[b] Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] Means should be "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75%

Appendix C Monitoring Sites Maps




HAV39
Eastern Ave E
Marshalls Park Academy
Parklands Junior School
HAV48
River Rom
MAWNEYS
HAV26
HAV13, 14, 15
Dunelm
Currys PC World Featuring Carphone...
DV247
HAV30
HAV51
Romford County Court
A12
ALDI
Matalan
Coronation Gardens
Lodge Farm Park
St Edwards Way
Romford Mark
HAV2, 5, 6
Premiere Cinemas
HAV42
The Liberty Shopping Centre
Romford
Vue Cinema Romford
HAV58, 59, 60
Glyn Hopkin Nissan &
London Rd


Romford
HV3, HAV1, 7, 8
HAV9, 10, 11
A1251
HAV31
Oldchurch Rd
Romford Cemetery
Queen's Hospital
HAV16, 17, 18
Crow Ln
Oldchurch Park
B&Q Romford - Roneo Corner
Tesco Extra
HAV27, 28, 29
YMCA Thames Gateway
Rush Green Rd
Rush Green
A125
A124
River Rom


Beam Valley Country Park
HAV49
HAV3
S End Rd
Cherry Tree Ln
A1306
Marsh Way
HAV50
A13
A1306
HV1
Upminster Rd N
Upminster Rd S
HAV56
CEME Innovation Centre
National Trust - Rainham Hall
Rainham
B1335
A1306
Lamson Rd
Ferry Ln
A13
B1335
HAV61
A13
easter industrial park