ARDENT
CONSULTING ENGINEERS

EAST MALLING TRUST

DITTON EDGE (APP REF: TM/18/02966/OA)

AIR QUALITY ASSESSMENT ADDENDUM

REPORT REF - 182600-20

SEPTEMBER 2020

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CONTENTS

APPENDICES

FIGURES

TABLES

DOCUMENT CONTROL SHEET

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT	FKL	FKL	-	Sept 2020
-	FINAL	FKL	FKL FKL	ATB ATB	Sept 2020

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1.0 INTRODUCTION

Scope

1.1 This air quality assessment addendum follows the air quality assessment dated December 2018 (report ref: 182600-13), which was submitted in support of planning application reference 18/02966/OA. This addendum has been prepared in response to recent comments on the original AQA from the Local Planning Authority, Tonbridge and Malling Borough Council (TMBC). It responds to the changes in the vehicle emission rates set out within Defra's Emissions Factor Toolkit (EFT) and associated tools, including the Nox to NO_2 calculator and mapped background concentrations. In addition, this addendum addresses concerns that have been raised regarding the potential for air quality impacts on receptors within the Aylesford Air Quality Management Area (AQMA). The opportunity has also been taken to update the traffic inputs to reflect the latest agreed traffic flows scenarios included in the Transport Assessment Addendum (ref: 182600-19). This addendum considers the potential impact of the development on local air quality during the operational phase, taking into account the revised emissions and expanded study area.

1.2 The main air pollutants of concern related to the operational phase are associated with road traffic: nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). $PM_{2.5}$ was not previously considered but has been incorporated into this assessment due to increasing concern regarding the potential impacts related to this size fraction.

1.3 There have been no changes which alter the construction dust assessment and this has therefore not been revised.

1.4 The assessment has been prepared taking into account relevant local and national guidance, policy and legislation and should be read in conjunction with the previous air quality assessment.

2.0 LEGISLATION, POLICY AND GUIDANCE

2.1 The potential impact of changes to legislation, policy and guidance has been considered.

2.2 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) and Planning Practice Guidance (PPG) (Ministry of Housing, Communities and Local Government, 2019) have been updated since the previous assessment. These updates do not materially alter the approach to air quality assessment, or the conclusions drawn.

2.3 There are no further potentially significant changes to legislation, policy and guidance. Whilst unchanged, details of the air quality objectives are set out below for ease of reference.

National Air Quality Objectives

2.4 NAQOs were defined by The Air Quality Strategy (Defra, 2007) and enshrined in regulations by the Air Quality Standards Regulation (Statutory Instrument, 2010, No 1001) Air Quality Standards (Amendment) Regulations (Statutory Instrument, 2016 No. 1184) which implemented the European Union Directive on ambient air quality and cleaner air for Europe (Directive 2008/50/EC).

2.5 This directive consolidated the previous directive relating to ambient air quality assessment and management along with its three daughter directives. The limit values remained unchanged, however, member states were given a time extension for compliance subject to approval. For most pollutants of interest, these documents set out average concentrations as either Objectives or Limit Values, however, for $PM_{2.5}$, exposure reduction targets were also set.

2.6 Relevant objectives are set out in **Table 2-1**, below.

Table 2-1: NO_2, PM_{10} and $PM_{2.5}$ Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40 µg/m^3
Particulate Matter (PM_{10})	24-hour mean	50 µg/m^3 not to be exceeded more than 35[1] times a year
	Annual mean	40 µg/m^3 [2]

[1] 7 times a year for Scotland

[2] 18 µg/m^3 for Scotland

Particulate Matter ($PM_{2.5}$)	Annual mean	25 µg/m^3 [3]
	Annual mean	20 µg/m^3 [4]
	Exposure reduction target	15% reduction between 2010 and 2020 at Urban Background sites

2.7 Analysis of long-term monitoring data suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the 1-hour mean NO_2 objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has therefore been used in this assessment to screen whether an exceedance of the 1-hour mean objective is likely.

2.8 Similarly, an annual mean PM_{10} concentration of 32 µg/m^3 is used to screen whether an exceedance of the daily-mean PM_{10} objective is likely.

[3] 12 µg/m^3 for Scotland

[4] Indicative stage 2 limit value post 2020

3.0 METHODOLOGY

3.1 The methodology set out in the following sections has been identified as being the most appropriate approach to identifying potential transport emissions impacts associated with the proposed development and whether these impacts are significant. This approach is unchanged from the previous assessment with the exception of updated tools and input data, however, is set out in detail here for ease of reference.

3.2 The approach has been to identify baseline[5] conditions, future conditions without the development in place and future conditions with the development in place (both based on modelled predictions). This allows an assessment to be carried out as to the impact of the development on local air quality.

Baseline Air Quality

3.3 Information regarding baseline air quality has been obtained by collating the results of monitoring carried out by TMBC and referring to maps of AQMAs. Background concentrations have been defined based on the national pollution maps published by Defra (Defra, 2020). In addition, concentrations of pollutants in 2019 have been modelled at a number of locations following the methodology set out under 'Detailed Assessment', below.

Operational Road Traffic Impacts

Screening

3.4 The IAQM/EPUK guidance 'Land Use Planning and Development Control: Planning for Air Quality' (Institute of Air Quality Management and Environmental Protection UK, 2017) includes a list of indicative criteria for where a detailed air quality assessment would be needed. The criteria relating to screening air quality impacts from additional traffic are:

- An increase in LDV traffic of 500 AADT (or 100 AADT within or adjacent to an AQMA); or
- An increase in HDV traffic of 100 AADT (or 25 AADT within or adjacent to an AQMA).

3.5 The above criteria apply to any individual link and therefore, a development generating over 500 AADT (or 100 AADT) may be considered to fall below the screening criteria where the increase is spread over a number of different road links.

3.6 Where it is not possible to screen out significant impacts from road sources, detailed modelling is then carried out.

[5] The baseline year for the purposes of this assessment has been taken to be 2019 as this is the most recent year for which annual mean monitoring data are available.

Detailed Assessment

3.7 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted for a range of worst case locations for human health exposure. These locations include existing properties sensitive to changes in air quality. Concentrations and changes in concentrations are then compared against appropriate assessment criteria in order to determine the significance of any impact.

3.8 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the NAQO. For NO_2, PM_{10} and $PM_{2.5}$, that are of interest in this assessment, these locations include the façades of existing dwellings in relation to the annual mean objectives. Whilst gardens and hotels are considered relevant to 24-hour and hourly mean objectives and parks and outside seating areas and façades of leisure buildings such as cinemas, restaurants and gyms are considered relevant for the hourly mean objective, worst case receptors, relevant to the annual mean objective have been included in preference as this objective is more stringent. When identifying worst case receptors, particular attention has been paid to locations close to junctions and/or crossings where the impact of more than one road link and/or slow, congested traffic may increase impacts.

3.9 Based on the criteria above, 18 existing residential properties were previously identified and two further properties have been identified as worst-case receptors within the Aylesford AQMA. The locations of these receptors have been chosen to represent locations where the impact of additional traffic from the development are likely to be greatest. The locations of these receptors are shown in **Table 3-1** and **Figure 3-1**, **Figure 3-2** and **Figure 3-3**.

3.10 In addition, concentrations have been modelled at eight diffusion tube monitoring sites for use in model verification. Further details of model verification are provided in **Appendix B**.

Table 3-1: Receptor Locations

Receptor	Description	X coordinate	Y coordinate	Height (m)
E1	Outside AQMA	571631	158255	1.5
E2	Outside AQMA	571629	158313	1.5
E3	Adjacent to Ditton AQMA	571323	158347	1.5
E4	Within Ditton AQMA	571355	158380	1.5
E5	Within Ditton AQMA	571294	158408	1.5
E6	Adjacent to Ditton AQMA	571283	158352	1.5
E7	Within Ditton AQMA	571247	158374	1.5
E8	Adjacent to Ditton AQMA	571225	158335	1.5
E9	Outside AQMA	571166	158240	1.5
E10	Outside AQMA	571202	158249	1.5
E11	Adjacent to Larkfield AQMA	571036	158443	1.5
E12	Within Larkfield AQMA	571051	158470	1.5
E13	Adjacent to Larkfield AQMA	571009	158451	1.5
E14	Within Larkfield AQMA	570906	158478	1.5

E15	Within Larkfield AQMA	570805	158459	1.5
E16	Adjacent to Larkfield AQMA	570793	158419	1.5
E17	Adjacent to Larkfield AQMA	570510	158374	1.5
E18	Within Larkfield AQMA	570488	158335	1.5
E19	Within Aylesbury AQMA	572423	157933	1.5
E20	Within Aylesbury AQMA	572400	157956	1.5

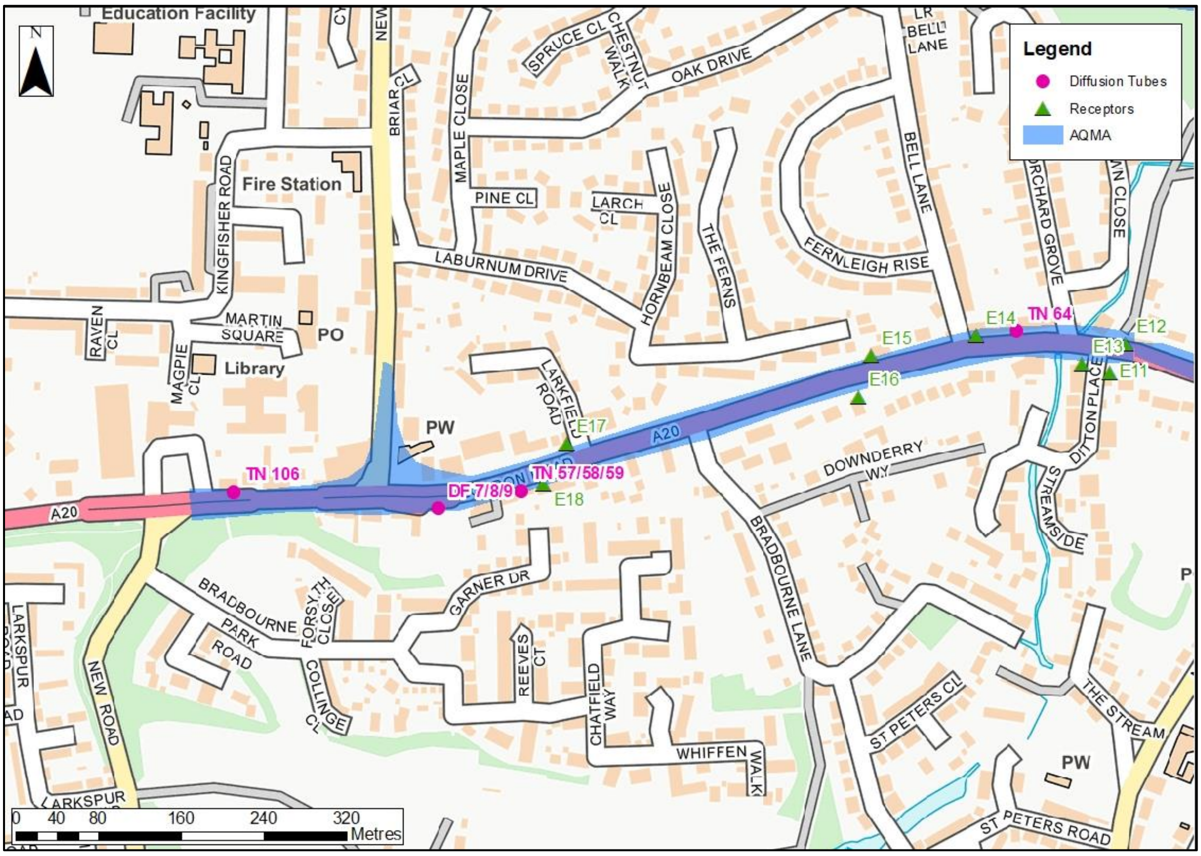

Figure 3-1: Receptors and Monitoring (Larkfield AQMA)

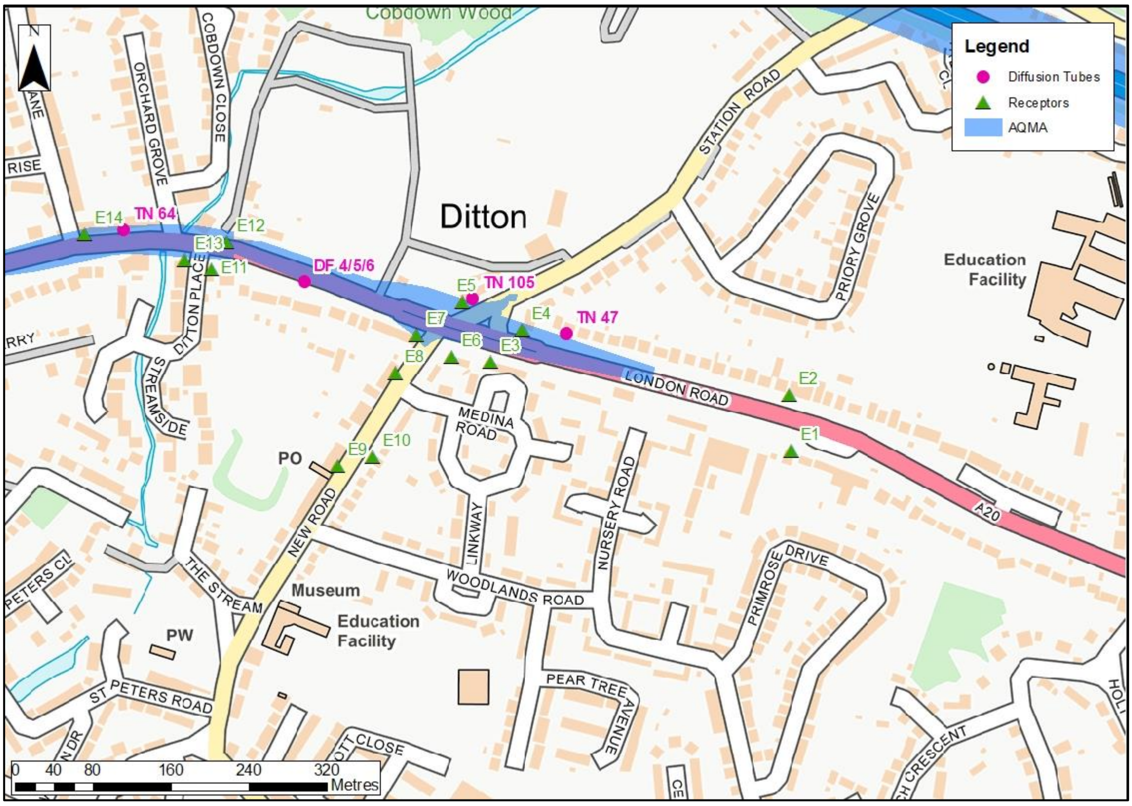

Figure 3-2: Receptors and Monitoring (Ditton AQMA)

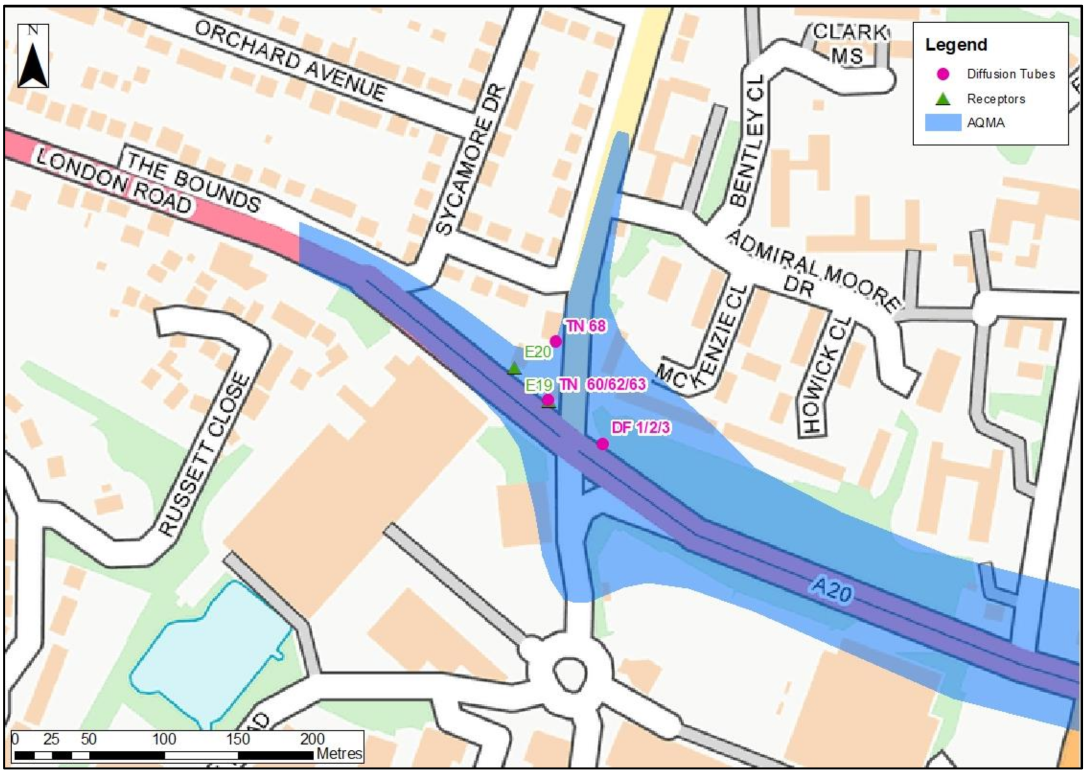

Figure 3-3: Receptors and Monitoring (Aylesford AQMA)

3.11 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5). This model requires a number of inputs including traffic flow (AADT), composition (proportion of HDVs) and speed as well as road characteristics such as width, gradient and street canyons as applicable. AADT flows and the proportion of HDVs have been provided by the project transport consultants, Ardent Consulting Engineers. These have been updated since the previous assessment was carried out. Traffic data used in this assessment is provided in **Appendix D**.

3.12 The model also requires meteorological data and inputs. The model has been run utilising 2019 data from the East Malling meteorological station which is considered suitable for the study area. **Appendix B** provides additional information on the meteorological inputs.

3.13 The emissions associated with the traffic have been calculated using the Emissions Factor Toolkit (EFT) v10.1 (Defra, 2020). This utilises emissions factors taken from the COPERT 5 emission tool, along with data relating to the fleet and vehicle turnover in the UK. Traffic data were entered into the EFT to provide emissions rates for each of the road links modelled, for a specified year (2018 to 2030), road type, vehicle fleet composition and speed. Whilst NOx emissions rates are related to exhaust, emissions rates for PM_{10} and $PM_{2.5}$ include increments for road, tyre and break wear.

Assumptions and Limitations

3.14 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent on the traffic data that have been input which will have inherent uncertainties associated with them. There is then the uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

3.15 The model relies on meteorological data for 2019 which may not represent conditions in the future. Whilst our understanding of climate change indicates that future conditions are likely to be more unsettled, which is likely to lead to better dispersion, this general trend may not be representative of conditions in the specific area or year of assessment.

3.16 Per-vehicle exhaust emissions are predicted to reduce year-on-year due to technological advances and changes to the vehicle mix such as uptake of Euro VI/6 vehicles as well as Low and Ultra Low emission technology. Whilst there has been uncertainty regarding the accuracy of these predictions in the past, evidence (Air Quality Consultants, 2020) suggests that the EFT v9 emissions factor predictions reflected real world conditions as long as appropriate verification processes were followed. The updates for EFT v10.1 include adjustments to the national fleet and are expected to increase accuracy of emissions predictions. It is therefore considered appropriate to use emissions factors as provided by the EFT for this assessment without adjustment beyond appropriate verification.

3.17 The baseline year has been chosen to reflect the most recent year for which sufficient data are available with which to model the verification site and carry out model verification. 2019 is the most recent year for which annual mean monitoring data for Tonbridge and Malling have been published and therefore has been identified as the baseline year.

3.18 As emissions are expected to reduce over time, it is considered a conservative approach to assess the impacts of the development in the earliest year of occupation. 2023 is the earliest year that the development is likely to be operational for a minimum of six months and has therefore been chosen as the future assessment year. In order to ensure that potential future impacts are considered fully, traffic data relating to 2031, when the development will be fully operational has been used, in conjunction with emissions relating to 2023 to represent the future assessment year. This is considered to be a precautionary approach as traffic data for 2031 will incorporate growth which will not be present in 2023.

Air Quality Impacts Significance Criteria

3.19 As there is no official guidance in the UK on how to assess the significance of the air quality impacts of a new development, the approach developed by the IAQM and EPUK (Institute of Air Quality Management and Environmental Protection UK, 2017) has been followed in this assessment. This approach considers the predicted change in air quality as a result of the development on existing receptors, taking into account the absolute concentrations in comparison to the objectives (set out in **Table 2-1**). This guidance sets out three stages of assessment:

1) Determine the magnitude of change at each receptor as a percentage of the objective / Limit Value;

2) Describe the impact at each receptor, taking into account the sensitivity of the receptor to changes in concentration (based on the average concentration in the assessment year); and

3) Assess the overall significance.

3.20 The first two steps are set out **Table 3-2.**

Table 3-2: Impact Descriptors for Individual Receptors [a]

Concentration [b]	% Change [c]			
	1[d]	2-5	6-10	>10
> 110 % [e]	Moderate	Substantial	Substantial	Substantial
> 102% - ≤110% [f]	Moderate	Moderate	Substantial	Substantial
>95%-≤102% [g]	Slight	Moderate	Moderate	Substantial
>75%-≤95% [h]	Negligible	Slight	Moderate	Moderate
≤75% [i]	Negligible	Negligible	Slight	Moderate

[a] Where concentrations increase, the impact is described as adverse and where it decreases, it is described as beneficial.
[b] Long term average concentration at receptor in assessment year
[c] In relation to Objective / Limit Value
[d] % change rounded to nearest whole number. Where the change is 0 (i.e. <0.5) the impact will be Negligible.
[e] NO_2 or PM_{10} annual mean >44μg/m^3; $PM_{2.5}$ annual mean >27.5μg/m^3; PM_{10} daily mean >35.2μg/m^3 annual mean

[f] NO_2 or PM_{10} annual mean >40.8-≤44µg/m^3; $PM_{2.5}$ annual mean >25.5-≤27.5µg/m^3; PM_{10} daily mean >32.64-≤35.2µg/m^3 annual mean
[g] NO_2 or PM_{10} annual mean >38-≤40.8µg/m^3; $PM_{2.5}$ annual mean >23.75-≤25.5µg/m^3; PM_{10} daily mean >30.4-≤32.64µg/m^3 annual mean
[h] NO_2 or PM_{10} annual mean >30-≤38µg/m^3; $PM_{2.5}$ annual mean >18.75-≤23.75µg/m^3; PM_{10} daily mean >24-≤30.4µg/m^3 annual mean
[i] NO_2 or PM_{10} annual mean ≤30µg/m^3; $PM_{2.5}$ annual mean ≤18.75µg/m^3; PM_{10} daily mean ≤24µg/m^3 annual mean

3.21 The assessment of overall significance (step 3) is made based on professional judgement, taking into account factors such as:

- The number of properties affected by different levels of impacts;
- The magnitude of any changes and descriptors (as identified in stage 1 and 2);
- Whether a new exceedance of an objective or limit value is predicted to arise, an existing exceedance removed or an existing exceedance substantially increased or reduced;
- The level of uncertainty, including the extent to which worst case assumptions have been made; and
- The extent of any exceedance of an objective or limit value.

3.22 When considered at individual receptors, moderate or substantial impacts at individual receptors may be considered significant and negligible or slight impacts not significant. Consideration of the overall effect on air quality needs to incorporate consideration of impacts as a whole including the extent to which receptors represent sensitive locations and whether this wider impact is significant or not.

4.0 BASELINE CONDITIONS

Site Context and Study Area

4.1 The site is bound to the East by Kiln Barn Road, to the north by existing residential dwellings and to the south and east by agricultural land.

4.2 The study area in relation to air quality incorporates receptors adjacent to roads expected to exceed the screening criteria set out in **paragraph 3.4**.

LAQM

4.3 TMBC has assessed air quality within its area as part of its responsibilities under LAQM. Seven AQMAs have been declared due to exceedances of the annual mean NO_2 objective, with the M20 AQMA also incorporating exceedances of the 24-hour mean PM_{10} objective. The development site is south of the Larkfield and Ditton AQMAs, both located on the A20, and approximately 1 km west of the Aylesbury AQMA, also located on the A20.

Monitoring

4.4 TMBC carried out NO_2 monitoring at two automatic and 52 diffusion tube monitoring sites in 2019. The closest and most representative locations are identified in **Figure 3-1**, **Figure 3-2** and **Figure 3-3**, above, and results for the last 5 years are shown in **Table 4-1**.

Table 4-1: Measured Annual Mean NO_2 Concentrations ($\mu g/m^3$)

Site ID	Site Name	Site Type	2015	2016	2017	2018	2019
DF 1/2/3	Aylesford (Hall Road) junction Bus stop (E-bound)	Roadside	**42.6**	**43.9**	**44.1**	**40.1**	**41.1**
DF 4/5/6	London Road (no559), Ditton Bus stop (W-bound)	Roadside	33.1	33	31.9	32	29.4
DF 7/8/9	London Road (by Wealden Hall), Larkfield Bus stop (W bound)	Roadside	35.2	**41.8**	35	32.8	30.4
TN 47	London Road, Ditton (nos 516)	Urban Background	18.8	19.6	19.6	18.0	17.9
TN 57/58/59	London Road, Larkfield (no 743)	Roadside	34	33.7	31.4	32.2	30.7
TN 60/62/63	London Road, Aylesford (no 290)	Roadside	**44.1**	**44.8**	**44.8**	**41.7**	**42.1**

TN 64	London Road, Larkfield (no 606)	Roadside	29.0	31.0	29.4	29.0	28.2
TN 68	7 Hall Road, Aylesford	Roadside	30.8	30.8	31.4	28.3	28.3
TN 105	7 Station Road, Ditton	Roadside	n/a	25.8	24.1	21.2	21.3
TN106	794 London Rd, Larkfield	Roadside	n/a	37.3	32.8	35.5	**41.5**
Objective			**40**				

Exceedances of the Objective highlighted in **BOLD**
2015 – 2019 data taken from (Tonbridge and Malling Borough Council, 2020)

4.5 Concentrations of NO_2 at monitoring sites close to the development site have been above the objective over the past five years at two sites (both within the Aylesford AQMA) and generally below the objective at the remaining eight sites, although concentrations were above the objective in 2016 at site DF 7/8/9 and in 2019 at site TN 106. Concentrations at all monitoring sites have been below 60 µg/m^3, suggesting that the 1-hour objective has been met. There is no significant trend in concentrations over this time.

4.6 TMBC do not measure PM_{10} or $PM_{2.5}$ concentrations.

Predicted Background Concentrations

4.7 Predicted background concentrations have been obtained from national maps provided by Defra (Defra, 2020). These are provided for every 1 km x 1 km grid square across the country. The backgrounds used in this assessment are shown in **Table 4-2**.

4.8 The predicted background concentrations are all well below the relevant objectives.

Table 4-2: Predicted Annual Mean Background Concentrations (µg/m^3)

Year	Location	NO_2	PM_{10}	$PM_{2.5}$
2019	570500, 158500	17.0	17.9	12.0
	571500, 158500	18.4	17.6	11.7
	572500, 157500	14.1	15.5	10.2
2023	570500, 158500	14.3	17.1	11.3
	571500, 158500	15.3	16.8	11.0
	572500, 157500	12.3	14.7	9.6
Objectives		**40**	**40**	**25**

Predicted Baseline Concentrations

4.9 The ADMS-Roads model has been used to predict baseline NO_2, PM_{10} and $PM_{2.5}$ concentrations at each of the existing receptor locations identified in **Table 3-1** for both the baseline scenarios (2019 and 2023). The results of these predictions are shown in **Table 4-3**.

Table 4-3: Predicted Annual Mean Baseline Concentrations (µg/m^3)

Receptor	NO_2		PM_{10}		$PM_{2.5}$	
	2019	2023	2019	2023	2019	2023
E1	22.1	17.8	18.3	17.5	12.1	11.4
E2	27.0	21.2	19.4	18.7	12.7	12.0
E3	25.5	19.8	18.7	17.8	12.3	11.6
E4	33.6	25.6	19.9	19.1	13.0	12.3
E5	31.0	23.0	19.5	18.5	12.8	12.0
E6	25.0	19.2	18.6	17.6	12.2	11.5
E7	28.8	21.0	19.1	18.0	12.6	11.7
E8	23.4	18.2	18.3	17.4	12.1	11.4
E9	21.5	17.3	18.1	17.2	11.9	11.2
E10	21.0	16.9	18.0	17.1	11.9	11.2
E11	24.7	18.4	18.9	17.7	12.4	11.5
E12	38.9	25.7	22.3	20.2	14.4	12.9
E13	25.8	19.0	19.2	17.9	12.5	11.6
E14	32.9	22.2	21.2	19.4	13.7	12.4
E15	31.1	21.3	20.7	19.0	13.4	12.3
E16	23.9	17.7	19.0	17.8	12.5	11.6
E17	29.1	20.2	20.1	18.6	13.1	12.0
E18	27.8	19.6	19.8	18.3	12.9	11.9
E19	**42.2**	34.6	22.0	22.0	14.3	14.0
E20	35.2	28.4	20.9	20.5	13.6	13.1
Objectives	**40**		**40**		**25**	

4.10 The predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations meet the relevant objectives in both 2019 and 2023 with the exception of R19 where an exceedance is predicted in 2019 but not 2023. Concentrations of NO_2 are below 60 µg/m^3 and therefore, it is unlikely that there would be exceedances of the hourly mean objective. Similarly, concentrations of PM_{10} are predicted to be below 32 µg/m^3 and therefore, it is expected that the daily-mean objective will be met.

5.0 PREDICTED IMPACTS

5.1 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at existing receptors in 2023, both with and without the proposed development in place. The identified receptors are described in **Table 3-1** and shown in **Figure 3-1**. Predicted concentrations, the proportional change and impact at each receptor are shown in **Table 5-1**, **Table 5-2** and **Table 5-3** for NO_2, PM_{10} and $PM_{2.5}$, respectively.

Table 5-1: Predicted Annual Mean Concentrations of NO_2 ($\mu g/m^3$), % Change and Impact at each Receptor

Receptor	2023 Without Development	2023 With Development	Change (%)	Impact
E1	17.8	17.8	<1	Negligible
E2	21.2	21.4	<1	Negligible
E3	19.8	20.1	1	Negligible
E4	25.6	25.9	1	Negligible
E5	23.0	23.4	1	Negligible
E6	19.2	19.6	1	Negligible
E7	21.0	21.8	2	Negligible
E8	18.2	19.2	2	Negligible
E9	17.3	18.1	2	Negligible
E10	16.9	17.5	1	Negligible
E11	18.4	18.5	<1	Negligible
E12	25.7	26.1	1	Negligible
E13	19.0	19.1	<1	Negligible
E14	22.2	22.5	1	Negligible
E15	21.3	21.5	1	Negligible
E16	17.7	17.8	<1	Negligible
E17	20.2	20.5	1	Negligible
E18	19.6	19.8	1	Negligible
E19	34.6	34.9	1	Negligible
E20	28.4	28.7	1	Negligible
Objective	**40**		**-**	

Table 5-2: Predicted Annual Mean Concentrations of PM_{10} ($\mu g/m^3$), % Change and Impact at each Receptor

Receptor	2023 Without Development	2023 With Development	Change (%)	Impact
E1	17.5	17.5	<1	Negligible
E2	18.7	18.7	<1	Negligible
E3	17.8	17.8	<1	Negligible
E4	19.1	19.2	<1	Negligible
E5	18.5	18.5	<1	Negligible

E6	17.6	17.7	<1	Negligible
E7	18.0	18.2	1	Negligible
E8	17.4	17.6	1	Negligible
E9	17.2	17.4	1	Negligible
E10	17.1	17.2	<1	Negligible
E11	17.7	17.7	<1	Negligible
E12	20.2	20.4	<1	Negligible
E13	17.9	17.9	<1	Negligible
E14	19.4	19.5	<1	Negligible
E15	19.0	19.1	<1	Negligible
E16	17.8	17.8	<1	Negligible
E17	18.6	18.7	<1	Negligible
E18	18.3	18.4	<1	Negligible
E19	22.0	22.1	<1	Negligible
E20	20.5	20.6	<1	Negligible
Objective	**40**		**-**	

Table 5-3: Predicted Annual Mean Concentrations of $PM_{2.5}$ (μg/m³), % Change and Impact at each Receptor

Receptor	2023 Without Development	2023 With Development	Change (%)	Impact
E1	11.4	11.4	<1	Negligible
E2	12.0	12.1	<1	Negligible
E3	11.6	11.6	<1	Negligible
E4	12.3	12.4	<1	Negligible
E5	12.0	12.0	<1	Negligible
E6	11.5	11.5	<1	Negligible
E7	11.7	11.8	<1	Negligible
E8	11.4	11.5	<1	Negligible
E9	11.2	11.4	<1	Negligible
E10	11.2	11.3	<1	Negligible
E11	11.5	11.5	<1	Negligible
E12	12.9	13.0	<1	Negligible
E13	11.6	11.6	<1	Negligible
E14	12.4	12.5	<1	Negligible
E15	12.3	12.3	<1	Negligible
E16	11.6	11.6	<1	Negligible
E17	12.0	12.1	<1	Negligible
E18	11.9	11.9	<1	Negligible
E19	14.0	14.0	<1	Negligible
E20	13.1	13.2	<1	Negligible
Objective	**40**		**-**	

5.2 The predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations in 2023, both without and with the proposed development in place, are below the relevant objectives at all existing receptor locations. Furthermore, predicted annual mean NO_2 concentrations are below 60 $\mu g/m^3$ and annual mean PM_{10} concentrations are below 32 $\mu g/m^3$, therefore exceedances of the short term objectives for NO_2 and PM_{10} are unlikely.

5.3 The changes in annual mean NO_2 concentrations (rounded to the nearest whole number) range from 0-2%. Using the criteria set out in **Table 3-2**, these impacts are described as being negligible at all receptors.

5.4 The changes in PM_{10} and $PM_{2.5}$ concentrations (when rounded to the nearest whole number) are between 0-1% at all receptors and therefore, PM_{10} and $PM_{2.5}$ impacts are considered to be negligible at all receptors.

5.5 The impact on existing receptors has been assessed, taking into account:

- the impacts at individual, modelled receptors;
- the number of properties represented by each modelled receptor;
- the conservative nature of the assessment;
- the predicted concentrations and how close these are to relevant objectives; and
- the potential for any change to impact an existing AQMA or result in the declaration or extension of an AQMA.

5.6 Taking these factors into account, the overall impact of the development on local air quality is considered to be 'not significant'.

6.0 CONCLUSIONS

6.1 The potential air quality impacts associated with the proposed residential development on Kiln Barn Road, Ditton have been assessed following updates to emissions factors and traffic data. In addition, the study area has been extended to include receptors within the Aylesford AQMA.

6.2 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been modelled in order to ascertain the potential impacts. It is concluded that the air quality impacts related to the development will be not significant. This conclusion is based on the predicted concentrations at all receptors being below the relevant objectives in the assessment year, both with and without the development and impacts at all individual receptors being negligible. This conclusion is unchanged from the conclusions reached in the previously completed Air Quality Assessment dated December 2018.

6.3 Overall, it is concluded that there are no air quality constraints to the proposed development which is in accordance with local, regional and national policy and guidance.

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Appendix A Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ACE	Ardent Consulting Engineers
ADMS	Air Dispersion Modelling System
APIS	Air Pollution Information System
AQA	Air Quality Assessment
AQMA	Air Quality Management Area
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube (DT)	A passive sampler used for collecting NO_2 in the air
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
m^3	Cubic Metres
NAQO	National Air Quality Objective as set out in Air Quality Strategy and the Air Quality Regulations
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides, generally considered to be nitric oxide and NO_2. The main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles and natural gas used in gas-fired boilers.
NPPF	National Planning Policy Framework
PM_{10} or $PM_{2.5}$	Small airborne particles less than 10/2.5 μg in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur

Appendix B Model Inputs and Results Processing

B1 Model Inputs and Results Processing Tools

Model Version	ADMS-Roads v5, April 2020
Street Canyons	The study area was not considered to include significant canyons and therefore the Advanced Street Canyon module was not utilised in this assessment.
British Summer Time (BST)	Adjustment for BST was made within the model, based on the following dates and times: BST begins – 01:00 on 31/03/2019 BST ends – 02:00 on 27/10/2019
Emission Factor Toolkit (EFT)	V10.1, August 2020
Time Varying Emissions Factors	Based on Department for Transport (DfT) statistics, Table TRA0307: Motor Vehicle Traffic Distributed by Time of Day and Day of the Week on all roads, Great Britain:2019.
Meteorological Data	2019 hourly meteorological data from the East Malling meteorological site has been used in the model. The wind rose is shown in **Figure B.1**.
Latitude	51°
Surface Roughness	A value of 0.5 for open suburbia was used to represent the modelled area. A value of 0.1 was used to represent the meteorological station site.
Minimum Monin-Obukhov Length	A value of 10 for small townes was used to represent the modelled area. A value of 10 was used to represent the meteorological station site.

NOx to NO_2 conversion	NO_2 from NOx calculator version 8.1 **(Defra, 2020)**
Background Maps	2018 reference year background maps **(Defra, 2020)**

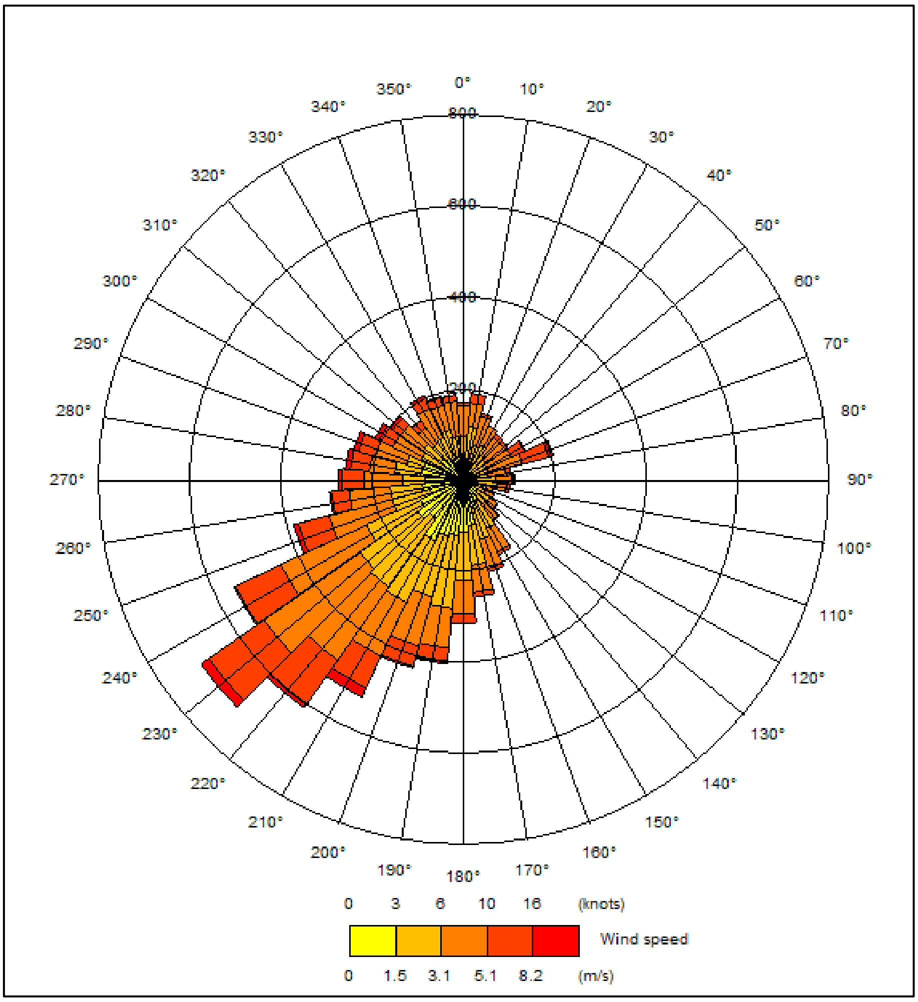

Figure B.1: 2019 East Malling Wind Rose

B2 Verification

Nitrogen Dioxide

B2.1 Most nitrogen dioxide (NO_2) is produced in the atmosphere by a reaction between nitric oxide (NO) and ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the annual mean road-NOx contribution in 2019 at eight monitoring locations (identified in **Table 4-1**).

B2.2 The choice of appropriate monitoring sites for verification has been based on:

- Appropriateness of site (roadside rather than background sites, presence of additional emission sources etc);
- Distance from study area; and
- Availability of traffic data for modelling.

B2.3 Monitoring sites TN 47 and TN 105 have been excluded from the verification process as they are located at too great a distance from the A20. TN 47 is listed as an Urban Background site due to this distance and therefore it is not suitable for use in verification. Whilst TN 105 is not listed as a background monitoring site, it is located on Station Road which is associated with lower emissions than the A20. Whilst it was included in the model, concentrations measured at this site are lower than those predicted. This is likely to be due to the distance between the diffusion tube and significant emissions sources and it is therefore not appropriate to include this within the emission calculation. This is a precautionary approach as inclusion of this site would lead to a lower verification factor and therefore smaller predicted impacts.

B2.4 The model output of road-NOx has been compared with the 'measured' road-NOx, which was calculated from the measured NO_2 concentrations within the NOx from NO_2 calculator.

B2.5 A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the modelled road contribution, forced through zero (**Figure B.2**). This factor was then applied to the modelled road-NOx concentrations. The total NO_2 concentrations were then determined by combining the adjusted modelled road-NOx with the predicted background NO_2 concentration within the NOx to NO_2 calculator. A secondary adjustment factor was then calculated as the slope of best fit between the measured NO_2 and primary adjusted, modelled NO_2, forced through zero (**Figure B.3**).

B2.6 The following primary and secondary adjustment factors have been applied to all modelled NO_2 data:

Primary adjustment factor: 1.5844

Secondary adjustment factor: 1.0162

B2.7 The results imply that overall, the model was under-predicting the road-NOx contribution. This is a common experience with this and most other models. The secondary NO_2 adjustment is minor.

B2.8 The Root Mean Square Error (RMSE) has been calculated as 2.6 µg/m^3 which is within the guideline variance recommended within TG(16) **(Defra, 2016)**.

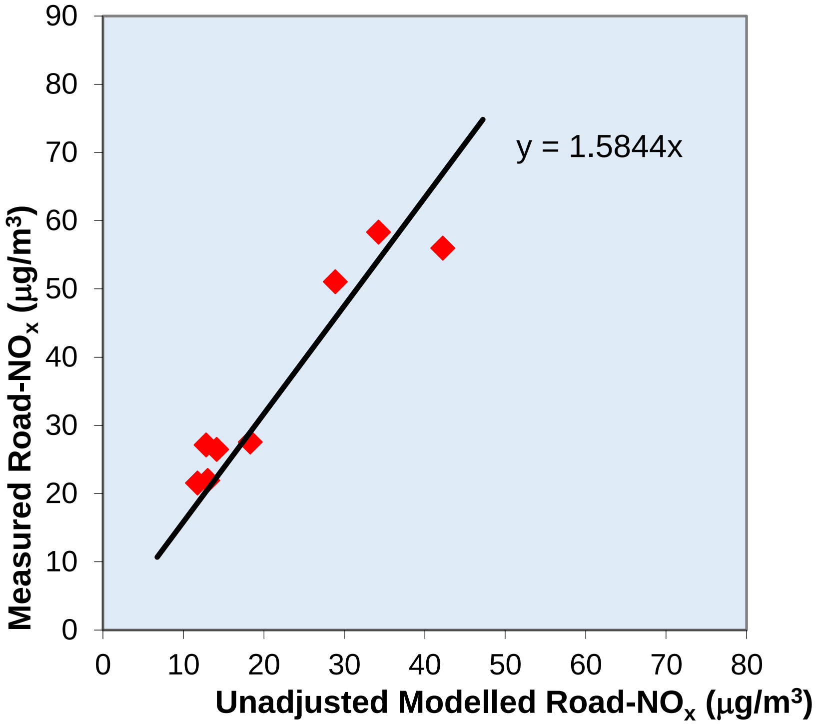

Figure B.2: Measured road-NOx / Modelled road-NOx concentrations

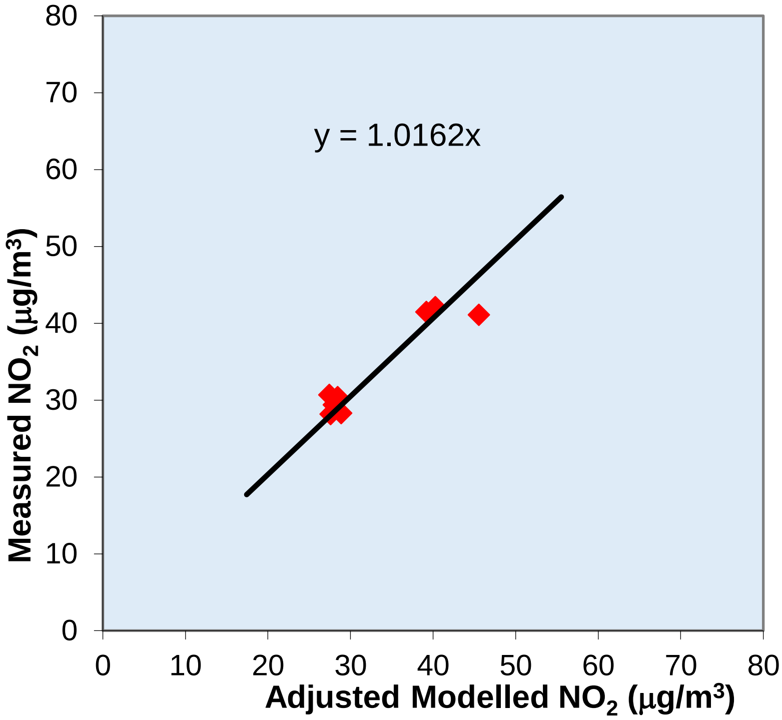

Figure B.3: Measured NO_2 / Primary Adjusted modelled NO_2 concentrations

PM_{10} and $PM_{2.5}$

B2.9 There is no PM_{10} or $PM_{2.5}$ monitoring in close proximity to the proposed development site. Therefore, the primary adjustment factor calculated for NO_2 concentrations has been applied to the modelled road-PM_{10} and $PM_{2.5}$ concentrations.

Appendix D Traffic Data and Road Network

Table D.1: Modelled Traffic Data

Road Link	Speed (Average / Slow Sections)	2019 Base		2031 Without Development		2031 With Development	
		AADT	%HDV	AADT	%HDV	AADT	%HDV
Kiln Barn Road / New Road (south of A20)	32/25	1,310	11.0%	1,469	11.0%	1,713	9.7%
A20 London Road (west of New Road)	64/50/25	1,310	11.0%	1,469	11.0%	2,894	6.6%
A20 London Road (east of New Road)	64/50/25	1,310	11.0%	1,469	11.0%	2,894	6.6%
A20 London Road (west of Hall Road)	64/50/25	18,438	10.0%	13,748	10.0%	14,425	9.6%
A20 London Road (east of Hall Road)	64/50/25	13,940	10.0%	15,340	10.0%	15,811	9.8%
Hall Road	48/25	14,612	10.0%	17,283	10.0%	17,754	9.8%
Mills Road	25	24,783	10.0%	30,980	10.0%	31,451	9.9%