

A3 Guildford Report

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0. Executive Summary

The A3 as it passes through Guildford is currently exceeding the Air Quality Limit Value for nitrogen dioxide (NO₂). In the latest version of the Pollutant Climate Mapping (PCM) model (based on 2018 projections), compliance is predicted in 2022 without any additional measures, a slight improvement to the compliance year of 2025 based on the 2017 projections. However, local modelling conducted by Highways England (HE), shows that concentrations close to the road are well above both of these PCM predictions, and compliance will not be achieved by 2030.

AECOM has worked alongside Guildford Borough Council (GBC) and Highways England (HE) to conduct a high-level analysis to understand what, if any, measures could be delivered in the next few years to improve air quality along this section of the A3. The study has gathered evidence on journey movements and vehicle types on the A3 to show that the majority of traffic (~60%) on the A3 is due to through journeys (i.e. those without an origin or destination in Guildford) and that the key contributors to NO_x emissions are from diesel vans and cars on the A3 (around 80% of vehicle emissions). Based on the current NO₂ concentrations and evidence collected, it is likely there is no single measure that will effectively bring forward compliance with the EU Limit Value. However, a number of potential measures have been short listed for further detailed investigation to consider air quality impacts and costs:

- Encouraging uptake of Electric Vehicles – Priority Option
- Comprehensive Guildford Borough cycle network (re-route away from A3) – Priority Option
- Promoting sustainable travel – easitGUILDFORD
- Rethinking Transport
- New rail station at Guildford West (Park Barn)

In combination, these measures may help to reduce vehicle use and/or encourage modal shift for journeys on the A3 and can be targeted at the approximately 20% of journeys to/from key employment areas.

1. Introduction

- 1.1 On 26 July 2017, the government published the UK plan for tackling roadside nitrogen dioxide (NO₂) concentrations ('the UK Plan') (Ref 1) to bring NO₂ concentrations within the European Union (EU)'s statutory annual limit value of 40 micrograms per cubic metre (µg/m³) in the shortest possible time. This initially focused on five key urban areas but has been extended to direct additional local authorities to work towards this limit. The Department for Environment, Food and Rural Affairs and the Department for Transport's Joint Air Quality Unit (JAQU) is responsible for overseeing the delivery of the UK Plan, which includes supporting local authorities and other organisations on the delivery of local measures in their area.
- 1.2 Highways England (HE) is responsible for improving air quality along their own Strategic Road Network and has been commissioned by DfT to assess a number of sections of the SRN in further detail, that were originally identified in the PCM model as above the limit value. Highways England has all the commissioned links, which includes the A3, and have developed measures where possible to help ensure that limit values for individual links can be met in the shortest timescales possible.
- 1.3 The HE focuses their air quality studies and mitigation on those links identified in the Government's Pollution Climate Mapping (PCM) model that are exceeding the EU Limit Value. The A3 as it passes through Guildford is one of the PCM links (ID 17736) on the HE road network that currently exceeds the Limit Value. In the latest version of the PCM model (based on 2018 projections), compliance is predicted in 2022 without any additional measures, a slight improvement to the compliance year of 2025 based on the 2017 projections. However, local modelling conducted by HE, shows that concentrations close to the road are well above both of these PCM predictions, and compliance will not be achieved by 2030.
- 1.4 GBC needs to collaborate closely with HE and Surrey County Council (SCC) to deliver real improvements in air quality along the A3, whilst also considering the risks of any unintended adverse impacts on other areas of the borough. The Air Quality Strategy, which sets objective values for key pollutants as a tool to help local authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive, requires local authorities to monitor and implement an action plan to improve air quality in AQMAs. Thus, it is of particular importance that there are no adverse impacts in nearby AQMAs.
- 1.5 For this study, AECOM has worked alongside Guildford Borough Council (GBC) and HE to conduct a high-level analysis of origin and destination of traffic and source apportionment to understand key journey types and sources, allowing for an informed appraisal of what, if any, measures could be delivered in the next few years to improve air quality along this section of the A3. The study outlines additional recommends and next steps in order to fully understand the potential air quality and wider impacts of short-listed measures.

2. Legislation and Policy Context

- 2.1 There are national, regional and local policies for the control of air pollution, and local action plans for the management of local air quality in Guildford Borough Council. The achievement of such policies and plans are matters that may be a material consideration for planning authorities when making decisions for individual planning applications.

National Legislation

Air Quality Standards (Amendment) Regulations (2016)

- 2.2 The Clean Air for Europe (CAFE) (Ref 2) programme revisited the management of Air Quality within the EU and replaced much of the existing air quality legislation with a single legal act, Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (Ref 3). This Directive repealed and replaced the EU Framework Directive 96/62/EC on Ambient Air Quality Assessment and Management (Ref 4) and its associated Daughter Directives 1999/30/EC (Ref 5), 2000/69/EC (Ref 6), 2002/3/EC (Ref 7), (relating to limit values for ambient air pollutants) and the Council Decision 97/101/EC (Ref 8) which established a reciprocal exchange of information and data within Member States.
- 2.3 Directive 2008/50/EC is transcribed into UK legislation by the Air Quality Standards Regulations 2010 (Ref 9) and subsequent amendments (Ref 10).
- 2.4 The UK National Air Quality Strategy (AQS) was initially published in 2000, under the requirements of the Environment Act 1995 (Ref 11). The most recent revision of the strategy (2007) (Ref 12) sets objective values for key pollutants as a tool to help local authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have subsequently been laid out within the Air Quality (England) Regulations 2000 (Ref 13) and later amendments (2015) (Ref 14, Ref 15).

UK Air Quality Strategy

- 2.5 The Air Quality Objective values referred to below have been outlined in legislation solely for the purposes of local air quality management. Under the local air quality management regime, the local authority has a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the governing local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. Consequently, it is not unusual for the boundary of an AQMA to include relevant locations where air quality is not at risk of exceeding an Air Quality Objective.
- 2.6 The UK's national Air Quality Objective values for the pollutants of relevance to this assessment are displayed in Table 2-1.

Table 2-1 Key Air Quality Strategy Objectives

Pollutant	Objective	Averaging Period	Maximum Permitted Exceedances
Nitrogen Dioxide (NO ₂)	200 µg/m ³	1 hour	18 times per year (i.e. 99.79 th percentile)
	40 µg/m ³	Annual	-
Particulate Matter (PM ₁₀)	40 µg/m ³	Annual	-
	50 µg/m ³	24-hour	35 times per year (i.e. 90.4 th percentile)
Particulate Matter (PM _{2.5})	25 µg/m ³	Annual	-

National Clean Air Strategy

- 2.7 In 2019, the UK government released its much-anticipated Clean Air Strategy 2019 (Ref 16), part of its 25 Year Environment Plan. The Strategy places greater emphasis on improving air quality in the UK than has been seen before and outlines how this is to be achieved (including the development of new enabling legislation).
- 2.8 Air quality management focus in recent years has primarily related to one pollutant, NO₂, and its principal source in the UK, road traffic. However, the Strategy broadens the focus to other areas, including domestic emissions from wood burning stoves and from agriculture. This shift in emphasis is part of a goal to reduce the levels of fine particulate matter (PM_{2.5}) in the air to below the World Health Organisation guideline level; far lower than the current EU limit value.

Regional Planning Policy

Surrey Transport Plan

- 2.9 The Surrey Transport Plan (STP) sets the strategy for guiding future investment in the local highways and transport infrastructure. It also sets a framework for considering transport infrastructure requirements associated with future development across the county. The Plan aims to deliver effective, reliable, safe and sustainable transport in order to “promote economic vibrancy, protect and enhance the environment and improve the quality of life”. A number of transport strategies form part of the STP, with each strategy setting out “the most effective, value for money, and customer-focused measures, interventions and policy tools that will best tackle problems and address objectives and targets”. SCC has embarked on a replacement STP. This will set out a route for transport policy and development in Surrey to achieve zero carbon. Consultation is expected to take place in mid-2021, with adoption anticipated in 2022. SCC commitment to sustainable transport as outlined in the STP ties in with several potential measures considered in this report, which aims to improve air quality on the A3 by encouraging alternative sustainable transport options.

Local Planning Policy

Guildford Borough Council’s Local Plan 2015-2034

- 2.10 The Local Plan sets out the Council’s vision for the borough and their approach to development in the period to 2034 (Ref 20). The Plan, adopted in April 2019, seeks to ensure development in a way that protects and enhances the natural environment, develops the local economy, improves leisure and visitor facilities, and supports more sustainable forms of travel. Air pollution is identified as a potential adverse material impact that new development is required to address through the development’s transport strategy - see Policy ID3 (6)(b).

Guildford Borough Council Air Quality Strategy 2017-2022

- 2.11 The strategy identifies key air quality issues within the borough and references the Council’s comprehensive Action Plan which details measures to be taken by the Council in the period to 2022 to help reduce concentrations of, and exposure to, air pollutants. The strategy aims to provide a framework for action to improve air quality in Guildford through working with the local community to help facilitate a modal shift in transport and travel patterns.

Guildford Borough Council Transport Strategy 2017

- 2.12 GBC’s Transport Strategy was published in 2017 and sets out a programme to address the historic infrastructure deficit and to mitigate the key transport impacts of proposed planned growth within the borough and beyond (Ref 21).
- 2.13 The Plan outlines the improvements to be delivered by the Council alongside their partners:

- A formal Memorandum of Understanding (MOU) that has been agreed between GBC, University of Surrey, Royal Surrey County Hospital and Surrey County Council to work together to deliver improved car parking and sustainable transport at the University, Hospital and Research Park.
- Proposed works as part of the Council's 'Rail' strategy include, but are not limited to, the construction of additional platforms, a bus interchange hub, a cycle hub and a new improved footbridge at Guildford rail station; and the construction of new rail stations at Guildford West (Park Barn) and Guildford West (Merrow).
- Highways England's anticipated A3 Guildford (A320 Stoke interchange junction to A31 Hog's Back junction) 'Road Investment Strategy' scheme, which forms part of GBC's 'Surface Access to Airports' and 'Strategic Road Network' strategies.
- GBC anticipate the delivery of a new Sustainable Movement Corridor under their 'Bus Transit' strategy, which will provide rapid and reliable bus journeys in Guildford urban area, in addition to the expansion of the Park & Ride scheme via the construction of a new site at Gosden Hill Farm urban extension (also part of the Council's 'Local Roads and Parking' strategy).
- GBC anticipate the implementation of traffic management and environmental improvements on key links within the borough as part of their 'Local Roads and Parking' strategy, including A31 Hog's Back. This strategy is intertwined with the Council's 'Road Transport and Air Quality' strategy, which seeks to achieve for there to be no requirement for Air Quality Management Areas in Guildford borough and to achieve improvements to air quality in our borough where feasible.
- The introduction of a comprehensive network of cycle routes, segregated where appropriate, to link existing and new communities is proposed as part of the Council's 'Active Modes' strategy.

3. Review of Previous Studies

A3 Air Quality Modelling

- 3.1 The Audit Summary Report (Ref 22) shows that air quality monitoring has been undertaken by HE at a number of locations along PCM Link 17736 for several years. These sites meet the EU siting criteria, in that they are within 4m of the road edge. NO₂ monitoring results showed exceedances of the annual mean NO₂ EU Limit Value of 40 µg/m³ at multiple locations.
- 3.2 During Phase 2, indicative modelling identified that there were potential exceedances of the EU limit values along this PCM link. As a result, mitigation measures were developed and it was recommended that further work be carried out in Phase 3 to confirm the potential for exceedances.
- 3.3 The Phase 3 assessment concluded that there are exceedances of the EU Limit Values up to and including the year 2030, see Figure A-1 in the Appendix. Therefore, mitigation measures were reviewed as part of this assessment.
- 3.4 In the report, mitigation measures were classified into three categories:
 - Reducing emissions from the SRN (Source);
 - Preventing the emissions reaching receptors (Pathway); and
 - Dealing with concentrations at the affected receptors (Receptor).
- 3.5 Traffic management feasibility studies were undertaken to investigate whether local traffic measures could be introduced that support compliance with the EU limit values in the shortest timescales possible. It was initially determined that options involving speed cameras/trip reduction could be potentially viable.
- 3.6 Many of the remaining source-focused mitigation measures (electric vans; bus retrofit; and HGV retrofit) have been dismissed due to the predicted negligible reduction in NO_x as a result of their implementation, and therefore failure to achieve compliance at an earlier date. Speed management at 60mph would not be applicable for this part of the network due to the existing 50mph speed limit along the A3. In addition, low friction road surfacing is not being pursued due to a lack of empirical evidence on the effects on NO_x emissions.
- 3.7 Pathway-focused mitigation measures reviewed include construction of a 9.5m high barrier or the construction of a tunnel, canopy or bypass. The current programme of the latter is estimated to be between 5-10 years; as the Phase 3 modelling has indicated, exceedances of the EU limit values along this PCM link up to and including the year 2030 are anticipated, and therefore further work will be required to assess whether a tunnel, canopy or bypass could be a viable option. Feasibility studies have been commissioned to determine whether the construction of a 9.5m high barrier and/or the introduction of any local traffic measures could be recommended to support compliance with the EU limit values in the shortest timescales possible. Thus far, it has been determined that delivery of a barrier may be possible in this location by the end of 2022. However, it is noted that whilst the estimated 2-5 µg/m³ reduction in annual mean NO₂ concentrations behind a 9.5m makes a substantive improvement in annual mean NO₂ concentrations, even with barrier the annual mean EU limit value still exceeds in 2030.
- 3.8 Mechanical filtration, however, is being considered as a cumulative measure alongside the introduction an air quality barrier, given that the barrier alone will not reduce annual mean NO₂ concentrations to within EU limits. Portable mechanical filtration as a means to improve indoor air quality will therefore be subject to further consideration.
- 3.9 Receptor-focused mitigation measures were dismissed by HE as not being feasible, for example cycle path/footpath realignment due to no potential for alternative routes for mitigation. It is understood that HE has undertaken a detailed study into the re-routing of the cycle path, but this report has not been made available to AECOM. As part of the discussions for this study, this measure is now being re-considered as an option.

Cycle Route Assessments

- 3.10 The existing means of crossing the A3 and negotiating the gyratory safely are considered to be poor quality and indirect. Furthermore, across the study area, crossing provision is not complete at many junctions, and adequate crossings are often not provided on all arms of junctions, irrespective of need.
- 3.11 To consider means to encourage more people to cycle and therefore lead to a potential reduction in shorter car journeys on the A3, GBC commissioned a feasibility study into Cycle Route Assessments in 2018 (Ref 23). This also included an audit of cycle parking (and survey of usage), consideration of bike sharing in Guildford town centre and a review of direction signage.
- 3.12 A Cycle Skills Network Audit of Guildford town centre was carried out to consider covered roads, paths and crossings to map existing barriers and potential opportunities for cycling. The audit found that whilst there are large areas which are considered widely accessible to all existing and potential cyclists, there are two major road barriers to cycling in Guildford:
- the A3 (and its junctions); and
 - the town centre gyratory.
- 3.13 The audit noted that on-road cycling infrastructure is limited and described the existing provision as 'mostly very poor'. Off-road, the existing network of paths and tracks around the town which can be cycled are inconsistent, with some areas well served and others having no provision. Mesh density analysis has demonstrated that much of Guildford is very poorly served by even the rudimentary cycle provision that exists, and area porosity analysis (the assessment of zones across the district bounded by primary roads with no cycle provision, or other barriers, based on their accessibility by cycle) has indicated that the majority of the study area is impermeable or semi-permeable (areas with no or a singular gateway to neighbouring areas, respectively), with only a small proportion of the town considered porous/very porous (areas with multiple, well-spaced gateways to neighbouring areas).
- 3.14 However, the report suggests that by allowing cycling on suitable paths (and associated installation of good signage) could offer a relatively inexpensive quick fix, with the need for only minor localised interventions such as widening pinch points. Should this be combined with more significant interventions, TI and UM state the potential to develop a mostly traffic-free cycle network.
- 3.15 In terms of cycle parking, the current approach taken in Guildford goes against the best practice rule for good cycle provision of little and often, with the audit identifying that provision is typically clustered in a few areas rather than well distributed.
- 3.16 Whilst Guildford's topography could be seen in part as a major barrier to cycling, it is the view of TI and UM that the high level of traffic across the town centre is the greatest barrier to increased uptake of cycling. The Bridge Street/Onslow Street gyratory is in their view the most significant barrier, preventing safe cycling to key destinations including the station and High Street.
- 3.17 TI and UM developed a schedule of proposed cycle routes which would form the Guildford Cycle Network, and have recommended, based on their analysis of existing parking, parking usage and fly parking, new cycle parking at 151 sites with a minimum of 489 new stands, which will offer a minimum of 978 extra parking spaces. Moreover, TI and UM have identified the requirement for good signage and the development of a cycle signing strategy.
- 3.18 The following priority interventions have been recommended:
- Removal of a traffic lane on the gyratory to facilitate wider pavements and segregated cycle lanes. It is their view that this could be achieved on an experimental basis; and
 - Installation of a modal filter or bus gate on Stoke Road at the railway bridge.
- 3.19 Additional suggested interventions include bus gates, modal filters, cycle crossings, junction improvements and bridges (new/upgrades/replacements). A number of areas that could become the focus of Low Traffic Neighbourhoods were also suggested in addition to specific route and junction interventions.

M25 to Solent Route Strategy

- 3.20 The M25 to Solent route connects the south coastal port cities of Southampton and Portsmouth to south-west London and Heathrow Airport, in addition to serving numerous urban centres that have been identified as focal points for economic growth. The route forms part of the national Strategic Road Network (SRN) and comprises the parallel M3 and A3/A3(M) corridors which run through Hampshire and Surrey from inside the M25 London Orbital to the M27 in the Solent sub-region, passing through the South Downs National Park.
- 3.21 Research conducted by Transport Focus (Ref 24) found that of the 18 route strategies compiled by HE, the M25 to Solent route was the route on which the largest percentage (61%) of road users reported experiencing problems, namely congestion/queueing traffic. The study found that on the A3, capacity issues are concentrated at Guildford, where the carriageway drops from 3 lanes to 2 between the A31 and the A320, and north of Send on the approaches to the M25 at junction 10. These are particularly predominant during weekday peak periods. Localised congestion has also been identified further south.
- 3.22 Safety concerns have also been identified at various points on the route, including the A3 around Guildford, impacting the ability of the route to cope with incidents when accidents occur, however minor. The A3 is also not on the core routes patrolled by the Highways England Traffic Officer Service. Moreover, issues that affect walking and cycling have been identified on the A3 at Guildford.
- 3.23 The M25 to Solent Route Strategy has identified study areas/areas of opportunity on the A3 (Guildford to Ripley) which require further investigation of the issues raised by stakeholders and identified through HE intelligence:
- **A31 Hog's Back:** additional traffic joins the A3 from the A31 at Hog's Back, making this section a hotspot for both network capacity and safety issues;
 - **A3 Corridor through the urban extent of Guildford:** multi-modal transport schemes have been identified which would reduce demand and improve conditions for all users of the A3 corridor through Guildford. These include rail capacity schemes (Network Rail) and Sustainable Transport Movement Corridor (Guildford Borough Council); and
 - **A3 at Ripley:** opportunities have been identified for enhanced capacity of truck laybys at Ripley and the introduction of north-facing slips at the A3/A247 at Ripley to relieve some pressure on local roads accessing the A3 at Guildford. This is a policy requirement in the Guildford Borough Local Plan adopted 2019.
- 3.24 Findings from this report have informed HE's Strategic Road Network Initial Report, which subsequently has informed the next Road Investment Strategy (RIS2), published in March 2020. RIS2 did not include the A3 Guildford scheme, which did appear in RS11.

A3 Trunk Road Interchanges in Guildford Urban Area

- 3.25 This study (Ref 25) addresses the issues raised by HE with respect to the anticipated impact of proposed planned development in the Submission Local Plan (SLP) on the Guildford section of the A3 trunk road in the period to 2024. The scheme is considered to be critical infrastructure. The SLP is based on the understanding that the implementation of the A3 Guildford scheme, as instructed by the DfT's RIS1 in March 2015, is required in order to accommodate future planned development both outside and within the borough. [This scheme has subsequently not been included in the DfT's RIS2, published in March 2020.]
- 3.26 Two key issues raised by HE in the period to 2024 are:
- The extent (both length and duration) of queuing resulting from traffic exiting the A3 at diverge junctions, particularly in peak periods; and
 - The operation of merging and diverging traffic associated with the junctions in the morning and evening peak periods.
- 3.27 The study considers the predicted change in operation of the following junctions with the addition of traffic demand associated with the SLP development:

- J4 – Hospital signalised crossroads;
- J5 – Hospital (Tesco) roundabout;
- J6 – Cathedral roundabout;
- J17 – Dennis signalised roundabout;
- J32 – A3 Off-slip / Woking Road signalised junction; and
- J33 – A25 / Stoke Road signalised crossroads.

3.28 Analysis has indicated that approximately 16% of all SLP trips are expected to use the slip roads in the Guildford study area in the AM and PM peak hours, concluding that the increases in flow on the slip roads due to the SLP-enabled development are shown to be relatively low in all cases. This therefore indicates that the SLP-enabled trips is not anticipated to have a detrimental impact on the operation of the A3 at any of the junction considered. Moreover, given the relatively low merge/diverge trips with the SLP-enabled development, the SLP is unlikely to have a detrimental impact on the operation of junction merges and diverges.

4. Baseline Conditions

Monitoring Data

- 4.1 Measured concentrations around the Guildford area during 2018 range from 27.0 to 41.2 $\mu\text{g}/\text{m}^3$. The exceedance measured by GBC was recorded in the town centre at monitoring site PR1.
- 4.2 Figure 4-1 displays GBC diffusion tube monitoring locations within the vicinity of the A3. Table 4-1 outlines the annual mean NO_2 concentrations of GBC monitoring locations along the A3. Of the monitoring locations near the A3, only site GD11 has historic concentrations. Concentrations at this site were 27 $\mu\text{g}/\text{m}^3$ in 2018, with little discernible trend in the past five years, with concentrations remaining broadly the same. The remainder of sites were newly commissioned in 2020, so a full set of data are not available. GBC have provided the monitoring results for these sites from January to August, thus an average to date has been included as an estimate. It should be noted that this represents a data capture of 66%, and that NO_2 concentrations often are greater during autumn and winter months.

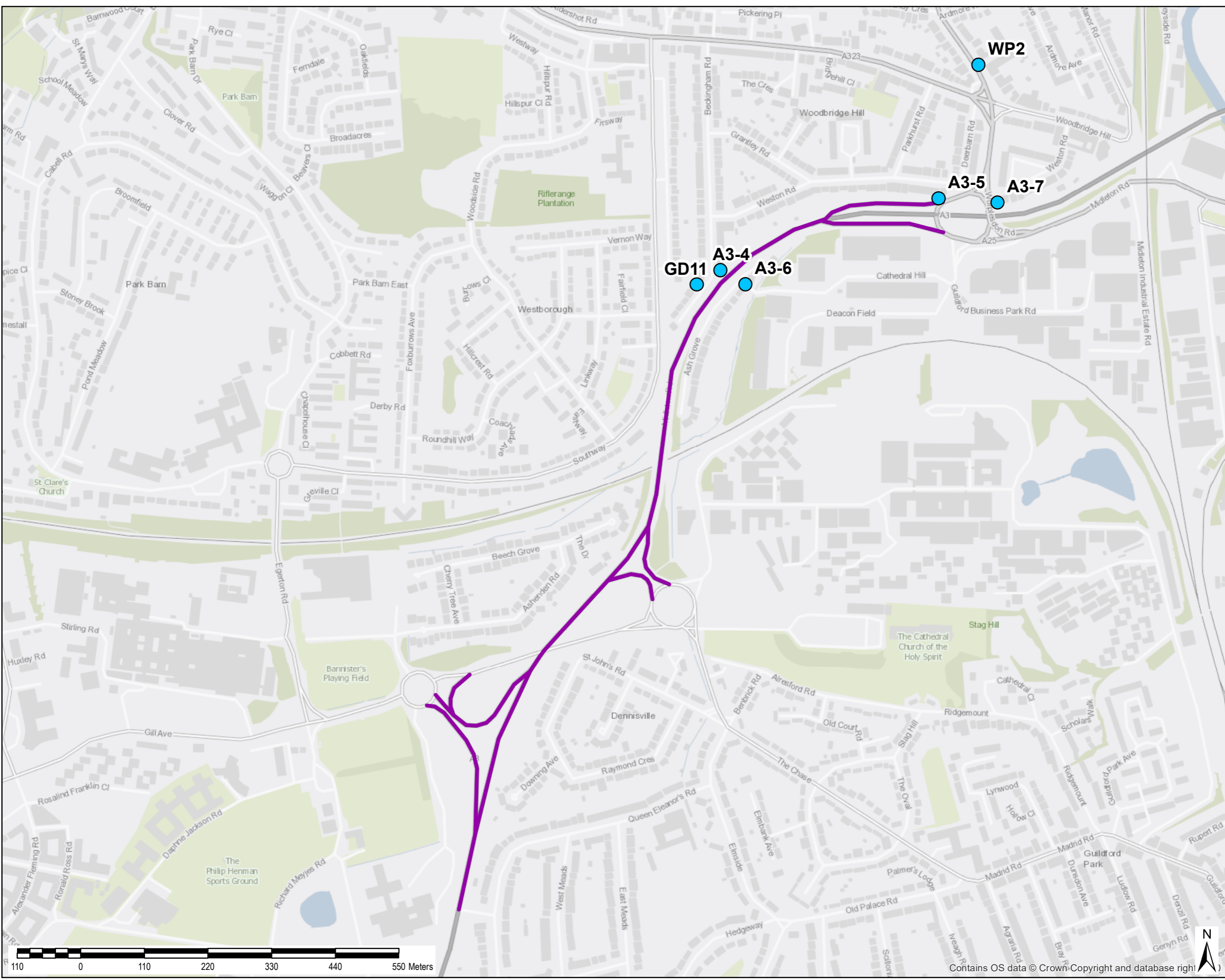
Table 4-1 GBC Diffusion Tube Monitoring Data

Site ID	Annual Mean NO_2 Concentration ($\mu\text{g}/\text{m}^3$)					
	2015	2016	2017	2018	2019	2020 (average to date)
GD11	28	29	24	27	26	-
A3-4	-	-	-	-	-	21.8
A3-5	-	-	-	-	-	32.8
A3-6	-	-	-	-	-	17.9
A3-7	-	-	-	-	-	20.4

- 4.3 HE has been monitoring in the area for the last few years, and 2018 measured concentrations range from 27-86 $\mu\text{g}/\text{m}^3$. The monitoring data from HE shows seven exceedances in 2018, and with three of these sites showing concentrations above 60 $\mu\text{g}/\text{m}^3$. There appears to be a slight improvement in annual mean concentrations from 2017 to 2018.

Table 4-2 HE Diffusion Tube Monitoring Data

Site ID	Annual Mean NO_2 Concentration ($\mu\text{g}/\text{m}^3$)	
	2017	2018
1	98	86
2	56	47
3	81	71
4	59	51
5	31	27
6	52	46
7	43	37
8	38	32
9	58	53
10	43	37
13	54	47
14	58	63
15	38	33



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

- LEGEND**
- GBC Diffusion Tube Locations
 - PCM 17736

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Project Title:
GUILDFORD A3

Drawing Title:
LOCATION OF GBC DIFFUSION TUBES

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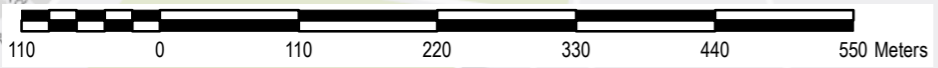
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FIGURE 4-1

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PCM and Highways England Model Results

- 4.4 Evidence from the latest version of the PCM model (Ref 26) is that compliance will be achieved along the A3 (Census ID 17736) in 2025 due to natural improvements in vehicle fleet technology and background concentrations. However, evidence from a recent local modelling study shows that concentrations along the A3 are much higher, and are almost double those predicted by the PCM, with $78 \mu\text{g}/\text{m}^3$ in 2022, dropping down to $51 \mu\text{g}/\text{m}^3$ in 2030. These modelled receptor points are within 15m of the PCM link, so meet the criteria for reporting against the EU Limit Value.

NO_x Reduction Required

- 4.5 For the years where compliance is not currently expected to be achieved by the PCM model and or the HE model, the percentage reduction in roadside NO_x concentrations required to achieve the annual mean NO₂ EU Limit Value on the A3 was estimated. This functions as an approximation of the percentage reduction in traffic that is expected to be required to achieve compliance.

Methodology

- 4.6 The reduction in road NO_x required to achieve the annual mean NO₂ EU Limit Value on the A3 was estimated, applying the NO_x reduction method detailed in LAQM.TG16 (Ref 27).
- 4.7 This calculation was based on modelled NO₂ concentrations from two sources; indicative PCM modelled concentration, and the HE modelled concentrations. Modelled concentrations were taken from the present year until compliance with the annual mean NO₂ EU Limit Value is estimated to be achieved; compliance was predicted to be achieved in 2025 by the PCM model, and not before 2030 by the HE model.
- 4.8 The background NO₂ concentrations were obtained from Defra Background Air Quality Maps (Ref 28) for relevant years. An average background concentration was taken of the grid squares which encompass the study area.
- 4.9 The latest version (v8.1) of the Defra 'NO_x to NO₂' conversion spreadsheet (version 8.1, August 2020) was used; this is a tool which can calculate the road component of NO_x from roadside NO₂ concentrations. The modelled NO₂ concentration and the background concentration were entered as inputs into the tool to estimate the predicted road NO_x concentration for the given year. This was repeated but using the annual mean NO₂ EU Limit Value of $40 \mu\text{g}/\text{m}^3$ to estimate the road NO_x concentration required to achieve the annual mean NO₂ EU Limit Value for the same year.
- 4.10 The percentage difference between the predicted road NO_x concentration and the equivalent road NO_x concentration corresponding to a NO₂ concentration of $40 \mu\text{g}/\text{m}^3$ (the EU Limit Value) was calculated. This is the percentage reduction in road NO_x required in the given year to meet the annual mean NO₂ Limit Value. This provides an approximate estimation of the percentage reduction in traffic required to achieve compliance.

Results

- 4.11 Table 4-3 presents the calculation and the estimated overall percentage reduction in road NO_x required to meet the annual mean NO₂ EU Limit Value, based on PCM modelled NO₂ concentrations (from 2017 projections). The estimated percentage reduction in road NO_x to achieve the limit value decreases with each year, for example, a 42.4% reduction is required in 2020, but this decreases to 4.3% by 2024. However, the road NO_x concentration required to meet the NO₂ limit value is higher in future years due to the reduction in contributions from the background NO₂ levels.

Table 4-3 NO_x Reduction Required to Achieve Annual Mean NO₂ EU Limit Value, PCM Modelled Data

Year	Inputs		Outputs		
	Indicative PCM Modelled NO ₂ Concentration (µg/m ³)	Background NO ₂ Concentration (µg/m ³)	Road NO _x Concentration at modelled NO ₂ (µg/m ³)	Road NO _x (µg/m ³) Concentration Required to EU LV	Percentage Reduction in Road NO _x Required (%)
2020	54	17.6	79.2	45.6	-42.4
2021	51	16.9	73.4	47.2	-35.7
2022	47	16.2	65.4	48.9	-25.3
2023	44	15.6	59.6	50.2	-15.7
2024	41	14.9	54.2	51.8	-4.3

4.12 Table 4-4 presents the calculation and estimated percentage reduction in road NO_x required to meet the annual mean NO₂ EU Limit Value, based on HE modelled NO₂ concentrations. Similar to the PCM based estimates above, the estimated percentage reduction in road NO_x required presented in Table 4-4 decreases with each year due to the assumptions in the model about reductions in future background concentrations and vehicle emissions. A 74.6% reduction is estimated to be required in 2020, but a 33% reduction is estimated to be required by 2030.

Table 4-4 NO_x Reduction Required to Achieve Annual Mean NO₂ EU Limit Value, HE Modelled Data

Year	Inputs		Outputs		
	HE Modelled NO ₂ Concentration (µg/m ³)	Background NO ₂ Concentration (µg/m ³)	Road NO _x Concentration (µg/m ³) at modelled NO ₂ level	Road NO _x Concentration Required to achieve EU LV (µg/m ³)	Percentage Reduction in Road NO _x Required (%)
2020	89	17.6	179.6	45.6	-74.6
2021	84	16.9	166.5	47.2	-71.6
2022	78	16.2	150.8	48.9	-67.6
2023	73	15.6	138.2	50.2	-63.7
2024	68	14.9	125.8	51.8	-58.8
2025	64	14.3	116.3	53.3	-54.2
2026	60	13.9	106.8	54.5	-49.0
2027	58	13.5	103.2	55.8	-45.9
2028	55	13.1	96.5	57.0	-40.9
2029	53	12.8	92.2	58.0	-37.1
2030	51	12.5	87.8	58.8	-33.0

4.13 The percentage reduction in NO_x required varies between the PCM model and the HE model. The modelled NO₂ concentrations from HE are higher than the PCM modelled concentrations, and thus a higher percentage reduction in road NO_x is estimated to be required to meet the annual mean NO₂ EU Limit Value for any given year. The HE based estimate suggest a 33.0% reduction is required in 2030. However, both model sources suggest a significant reduction is required, between 35.1% - 71.6% in whilst the PCM modelling suggest compliance before this time.

Source Apportionment

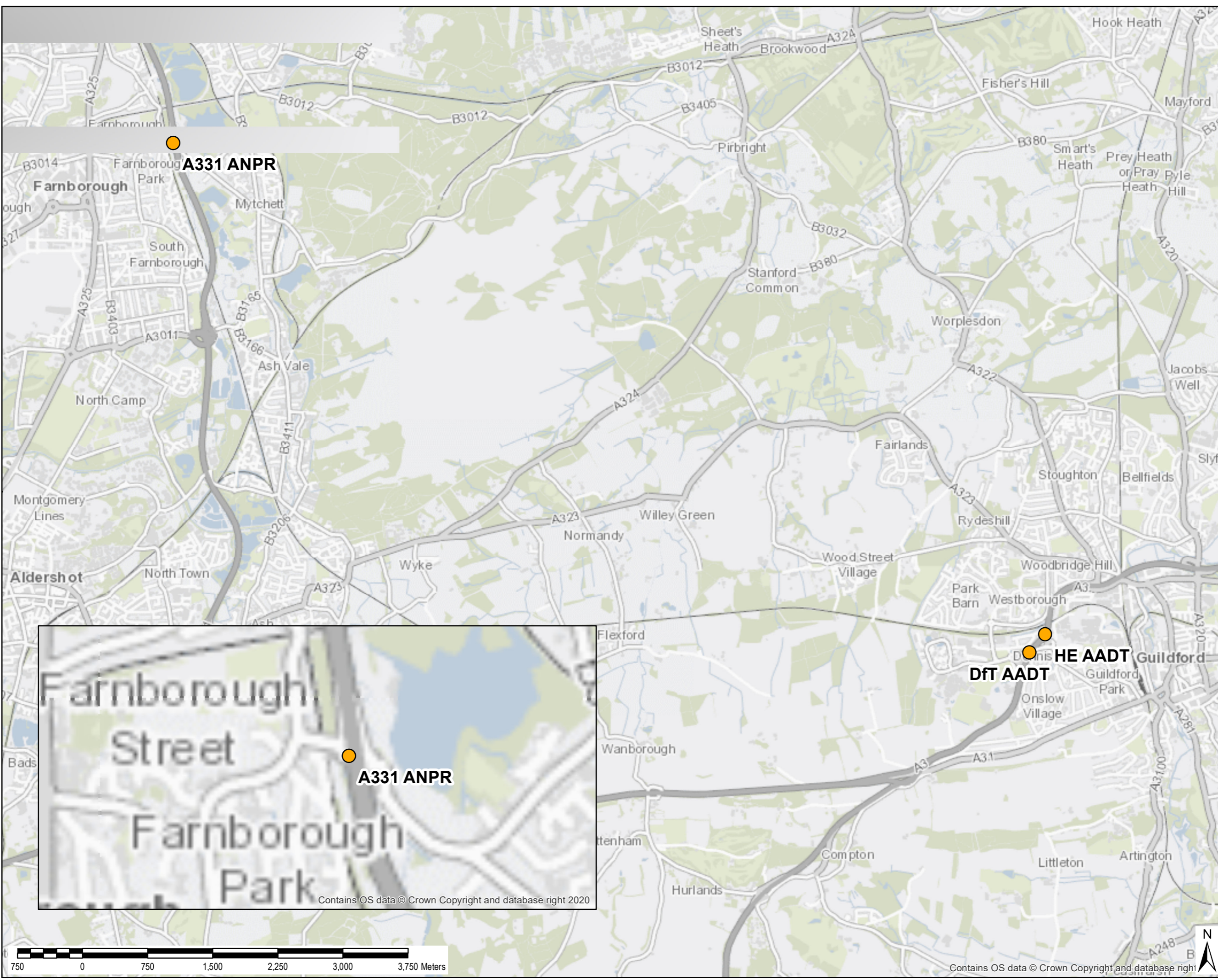
4.14 In order to better understand the sources of NO₂ emissions on the A3, a source apportionment study was undertaken. The source apportionment assessment allowed for the identification of key road traffic sources, and the estimation of the relative contribution of different vehicle types.

Methodology

- 4.15 The source apportionment analysis was undertaken using Defra's Emission Factors Toolkit (EFT) Version 10.1. The EFT allows users to calculate road vehicle pollutant emission rates for numerous pollutants, for a specified year, road type, vehicle speed and vehicle fleet composition.
- 4.16 The EFT contains default estimates for the fleet Euro proportions for the specified area and year. The years covered in the latest version of the EFT are 2018 to 2030. The areas are the countries of the UK, and with London as a separate category to England. For the purposes of the source apportionment study, the fleet Euro proportions were refined for a more localised area.
- 4.17 Automatic number plate recognition (ANPR) vehicle count data from the A331 was used to estimate the Euro fleet proportions for the local area. The A331 runs from Blackwater in the north (junction with the A30) to Tongham in the south (junction with the A31), with a junction with the M3 (junction 4) at Frimley. The A331 crosses multiple local authorities, Guildford Borough and Surrey Heath Borough in Surrey, and Rushmoor in Hampshire. The A331 is approximately 8 km to the west of the section of the A3 of interest to this report, connecting to the A3 through the A31. The location of the ANPR survey can be seen in Figure 4-2. The Euro fleet makeup of the A331 is considered to be representative of road traffic on the A3. The ANPR data from the A331 was collected by Intelligent Data Collection Limited, as commissioned by Surrey County Council. The survey took place over 24-hour period on the 24th June 2020 so is relevant to this current study. However, it should be noted that there can be considerable variations in total traffic flows and fleet composition across daily to annual timescales.

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- LEGEND**
- Source
 - Apportionment
 - Survey Locations



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Purpose of Issue:
Client:
GUILDFORD BOROUGH COUNCIL

Project Title:
GUILDFORD A3

Drawing Title:
LOCATION OF SOURCE APPORTIONMENT SURVEYS ON A331

Drawn: HC	Chk'd: JM	App'd: JM	Date: 17/11/2020
AECOM Internal Project No: 60579888		Scale at A3: 1:10,982	

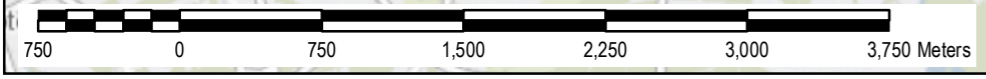
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4.18 The A331 ANPR data included Euro class counts for the following vehicle types:

- Car;
- Light Goods Vehicles - LGV (less than 3.5 Tonne and greater than 3.5 Tonne);
- Heavy Goods Vehicles- HGV (4 Axle, 5 Axle, and 6 Axle);
- Car Transporter;
- Refuse Collection;
- Taxi;
- Invalid Carriage;
- Emergency;
- Motorhome;
- Minibus;
- Bus/Coach;
- Agriculture; and
- Plant.

4.19 The Euro fleet proportion of each vehicle type included within the EFT was calculated from the A331 ANPR data, these are included in Table A-1 to Table A-4 in the Appendix. This proportion was calculated for the northbound and southbound carriageways of the A331. Some vehicle type categories were not included in the A331 ANPR data compared to the EFT vehicle types, for example the A331 data did not count motorcycles, nor did it distinguish between full hybrid and plugin hybrid cars. Vehicle types not counted in the A331 ANPR data are shaded in Tables A-1 to Table A-4 in the Appendix. There were also vehicle types where no such vehicles were counted during the survey period. In both these cases, the default proportions from the EFT were retained.

4.20 Annual Average Daily Traffic (AADT) for 2019 on the A3 was obtained from the Department for Transport (DfT)'s Road Traffic Statistics (Ref 29). The DfT AADT is the manual count taken at site ID 17736, located approximately at the A3 overpass across Egerton Road, to the northwest of Guildford town centre (the location is shown in Figure 4-2). Traffic counts were provided for individual vehicle types; the percentage vehicle types were calculated and are detailed in Table 4-5.

4.21 AADT data along the A3 is also available from Highways England (HE), but only for the southbound carriageway during 2019. This data is surveyed at a minor junction between A322 and A31 and before the exit on to Cathedral Roundabout.

4.22 As can be seen in Table 4-5 below, the traffic flows for 2019 are comparable, albeit with the HE survey demonstrating a greater proportion of Heavy Duty Vehicles (HDV, this includes Heavy Goods Vehicles, buses and coaches). The DfT AADT total on the southbound carriageway is greater than the HE estimate for the same year. The DfT data was chosen for the source apportionment study as a conservative approach, and due to the availability of more detailed information on vehicle types.

Table 4-5 Comparison of AADT Data from the DfT and HE

Data Source	Year	Direction	AADT	Car (%)	Taxi -Black Cab (%)	LGV (%)	HGV (%)	Bus and Coach (%)	Motorcycle (%)
DfT	2019	N	44641	80.2	0.0	15.4	3.6	0.1	0.7
DfT	2019	S	39510	79.7	0.0	16.4	3.2	0.2	0.6
HE	2019	S	37350	-	-	-	-	-	-
HE	2017	N	41917	-	-	-	-	-	-
HE	2017	S	35722	-	-	-	-	-	-

4.23 The EFT was run for the year 2020 using the Euro fleet proportions from the A331 data and the DfT traffic flows as discussed above. The speed was assumed to be 80.47 kph (50 mph).

Results

4.24 Table 4-6 presents the percentage contribution to NO_x emissions on both northbound and southbound carriageways of the A3.

Table 4-6 Percentage Contribution by Vehicle Type

Source Type	Percentage Contribution to NO _x Emissions	
	Northbound Carriageway (%)	Southbound Carriageway (%)
Petrol Cars	6.5	6.6
Diesel Cars	40.0	40.5
Petrol LGVs	<0.1	<0.1
Diesel LGVs	43.3	44.1
Rigid HGVs	2.5	2.2
Artic HGVs	1.2	1.1
Buses/Coaches	5.3	4.4
Motorcycles	0.3	0.3
Full Hybrid Petrol Cars	0.3	0.3
Plug-In Hybrid Petrol Cars	<0.1	<0.1
Full Hybrid Diesel Cars	0.4	0.4
CNG Buses	<0.1	<0.1
Hybrid Buses	0.1	0.1

4.25 These results are illustrated as pie charts in Figure A-2 and Figure A-3 of the Appendix.

4.26 The results from the source apportionment study show the greatest contributor of NO_x emissions are diesel LGVs, contributing 43.3% and 44.1% for north- and southbound traffic respectively. Diesel cars are the next greatest contributors (40.0% northbound, and 40.5% southbound). Petrol cars, rigid HGVs and articulated HGVs are the next highest sources of NO_x emissions, albeit representing a significantly smaller proportion than diesel vehicles with percentage contributions ranging from 1.1% to 6.6%. The percentage contribution of petrol LGVs, buses/coaches, motorcycles, and alternative technology vehicles are negligible, suggesting these are not significant sources of NO_x emissions on the A3.

4.27 The source apportionment results are comparable between northbound and southbound traffic, with both demonstrating contributions by vehicle type.

Origin – Destination

Methodology

SINTRAM Model

4.28 The review of traffic patterns on the A3, as it passes through Guildford, has made use of SCC's strategic transport model, SINTRAM.

4.29 The SINTRAM model has formerly been used to appraise the highway impacts of the Guildford Borough Local Plan and associated forecast scenarios. The model encompasses the road networks of Surrey County Council and surrounding local authorities, and is made up of 1,615 zones¹, including 218 zones in the Borough of Guildford. The zone names come from the SINTRAM model, and each zone has been assigned a predominant land use that reflects the main trip generator in the zone. Therefore there are likely to be other land uses within each zone.

¹ A zone represents a geographical area where vehicle trips are generated by the land uses contained within.

4.30 Using select link analysis², SCC has provided origin-destination matrices (1,615 zones) for each of the following road links for the 2014 Baseline scenario:

- Northbound between Beechcroft Drive and Egerton Road (Tesco Roundabout)
- Northbound between Egerton Road (Tesco Roundabout On-Slip) and Dennis Roundabout
- Southbound between Dennis Roundabout On-Slip and Cathedral Roundabout Off-Slip
- Southbound between Cathedral Roundabout On-Slip and Wilderness Road

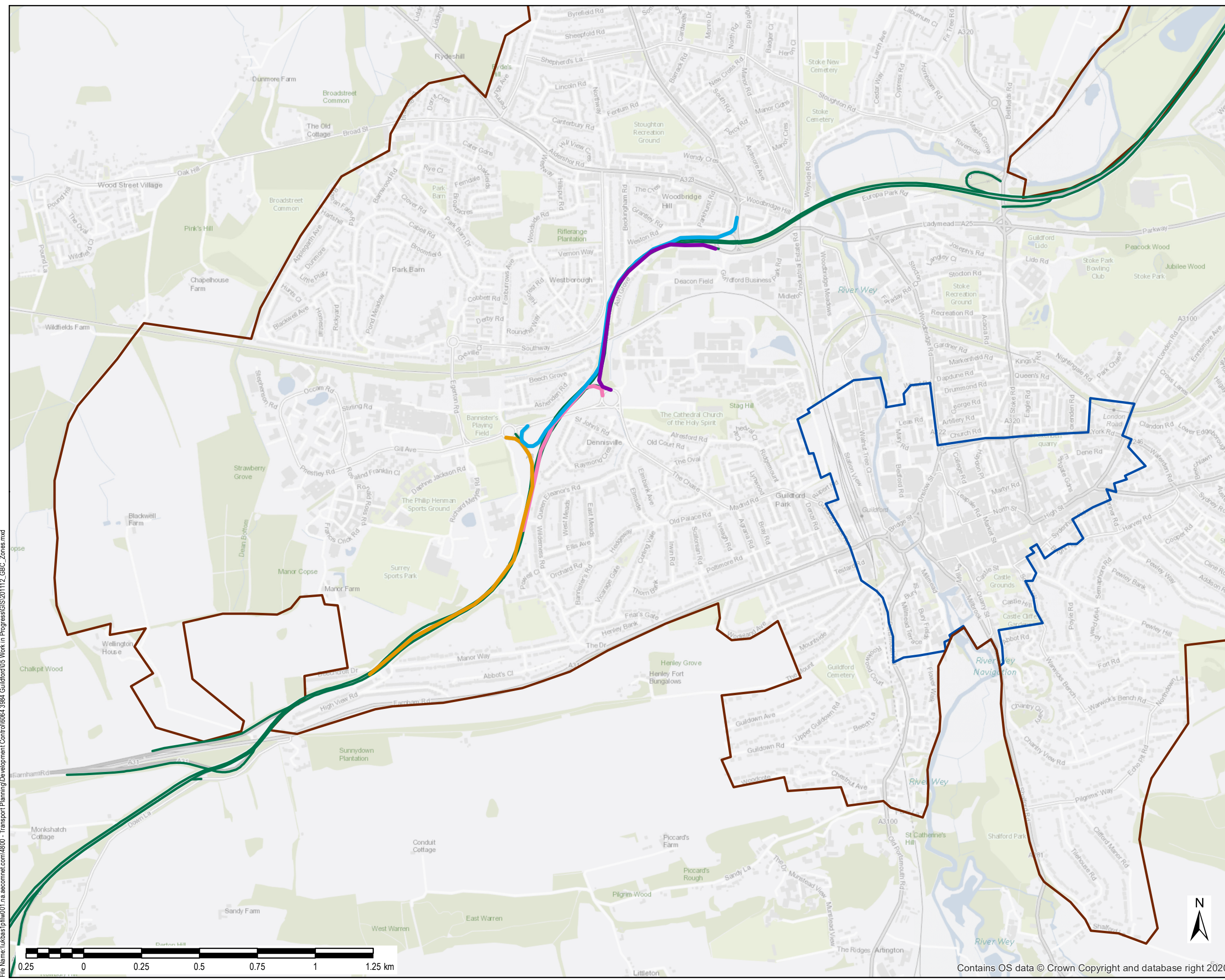
4.31 Figure 4-3 illustrates the links selected for analysis in the SINTRAM model.

4.32 The matrices provided cover the following time periods, which overall represents a twelve-hour weekday (0700 – 1900):

- Weekday average AM peak hour (0700 – 1000);
- Weekday average inter peak hour (1000 – 1600); and
- Weekday average PM peak hour (1600 – 1900)

² Select link analysis provides information on where traffic comes from and goes to for a selected link or links within a modelled network.

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LEGEND

- A3
- Guildford Urban Area
- Guildford Town Centre

A3 AQ Links

- NB Beechcroft Dr to Egerton Rd (Tesco Rbt)
- NB Egerton Rd (Tesco Rbt Off-Slip) to Dennis Rbt
- SB Cathedral Rbt On-Slip to Wilderness Rd
- SB Dennis Rbt On-Slip to Cathedral Rbt Off-Slip

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Project Title **A3 GUILDFORD - AIR QUALITY MITIGATION MEASURES**

Drawing Title **AREAS FOR APPRAISAL**

Drawn HI	Checked PK	Approved JM	Date 12/11/20
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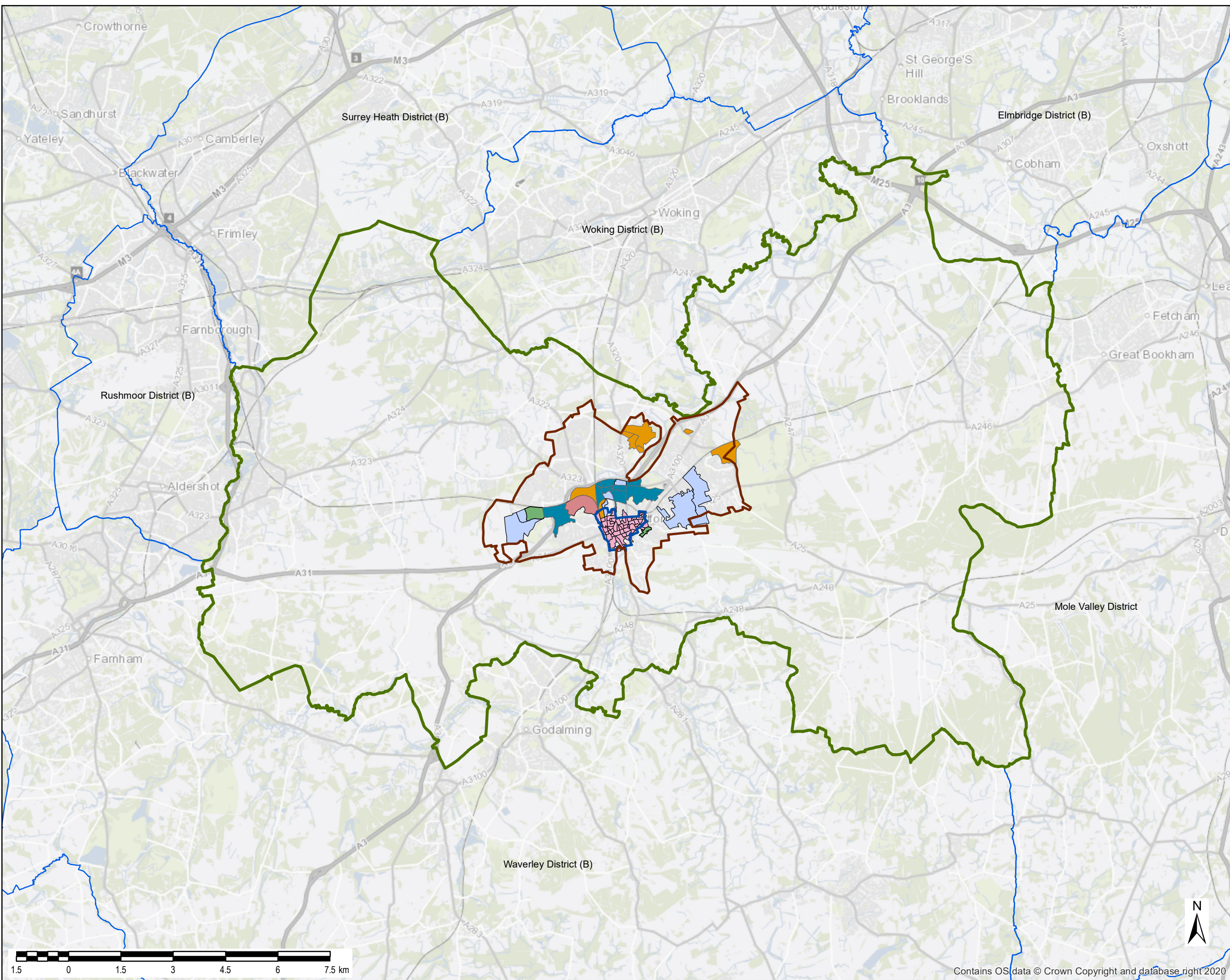
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Aggregation of Data

- 4.33 To analyse and identify the key travel trends through the select links, the 1,615 zones have been aggregated into key areas. These zones were discussed with GBC, SCC and HE and the following key zones were agreed;
- Guildford Town Centre - All zones with a centroid³ falling within the Guildford Town Centre boundary as defined in the Guildford Borough Local Plan.
 - Guildford Employment Areas - Main employment areas in Guildford (including business, health and retail).
 - Guildford Urban Area - All zones with a centroid falling in the Guildford Urban area excluding Guildford Town Centre and Guildford Employment Areas.
 - Rest of Guildford - All zones with a centroid falling within the rest of Guildford Borough excluding Guildford Town Centre, Guildford Employment Areas and Guildford Urban Area.
 - Surrounding Districts - Adjacent districts and boroughs comprising Elmbridge, Mole Valley, Rushmoor, Surrey Heath, Waverley and Woking.
 - External - All remaining zones outside of Guildford and Surrounding Districts
- 4.34 Figure 4-4 to Figure 4-5 illustrate these aggregated areas. Please note that the zone names and land use are from the SINTRAM model and the land use represents the main land use, not the sole land use.
- 4.35 Following the aggregation and review of data, further analysis has then been completed at the zone level within the Guildford area to establish key trip destinations to inform the consideration of mitigation measures within Guildford.

³ The centroid (non-weighted) is the nominal geometric centre of the zone (polygon).

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- LEGEND**
- Guildford Town Centre
 - Guildford Urban
 - Guildford District Boundary
 - Borough Boundaries
- Employment Zone**
- Business Park
 - Higher Education
 - Hospital
 - Industrial Estate
 - Retail Park
 - Town Centre

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Project Title **A3 GUILDFORD - AIR QUALITY MITIGATION MEASURES**

Drawing Title **AREAS FOR APPRAISAL**

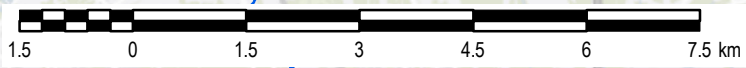
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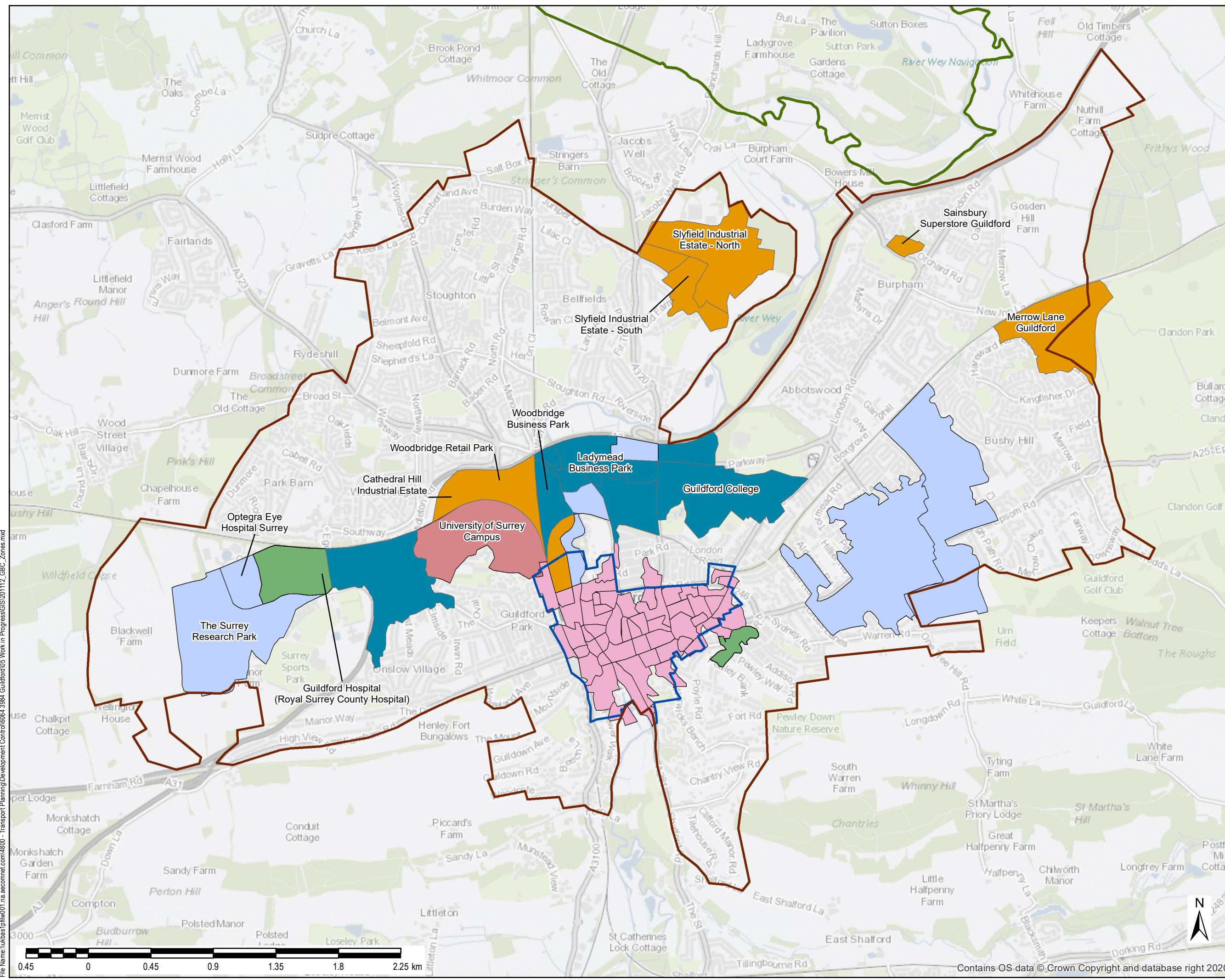


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- LEGEND**
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 - Guildford Urban Area
 - Guildford District Boundary
- Employment Zone**
- Business Park
 - Higher Education
 - Hospital
 - Industrial Estate
 - Retail Park
 - Town Centre



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Project Title **A3 GUILDFORD - AIR QUALITY MITIGATION MEASURES**

Drawing Title **GUILDFORD EMPLOYMENT ZONES**

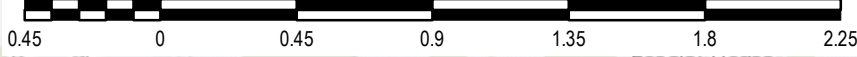
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Results

General Travel Trends

- 4.36 Figure 4-6 to Figure 4-9 detail the number of vehicles travelling to and from each area in each time period by link. The percentage split for each Origin-Destination pair based on the total link flow is also shown.
- 4.37 Based on the results in Figure 4-6 to Figure 4-9 the following key trends have been identified by direction.
- 4.38 Northbound Direction between Beechcroft Drive and Egerton Road (Tesco Roundabout)
- 62% of traffic (1,876 of 3,036 movements) in the AM peak average hour are due to through traffic;
 - 64% of traffic (1,952 of 3,036 movements) in the AM peak average hour are due to through traffic from Guildford Borough travelling out of the Guildford area;
 - 67% of traffic (1,571 of 2,336) in the IP peak average hour are due to through traffic;
 - 78% of traffic (1,951 of 2,569) in the PM peak average hour are due to through traffic;
 - 20% of traffic (613 vehicle movements) in the AM peak are travelling to key Guildford employment areas of which more than half come from surrounding districts:
 - 17% of traffic (407 movements) in the IP peak are travelling to key Guildford employment areas;
 - 10% of traffic (245 movements) the PM Peak are travelling to key Guildford employment areas;
 - Very few trips in any period (2% in the AM peak, 1% in the IP and 1% in the PM peak) are travelling to the town centre;
- 4.39 Northbound Direction between Egerton Road (Tesco Roundabout Off-Slip) and Dennis Roundabout to the north;
- Similar splits are seen as for the previous link, although total flow levels are higher which suggest that more vehicles are entering the A3 from Tesco Roundabout than departing.
 - Lower numbers of traffic are travelling to employment areas are observed in all time periods.
 - Very few vehicle trips in any period are travelling to the town centre;
- 4.40 Southbound between Dennis Roundabout and Cathedral Hill Roundabout:
- 70% of all traffic (2,016 movements of 2,862 movements) in the AM peak off-slip are from an external destination outside of Guildford;
 - 19% of traffic (556 vehicle movements) in the AM peak are travelling to key Guildford employment areas.
 - 11% of traffic (287 movements) in the IP peak are travelling to key Guildford employment areas;
 - 12% of all traffic (339) in the PM peak are travelling to key Guildford employment areas.
 - Very few trips are travelling to the town centre in any of the peaks.
- 4.41 Southbound between Cathedral Roundabout On-Slip and Wilderness Road. At
- The majority of Guildford bound trips have already left the A3 before this link, with more than 90% of traffic due to through traffic in all peaks.
- 4.42 Based on the above results, it is clear that more than 60% of traffic on the A3 area of interest passes through Guildford without an origin and destination in the borough in all time periods. Very few trips have a destination in Guildford Town Centre on this section of the A3 and therefore the results suggest little merit in focusing any measures on this area. There is still however a number of trips associated with Guildford Employment Areas that offer the opportunity to influence movements and emissions on the A3 directly within the Guildford area, and therefore these are considered further below.

Guildford Employment Zones

- 4.43 Between 10-20% of traffic are travelling to the key Guildford employment areas across the peak hours.

4.44 Table 4-7 to Table 4-9 provides a more detailed breakdown of journeys to the individual employment related zone originating from the A3 links for a **single hour** in each peak only.

4.45 The results indicate the following:

- For vehicles travelling northbound, the vast majority (eg 69% in the AM peak) of these trips to employment areas are focused on Cathedral Hill Industrial Estate, University of Surrey Campus, Guildford Hospital (Surrey County Hospital) and Optegra Eye Hospital. The latter is associated with the Surrey Research Park and therefore should be jointly considered with this zone.
- The number of trips travelling to Cathedral Hill Industrial Estate in each time period increases on the link between Egerton Road (Tesco Roundabout Off-Slip) and Dennis Roundabout to the north compared to the Beechcroft Drive and Egerton Road (Tesco Roundabout) link. This indicates that a number of vehicles from the Guildford area are joining the A3 at the Tesco Roundabout On-Slip and travelling one junction before exiting the A3 again.
- In the southbound direction, the primary destination for vehicles travelling to employment areas are University of Surrey Campus, followed by Guildford Hospital (Surrey County Hospital), Opetgra Eye Hospital (also Surrey Research Park), Surrey Research Park and finally Raymond Crescent. No further employment related destinations, other than the town centre are recorded on the southbound link between Dennis Roundabout On-Slip and Cathedral Roundabout Off-Slip.

Table 4-7 A3 Employment Zones for a single AM Average Peak Hour Traffic (Destination)

Location	Northbound				Southbound			
	Beechcroft Dr and Egerton Rd	Egerton Rd to Dennis Rdbt	Total NB (1161 trips)	%	Dennis Rdbt to Cathedral Rdbt	Cathedral Rdbt to Wilderness Rdbt	Total SB (556 trips)	%
BMI Mount Alvernia Hospital	3	3	6	0.5	0	0	0	0.0
Boxgrove Primary School	3	4	7	0.6	0	0	0	0.0
Cathedral Hill Industrial Estate	141	331	472	40.7	0	0	0	0.0
Europa Park Road Retail Park	19	24	43	3.7	0	0	0	0.0
Guildford College	10	12	22	1.9	0	0	0	0.0
Guildford Hospital	97	0	97	8.4	127	0	127	22.8
Jewsons Walnut Tree Close Guildford	6	7	13	1.1	0	0	0	0.0
Josephs Road Guildford	4	4	8	0.7	0	0	0	0.0
Ladymead	1	1	2	0.2	0	0	0	0.0
Ladymead Business Park	7	7	14	1.2	0	0	0	0.0
Merrow Lane Guildford	17	18	35	3.0	0	0	0	0.0
Old Farm Road Guildford	3	3	6	0.5	0	0	0	0.0
Optegra Eye Hospital Guildford	57	0	57	4.9	77	0	77	13.8
Parkway Guildford	1	1	2	0.2	0	0	0	0.0
Raymond Crescent Guildford	8	0	8	0.7	19	0	19	3.4
Recreation Road Guildford	14	19	33	2.8	0	0	0	0.0
Sainsbury Superstore Guildford	0	0	0	0.0	0	0	0	0.0
Slyfield Industrial Estate - North	32	34	66	5.7	0	0	0	0.0
Slyfield Industrial Estate - South	0	1	1	0.1	0	0	0	0.0
St Thomas of Canterbury Catholic Primary School	2	2	4	0.3	0	0	0	0.0
The riverside business centre	5	6	11	0.9	0	0	0	0.0
The Surrey Research Park	8	0	8	0.7	18	0	18	3.2
Trinity Gate Guildford	0	1	1	0.1	0	0	0	0.0
University of Surrey Campus	146	28	174	15.0	315	0	315	56.7
Walnut Tree Close Car Park	17	23	40	3.4	0	0	0	0.0
Woodbridge Business Park	8	12	20	1.7	0	0	0	0.0
Woodbridge Retail Park	1	2	3	0.3	0	0	0	0.0
Woodbridge Road Retail Park	4	4	8	0.7	0	0	0	0.0

Table 4-8 A3 Employment Zones for a single IP Average Peak Hour Traffic (Destination)

Location	Northbound				Southbound			
	Beechcroft Dr and Egerton Rd	Egerton Rd to Dennis Rdbt	Total NB (763 trips)	%	Dennis Rdbt to Cathedral Rdbt	Cathedral Rdbt to Wilderness Rd	Total SB (287 trips)	%
BMI Mount Alvernia Hospital	3	3	6	0.8	0	0	0	0.0
Boxgrove Primary School	4	5	9	1.2	0	0	0	0.0
Cathedral Hill Industrial Estate	60	208	268	35.1	0	0	0	0.0
Europa Park Road Retail Park	10	12	22	2.9	0	0	0	0.0
Guildford College	5	6	11	1.4	0	0	0	0.0
Guildford Hospital	105	0	105	13.8	88	0	88	30.7
Jewsons Walnut Tree Close Guildford	3	5	8	1.0	0	0	0	0.0
Josephs Road Guildford	3	3	6	0.8	0	0	0	0.0
Ladymead	1	2	3	0.4	0	0	0	0.0
Ladymead Business Park	2	2	4	0.5	0	0	0	0.0
Merrow Lane Guildford	3	5	8	1.0	0	0	0	0.0
Old Farm Road Guildford	14	15	29	3.8	0	0	0	0.0
Optegra Eye Hospital Guildford	48	0	48	6.3	49	0	49	17.1
Parkway Guildford	1	1	2	0.3	0	0	0	0.0
Raymond Crescent Guildford	11	0	11	1.4	32	0	32	11.1
Recreation Road Guildford	14	20	34	4.5	0	0	0	0.0
Sainsbury Superstore Guildford	0	0	0	0.0	0	0	0	0.0
Slyfield Industrial Estate - North	31	34	65	8.5	0	0	0	0.0
Slyfield Industrial Estate - South	1	1	2	0.3	0	0	0	0.0
St Thomas of Canterbury Catholic Primary School	3	5	8	1.0	0	0	0	0.0
The riverside business centre	2	3	5	0.7	0	0	0	0.0
The Surrey Research Park	10	0	10	1.3	13	0	13	4.5
Trinity Gate Guildford	0	1	1	0.1	0	0	0	0.0
University of Surrey Campus	54	0	54	7.1	105	0	105	36.6
Walnut Tree Close Car Park	8	14	22	2.9	0	0	0	0.0
Woodbridge Business Park	6	9	15	2.0	0	0	0	0.0
Woodbridge Retail Park	2	3	5	0.7	0	0	0	0.0
Woodbridge Road Retail Park	1	1	2	0.3	0	0	0	0.0
<i>Surrey Research Park Total</i>	<i>58</i>	<i>0</i>	<i>58</i>	<i>7.6</i>	<i>62</i>	<i>0</i>	<i>62</i>	<i>21.6</i>

Table 4-9 A3 Employment Zones for a single PM Average Peak Hour Traffic (Destination)

Location	Northbound				Southbound			
	Beechcroft Dr and Egerton Rd	Egerton Rd to Dennis Rdbt	Total NB (440 trips)	%	Dennis Rdbt to Cathedral Rdbt	Cathedral Rdbt to Wilderness Rd	Total SB (339 trips)	%
BMI Mount Alvernia Hospital	4	4	8	1.8	0	0	0	0.0
Boxgrove Primary School	5	6	11	2.5	0	0	0	0.0
Cathedral Hill Industrial Estate	33	93	126	28.6	0	0	0	0.0
Europa Park Road Retail Park	6	8	14	3.2	0	0	0	0.0
Guildford College	5	6	11	2.5	0	0	0	0.0
Guildford Hospital	74	0	74	16.8	122	0	122	36.0
Jewsons Walnut Tree Close Guildford	2	3	5	1.1	0	0	0	0.0
Josephs Road Guildford	3	3	6	1.4	0	0	0	0.0
Ladymead	1	1	2	0.5	0	0	0	0.0
Ladymead Business Park	1	2	3	0.7	0	0	0	0.0
Merrow Lane Guildford	3	8	11	2.5	0	0	0	0.0
Old Farm Road Guildford	6	6	12	2.7	0	0	0	0.0
Optegra Eye Hospital Guildford	31	0	31	7.0	61	0	61	18.0
Parkway Guildford	1	1	2	0.5	0	0	0	0.0
Raymond Crescent Guildford	7	0	7	1.6	46	0	46	13.6
Recreation Road Guildford	9	13	22	5.0	0	0	0	0.0
Sainsbury Superstore Guildford	0	0	0	0.0	0	0	0	0.0
Slyfield Industrial Estate - North	14	15	29	6.6	0	0	0	0.0
Slyfield Industrial Estate - South	1	1	2	0.5	0	0	0	0.0
St Thomas of Canterbury Catholic Primary School	3	5	8	1.8	0	0	0	0.0
The riverside business centre	2	2	4	0.9	0	0	0	0.0
The Surrey Research Park	6	0	6	1.4	19	0	19	5.6
Trinity Gate Guildford	0	1	1	0.2	0	0	0	0.0
University of Surrey Campus	18	0	18	4.1	91	0	91	26.8
Walnut Tree Close Car Park	4	8	12	2.7	0	0	0	0.0
Woodbridge Business Park	4	6	10	2.3	0	0	0	0.0
Woodbridge Retail Park	1	2	3	0.7	0	0	0	0.0
Woodbridge Road Retail Park	1	1	2	0.5	0	0	0	0.0
<i>Surrey Research Park Total</i>	<i>37</i>	<i>0</i>	<i>37</i>	<i>8.4</i>	<i>80</i>	<i>0</i>	<i>80</i>	<i>23.6</i>

Figure 4-6: Origin-Destination Summary for Select A3 Link (Beechcroft Dr to Egerton Rd)

Link Summary

Road Link A3 Guildford and Godalming Bypass
 Direction NB
 Location Between Beechcroft Drive to Egerton Road (Tesco Roundabout)
 Link Number (SINTRAM) 1182
 Scenario 2014 Baseline
 Speed Limit 50 mph

Area

Description
 Guildford Town Centre All zones with a centroid falling within the Guildford Town Centre boundary as defined in the Guildford Borough Local Plan
 Guildford Employment Areas Main employment areas in Guildford (including business, health and retail accessible from the A3)
 Guildford Urban Area All zones with a centroid falling within the rest of Guildford Urban area excluding Guildford Town Centre and Guildford Employment Areas
 Rest of Guildford All zones falling within the rest of Guildford Borough excluding the above
 Surrounding Districts Adjacent districts and boroughs comprising Elmbridge, Mole Valley, Rushmoor, Surrey Heath, Waverley and Woking
 External All remaining zones outside of Guildford and Surrounding Districts



		Destination						
Zone		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total
Origin	Rest of Guildford	20	9	22	110	21	49	231
	Guildford Town Centre	0	0	0	0	0	0	0
	Guildford Urban Area	15	0	2	16	1	5	39
	Guildford Employment Areas	0	0	0	0	0	0	0
	Surrounding Districts	117	33	74	346	163	340	1072
	External	129	13	37	140	189	1184	1693
	Total	281	55	135	613	374	1578	3036

		Destination						
Zone		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total
Origin	Rest of Guildford	1%	0%	1%	4%	1%	2%	8%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%
	Guildford Urban Area	0%	0%	0%	1%	0%	0%	1%
	Guildford Employment Areas	0%	0%	0%	0%	0%	0%	0%
	Surrounding Districts	4%	1%	2%	11%	5%	11%	35%
	External	4%	0%	1%	5%	6%	39%	56%
	Total	9%	2%	4%	20%	12%	52%	100%

		Destination						
Zone		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total
Origin	Rest of Guildford	17	1	18	66	22	41	165
	Guildford Town Centre	0	0	0	0	0	0	0
	Guildford Urban Area	2	0	5	10	0	2	19.6
	Guildford Employment Areas	0	0	0	0	0	0	0
	Surrounding Districts	76	6	95	225	107	328	837
	External	82	7	48	106	114	957	1314
	Total	178	14	166	407	243	1328	2336

		Destination						
Zone		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total
Origin	Rest of Guildford	1%	0%	1%	3%	1%	2%	7%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%
	Guildford Urban Area	0%	0%	0%	0%	0%	0%	1%
	Guildford Employment Areas	0%	0%	0%	0%	0%	0%	0%
	Surrounding Districts	3%	0%	4%	10%	5%	14%	36%
	External	4%	0%	2%	5%	5%	41%	56%
	Total	8%	1%	7%	17%	10%	57%	100%

		Destination						
Zone		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total
Origin	Rest of Guildford	20	1	17	40	14	34	125
	Guildford Town Centre	0	0	0	0	0	0	0
	Guildford Urban Area	1	0	1	5	0	1	7.9
	Guildford Employment Areas	0	0	0	0	0	0	0
	Surrounding Districts	76	10	104	130	95	437	853
	External	75	11	55	70	93	1278	1582
	Total	172	22	178	245	202	1749	2569

		Destination						
Zone		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total
Origin	Rest of Guildford	1%	0%	1%	2%	1%	1%	5%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%
	Guildford Urban Area	0%	0%	0%	0%	0%	0%	0%
	Guildford Employment Areas	0%	0%	0%	0%	0%	0%	0%
	Surrounding Districts	3%	0%	4%	5%	4%	17%	33%
	External	3%	0%	2%	3%	4%	50%	62%
	Total	7%	1%	7%	10%	8%	68%	100%

Figure 4-7: Origin-Destination Summary for Select A3 Link (Egerton Road (Tesco Roundabout) and Dennis Roundabout)

Link Summary

Road Link	A3 Guildford and Godalming Bypass
Direction	NB
Location	Between Egerton Road (Tesco Roundabout) and Dennis Roundabout
Link Number (SINTRAM)	323996
Scenario	2014 Baseline
Speed Limit	50 mph

Area

Description	All zones with a centroid falling within the Guildford Town Centre boundary as defined in the Guildford Borough Local Plan
Guildford Town Centre	Main employment areas in Guildford (including business, health and retail accessible from the A3)
Guildford Urban Area	All zones with a centroid falling within the rest of Guildford Urban area excluding Guildford Town Centre and Guildford Employment Areas
Rest of Guildford	All zones falling within the rest of Guildford Borough excluding the above
Surrounding Districts	Adjacent districts and boroughs comprising Elmbidge, Mole Valley, Rushmoor, Surrey Heath, Waverley and Woking
External	All remaining zones outside of Guildford and Surrounding Districts



AM		Destination						Total
Origin	Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
	Rest of Guildford	16	9	12	68	21	51	177
	Guildford Town Centre	0	0	0	0	1	0	1
	Guildford Urban Area	11	0	12	136	6	22	186
	Guildford Employment Areas	13	7	31	102	39	77	268
	Surrounding Districts	103	30	42	151	163	340	829
	External	99	13	26	92	189	1184	1602
	Total	241	59	123	548	418	1674	3064

		Destination						Total
Origin	Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
	Rest of Guildford	1%	0%	0%	2%	1%	2%	6%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%
	Guildford Urban Area	0%	0%	0%	4%	0%	1%	6%
	Guildford Employment Areas	0%	0%	1%	3%	1%	3%	9%
	Surrounding Districts	3%	1%	1%	5%	5%	11%	27%
	External	3%	0%	1%	3%	6%	39%	52%
	Total	8%	2%	4%	18%	14%	55%	100%

IP		Destination						Total
Origin	Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
	Rest of Guildford	13	1	9	34	19	41	116
	Guildford Town Centre	0	0	0	0	0	0	0
	Guildford Urban Area	7	0	13	85	5	26	136.0
	Guildford Employment Areas	23	6	94	102	35	135	394
	Surrounding Districts	57	5	66	80	107	328	642
	External	70	7	36	59	114	957	1243
	Total	169	19	218	360	279	1487	2532

		Destination						Total
Origin	Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
	Rest of Guildford	1%	0%	0%	1%	1%	2%	5%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%
	Guildford Urban Area	0%	0%	1%	3%	0%	1%	5%
	Guildford Employment Areas	1%	0%	4%	4%	1%	5%	16%
	Surrounding Districts	2%	0%	3%	3%	4%	13%	25%
	External	3%	0%	1%	2%	4%	38%	49%
	Total	7%	1%	9%	14%	11%	59%	100%

PM		Destination						Total
Origin	Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
	Rest of Guildford	11	1	13	22	13	34	93
	Guildford Town Centre	0	0	2	0	0	0	2
	Guildford Urban Area	6	0	15	31	5	27	83.7
	Guildford Employment Areas	18	7	103	58	35	180	401
	Surrounding Districts	58	8	78	43	95	437	720
	External	65	10	42	41	93	1278	1528
	Total	158	26	253	195	241	1955	2828

		Destination						Total
Origin	Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
	Rest of Guildford	0%	0%	0%	1%	0%	1%	3%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%
	Guildford Urban Area	0%	0%	1%	1%	0%	1%	3%
	Guildford Employment Areas	1%	0%	4%	2%	1%	6%	14%
	Surrounding Districts	2%	0%	3%	2%	3%	15%	25%
	External	2%	0%	1%	1%	3%	45%	54%
	Total	6%	1%	9%	7%	9%	69%	100%

Figure 4-8: Origin-Destination Summary for Select A3 Link (Cathedral Roundabout On-Slip and Wilderness Road)

Link Summary

Road Link A3 Guildford and Godalming Bypass
 Direction SB
 Location Between Cathedral Roundabout On-Slip and Wilderness Road
 Link Number (SINTRAM) 332413
 Scenario 2014 Baseline
 Speed Limit 50 mph

Area

Area
 Guildford Town Centre All zones with a centroid falling within the Guildford Town Centre boundary as defined in the Guildford Borough Local Plan
 Guildford Employment Areas Main employment areas in Guildford (including business, health and retail accessible from the A3
 Guildford Urban Area All zones with a centroid falling within the rest of Guildford Urban area excluding Guildford Town Centre and Guildford Employment Areas
 Rest of Guildford All zones falling within the rest of Guildford Borough excluding the above
 Surrounding Districts Adjacent districts and boroughs comprising Elmsbridge, Mole Valley, Rushmoor, Surrey Heath, Waverley and Woking
 External All remaining zones outside of Guildford and Surrounding Districts



AM		Destination						
Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total	
Rest of Guildford	30	0	5	0	85	67	188	
Guildford Town Centre	1	0	0	0	4	1	6	
Guildford Urban Area	13	0	9	0	107	34	162	
Guildford Employment Areas	32	0	12	0	116	35	195	
Surrounding Districts	12	0	2	0	135	79	228	
External	43	0	4	0	516	935	1497	
Total	130	0	32	0	962	1151	2277	

IP		Destination						
Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total	
Rest of Guildford	13	0	5	0	78	76	172	
Guildford Town Centre	5	0	0	0	20	9	34	
Guildford Urban Area	22	0	12	0	95	35	163.6	
Guildford Employment Areas	71	0	22	0	275	72	440	
Surrounding Districts	14	0	2	0	140	123	279	
External	46	0	6	0	330	955	1337	
Total	171	0	47	0	938	1270	2425	

PM		Destination						
Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total	
Rest of Guildford	10	0	0	0	71	108	189	
Guildford Town Centre	7	0	0	0	28	8	43	
Guildford Urban Area	9	0	0	0	66	34	109.2	
Guildford Employment Areas	66	0	0	0	238	79	383	
Surrounding Districts	13	0	0	0	132	154	299	
External	29	0	0	0	372	1082	1482	
Total	134	0	0	0	907	1464	2505	

		Destination						
Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total	
Rest of Guildford	1%	0%	0%	0%	4%	3%	8%	
Guildford Town Centre	0%	0%	0%	0%	0%	0%	0%	
Guildford Urban Area	1%	0%	0%	0%	5%	1%	7%	
Guildford Employment Areas	1%	0%	1%	0%	5%	2%	9%	
Surrounding Districts	1%	0%	0%	0%	6%	3%	10%	
External	2%	0%	0%	0%	23%	41%	66%	
Total	6%	0%	1%	0%	42%	51%	100%	

		Destination						
Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total	
Rest of Guildford	1%	0%	0%	0%	3%	3%	7%	
Guildford Town Centre	0%	0%	0%	0%	1%	0%	1%	
Guildford Urban Area	1%	0%	0%	0%	4%	1%	7%	
Guildford Employment Areas	3%	0%	1%	0%	11%	3%	18%	
Surrounding Districts	1%	0%	0%	0%	6%	5%	11%	
External	2%	0%	0%	0%	14%	39%	55%	
Total	7%	0%	2%	0%	39%	52%	100%	

		Destination						
Zone	Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	Total	
Rest of Guildford	0%	0%	0%	0%	3%	4%	8%	
Guildford Town Centre	0%	0%	0%	0%	1%	0%	2%	
Guildford Urban Area	0%	0%	0%	0%	3%	1%	4%	
Guildford Employment Areas	3%	0%	0%	0%	9%	3%	15%	
Surrounding Districts	1%	0%	0%	0%	5%	6%	12%	
External	1%	0%	0%	0%	15%	43%	59%	
Total	5%	0%	0%	0%	36%	58%	100%	

Figure 4-9: Origin-Destination Summary for Select A3 Link (Dennis Roundabout On-Slip and Cathedral Roundabout Off-Slip)

Link Summary

Road Link	A3 Guildford and Godalming Bypass
Direction	SB
Location	Between Dennis Roundabout and Cathedral Roundabout Off-Slip
Link Number (SINTRAM)	8037
Scenario	2014 Baseline
Speed Limit	50 mph

Area Description

Guildford Town Centre	All zones with a centroid falling within the Guildford Town Centre boundary as defined in the Guildford Borough Local Plan
Guildford Employment Areas	Main employment areas in Guildford (including business, health and retail accessible from the A3)
Guildford Urban Area	All zones with a centroid falling within the rest of Guildford Urban area excluding Guildford Town Centre and Guildford Employment Areas
Rest of Guildford	All zones falling within the rest of Guildford Borough excluding the above
Surrounding Districts	Adjacent districts and boroughs comprising Elmbridge, Mole Valley, Rushmoor, Surrey Heath, Waverley and Woking
External	All remaining zones outside of Guildford and Surrounding Districts



AM		Destination						Total
		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
Origin	Rest of Guildford	32	1	10	30	77	65	216
	Guildford Town Centre	1	0	3	10	4	1	19
	Guildford Urban Area	24	15	39	186	98	30	392
	Guildford Employment Areas	22	2	24	41	57	20	166
	Surrounding Districts	30	2	8	57	135	79	312
	External	51	2	25	230	516	935	1759
	Total	160	22	109	556	885	1130	2862

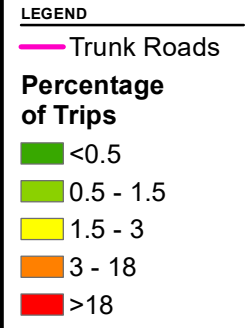
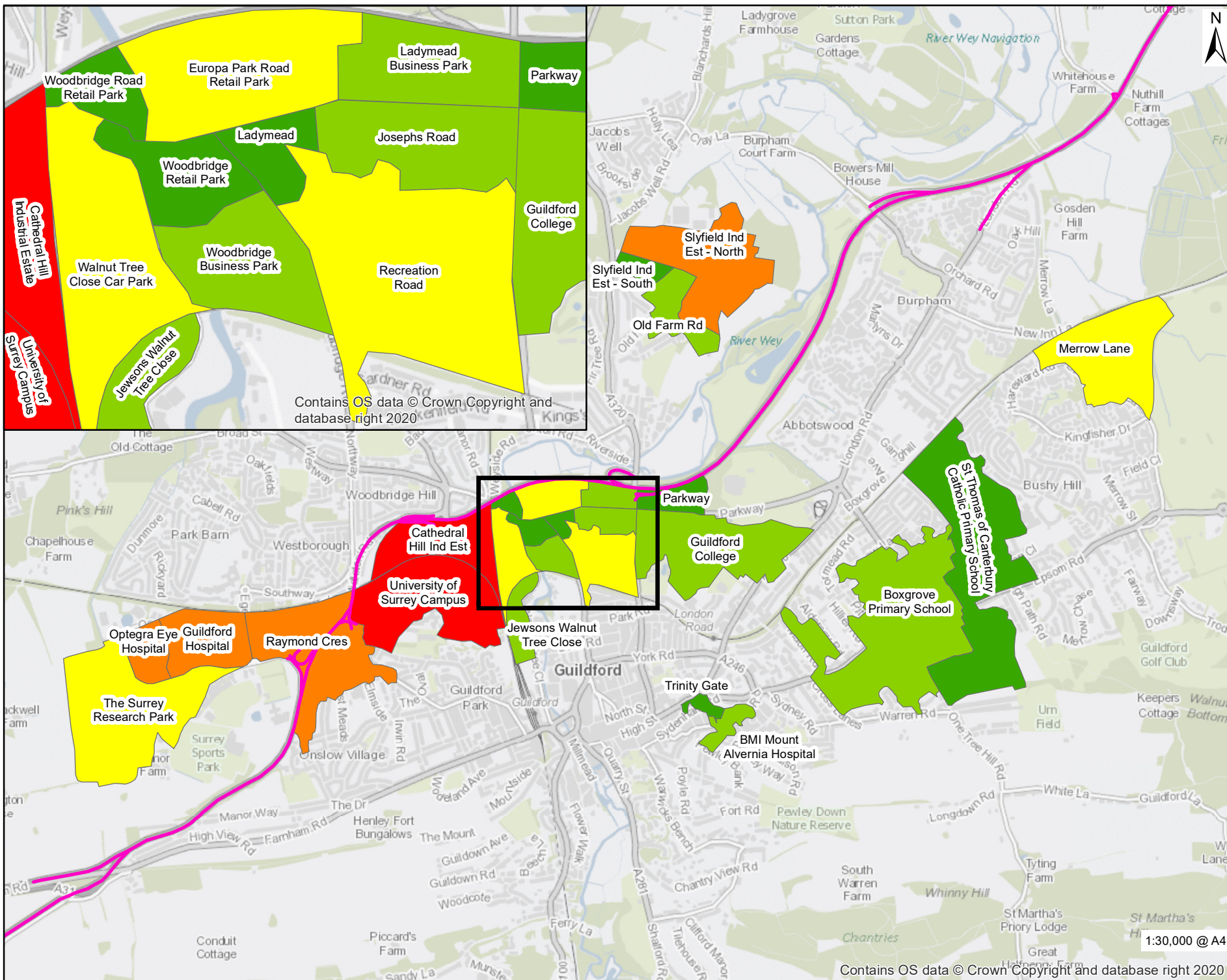
AM		Destination						Total
		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
Origin	Rest of Guildford	1%	0%	0%	1%	3%	2%	8%
	Guildford Town Centre	0%	0%	0%	0%	0%	0%	1%
	Guildford Urban Area	1%	1%	1%	7%	3%	1%	14%
	Guildford Employment Areas	1%	0%	1%	1%	2%	1%	6%
	Surrounding Districts	1%	0%	0%	2%	5%	3%	11%
	External	2%	0%	1%	8%	18%	33%	61%
	Total	6%	1%	4%	19%	31%	39%	100%

IP		Destination						Total
		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
Origin	Rest of Guildford	15	0	13	17	71	70	187
	Guildford Town Centre	5	0	6	16	20	9	56
	Guildford Urban Area	18	1	34	54	63	30	199.5
	Guildford Employment Areas	51	1	40	47	109	42	289
	Surrounding Districts	16	1	7	21	148	123	317
	External	54	0	21	131	342	996	1545
	Total	159	3	121	287	753	1271	2593

IP		Destination						Total
		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
Origin	Rest of Guildford	1%	0%	1%	1%	3%	3%	7%
	Guildford Town Centre	0%	0%	0%	1%	1%	0%	2%
	Guildford Urban Area	1%	0%	1%	2%	2%	1%	8%
	Guildford Employment Areas	2%	0%	2%	2%	4%	2%	11%
	Surrounding Districts	1%	0%	0%	1%	6%	5%	12%
	External	2%	0%	1%	5%	13%	38%	60%
	Total	6%	0.10%	5%	11%	29%	49%	100%

PM		Destination						Total
		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
Origin	Rest of Guildford	11	1	13	31	72	97	224
	Guildford Town Centre	7	0	15	17	29	8	76
	Guildford Urban Area	10	2	23	34	56	28	153.4
	Guildford Employment Areas	45	2	46	52	117	44	305
	Surrounding Districts	17	1	13	65	140	156	392
	External	35	1	40	139	400	1099	1714
	Total	125	6	149	339	813	1432	2864

PM		Destination						Total
		Rest of Guildford	Guildford Town Centre	Guildford Urban Area	Guildford Employment Areas	Surrounding Districts	External	
Origin	Rest of Guildford	0%	0%	0%	1%	3%	3%	8%
	Guildford Town Centre	0%	0%	1%	1%	1%	0%	3%
	Guildford Urban Area	0%	0%	1%	1%	2%	1%	5%
	Guildford Employment Areas	2%	0%	2%	2%	4%	2%	11%
	Surrounding Districts	1%	0%	0%	2%	5%	5%	14%
	External	1%	0%	1%	5%	14%	38%	60%
	Total	4%	0%	5%	12%	28%	50%	100%



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External Trip Analysis

- 4.46 As discussed in section 4.37, more than 60% of trips along the A3 are external trips, with neither an origin nor destination within Guildford Borough. These were analysed by removing all Guildford trips from the matrices. The southernmost Northbound link (between Beechcroft Drive and Egerton Road) and the northernmost Southbound link (between Dennis Roundabout On-Slip and Cathedral Roundabout) were analysed. In addition, interpeak journeys were excluded from the analysis.
- 4.47 All origins/destinations with greater than 1% of the external trips were selected. In order to summarise the data, the origins and destinations were totalled, and the results are shown in Figure 4-11.
- 4.48 The neighbouring district of Waverley has the highest number of both origins and destinations (13%), followed by other nearby districts such as East Hampshire, Havant and Portsmouth (4-6%). Shepway has a relatively high number of destinations (2-4%), which may be surprising given the distance from Guildford. However, it is likely that these journeys are to the Port of Folkestone. Interestingly there is a higher percentage of trips with a destination of Shepway than an origin of Shepway, suggesting that when originating from Shepway, drivers are more likely to take an alternative route (likely via the M3).
- 4.49 Given the high proportion of through-traffic, attempts to re-distribute these trips elsewhere on the strategic network was considered as an option. However, the analysis shows a huge number of different origins /destinations, with Waverley being by far the highest contributor, with approximately 13% of both origins and destinations. Given Waverley's location – adjacent to Guildford and the next destination along the A3, it is difficult to see a realistic alternative route for this traffic. The next highest contributor is the London Borough of Hillingdon, with 8.3% of destinations and 7% of origins.
- 4.50 Given that redirection of traffic could only be done by changing signage on the network, and the large percentage of trips that are likely to be dictated by satellite navigation, it seems unlikely that there is any one route that would make a material difference to the volume of traffic on the A3.
- 4.51 Table 4-10 and Table 4-11 show the top ten individual trips northbound and southbound. As noted, the most popular single trip is Winchester to Shepway northbound, and Shepway to Winchester southbound. As noted above, more journeys are made to Shepway via the A3 than from Shepway.
- 4.52 It is noted that route selection has been defined by the strategic traffic model and therefore some of the trends observed here could be a result of how the model was created. It is recommended that further survey work would be needed to validate trip patterns, for example from Winchester to Shepway.


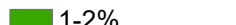
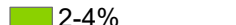
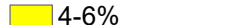
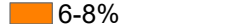


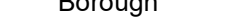
Table 4-10 Top 10 Northbound External Trips

Origin	Destination	Trips	Percentage of Trips
Winchester	Shepway	301.5	8.0
Fareham	LB.Hillingdon	217.5	5.8
City of Portsmouth	LB.Hillingdon	128.4	3.4
Chichester	Slough	101.6	2.7
Waverley	Woking	81.9	2.2
Dorset	LB.Merton	76.9	2.0
Waverley	Essex	76.5	2.0
Waverley	Hertfordshire	74.9	2.0
Waverley	Elmbridge	73.0	1.9
Waverley	Reigate.And.Banstead	67.9	1.8

Table 4-11 Top 10 Southbound External Trips

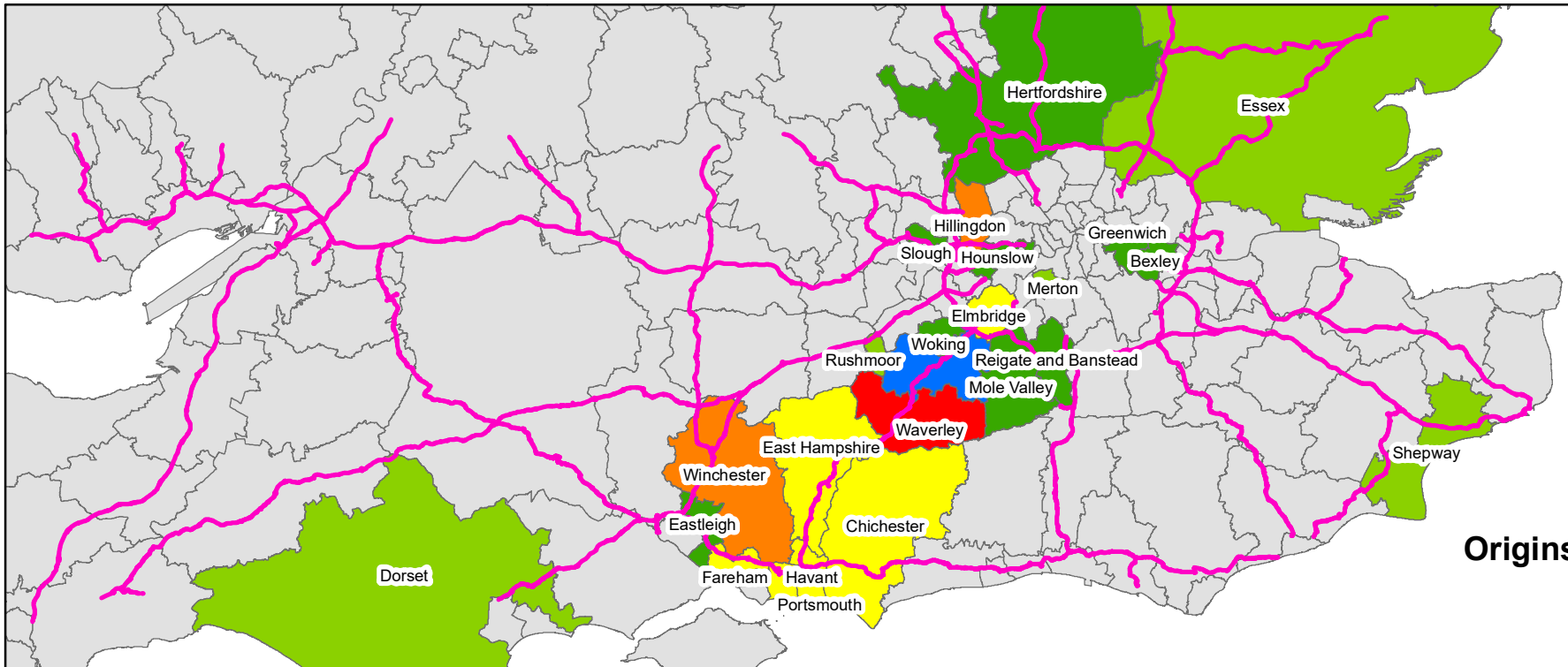
Origin	Destination	Trips	Percentage of Trips
Shepway	Winchester	168.9	4.9
LB Hillingdon	Fareham	156.7	4.5
LB Hillingdon	City.of.Portsmouth	152.7	4.4
Elmbridge	Waverley	104.1	3.0
Essex	Waverley	72.5	2.1
Reigate And Banstead	Waverley	72.0	2.1
LB Merton	Waverley	70.4	2.0
Woking	Waverley	66.5	1.9
Elmbridge	Rushmoor	61.5	1.8
Elmbridge	East.Hampshire	60.0	1.7



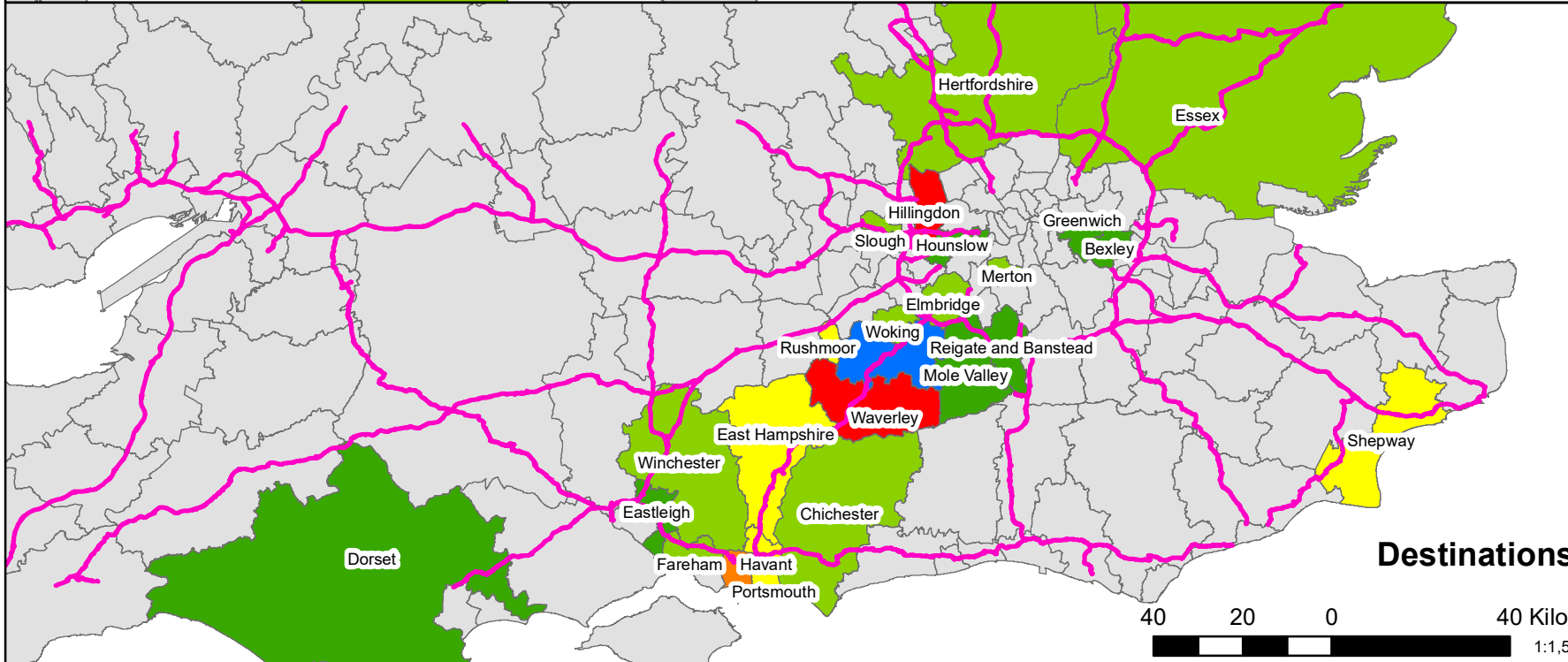
-  Trunk Roads
- External Trips**
- Percentage of trips**
-  1-2%
-  2-4%
-  4-6%
-  6-8%
-  >8%
-  Guildford Borough
-  <1

NOTES
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ISSUE PURPOSE
FOR INFORMATION
PROJECT NUMBER
60643984
SHEET TITLE
External Trip Analysis



Origins



Destinations



Summary of Baseline Conditions

- 4.53 The current annual mean NO₂ concentrations along the A3 under consideration in this report are currently exceeding AQO / EU Limit Values. The highest monitored annual mean concentration in 2018 was 86 µg/m³. The PCM model indicated compliance with the EU Limit Values could be achieved in 2025, due to natural improvements in vehicle fleet technology and background concentrations. However more recent local modelling suggests this section of the A3 may still be exceeding Limit Values in 2030. An estimated 35.7% to 71.6% reduction in NO_x is estimated to be required in 2021 in order to achieve compliance, with this decreasing every year as natural improvements in vehicle fleet and background concentrations occur.
- 4.54 The source apportionment analysis identified the key sources of emissions on the A3 area of interest. Diesel cars and diesel LGVs are the key contributors of NO_x emissions.
- 4.55 The results of the origin destination analysis indicate the majority of traffic on the A3 area of interest are passing through without an origin and destination in the borough, across all time periods. Between 62% to 78% of northbound traffic between Beechcroft Drive and Egerton Road (Tesco Roundabout) are travelling without a destination in Guildford, and 70% of traffic travelling southbound between Dennis Roundabout and Cathedral Hill Roundabout off-slip are external journeys with a destination outside of Guildford. Of the key external journeys using the A3 area of interest, Waverley is the predominant origin and destination, accounting for 13% of all trips. The London Borough of Hillingdon is the next largest contributor.
- 4.56 Of the local traffic using the A3 area of interest with internal destinations within the Borough, most are associated with Guildford Employment Areas (between 10-20% on the northbound section and between 11%-19% on the southbound depending on time of day). There are very few trips along the A3 area of interest which are travelling to Guildford town centre.
- 4.57 The Borough has greater influence to implement measures to target internal journeys on the A3 travelling to or from Guildford, however the impact may be limited as these journeys only represent a small proportion of the total traffic. The most effective strategy to reducing emissions on the A3 area of interest would be to implement measures which target the majority of trips, if not all. As the majority of traffic on the A3 area of interest is through-traffic, the main means by which external journeys could be influenced is to redirect these trips elsewhere on the strategic network. Measures which impact emissions from both internal and external trips would also be effective.

5. Options Review

5.1 Based on the review conducted of measures previously considered and following discussions with GBC, SCC and HE on potential new initiatives, a number of measures have been taken forward for further investigation as part of this study.

Table 5-1 to Table 5-3 summarises these measures split up by the potential area of impact, based on the results from the origin and destination analysis. Table 5-1 details measures targeting through trips on the A3 (where origin / destination is outside of Guildford), Table 5-2 outlines measures addressing internal trips (journeys to / from Guildford) and Table 5-3 contains measures which affect all journeys on the A3.

Table 5-1 Table of Measures, Both Previously Considered and New Ideas – Through Journeys

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
Change signs to re-route traffic	Direct external traffic away from the A3 – eg to the M3, for example through signage or campaigns	HE	New	Short-term	None	Evidence shows minimal impact. May have adverse effects elsewhere on the strategic network.	External to External journeys - encourage people to use M3 of other routes
Bypass	A bypass of Guildford to take the A3 out of the town and away from receptors.	GBC / Highways England	Existing	Long-term	Dismissed	Dismissed due to cost, and the number of highly sensitive receptors along the proposed alternative routes.	External journeys – alternative route

Table 5-2 Table of Measures, Both Previously Considered and New Ideas – Journeys to/from Guildford

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
Promoting sustainable travel - easitGUILDFORD	Easit is a social enterprise company aiming to reduce travel emissions by helping a shift away from car travel. initiatives available to members:	GBC / SCC	Existing	Short-term	Quote from SCC: "easitNETWORK has successfully engaged companies in travel planning activities in sustained way and on a scale not previously achieved in Surrey. We have been pleased with the benefits that the 'easit' network	None	Areas of Employment – reducing private car use

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
	<ul style="list-style-type: none"> • 15% discount on Southern Rail Network including the route between Redhill and Guildford • Rail Season Tickets • 10% staff discount on Compass Bus Travel. • 10% staff discount and FREE taster tickets with Stagecoach buses • Sharing your journey to work with easitSHARE. • Discounted electric vehicle charging units • Savings and FREE driving credit with Enterprise Car Club • Bike loans including folding and electric models • 25% discount on EcoMove Smart Electric Mopeds • Discounts with Halfords • Free Co-wheels Car Club membership • Rotational staff parking schemes • Cycle Routes • Promotional & marketing material • Travel planning/surveys • Cycle-to-work scheme • Carbon neutral car benefit scheme 				<p>has brought to companies in Surrey and to the agenda of reducing transport carbon emissions and congestion.”</p>		

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
New rail station at Guildford West (Park Barn)	Establishment of a new rail station west of the town would help relieve congestion and parking in the area by providing a genuine alternative to private car use. The scheme would encourage modal shift and support the proposed expansion of the area, which included the Royal Surrey County Hospital, University of Surrey and Surrey Research Park, in addition to a large residential population. Other benefits included an interface with, and complementing, Phase 1 of the Council's Sustainable Movement Corridor	GBC / Network Rail	Existing	Long-term	Subject to further assessment, approval and funding being secured Stage 2 (Feasibility) of Network Rail's Governance for Railway Investment Projects (GRIP) Process undertaken to investigate the viability of the scheme. The GRIP process eliminated non-viable options and provided costs for preferred option construction and commissioning. GRIP3 study work is ongoing. Funding TBC	Funding May need to be combined with measures such as parking levies to push the switch to public transport.	Employment areas, focused on Guildford Hospital and Research Park - reducing private car use
Encouraging uptake of Electric Vehicles and retrofitting	Promote and incentivise EV uptake (vans, cars and bikes) or measures to promote or fund retrofitting of vehicles. Encourages a move away from diesel vans and cars in particular, as the source apportionment shows this is a key source of emissions.	GBC and HE	New	Short-term	For consideration by GBC		Guildford town centre area and Employment Areas – focused at reducing use of diesel vehicles
Business Parking Levy in conjunction with other measures.	In some locations (such as the Research Park) a parking levy is unlikely to change behaviour as the area is hard to access by public transport from areas outside the town centre. However, with the	SCC	New	Short-term	None	Opposition from businesses and Councillors Further analysis would be required.	Employment Areas - reducing private car use

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
	building of Guildford West railway station and/or a more convenient P&R, this measure could encourage people to make the switch.						
Rethinking Transport	<p>The ambitions of the programme are to:</p> <ul style="list-style-type: none"> • Take journeys off the road • Improve air quality • Increase opportunities for flexible & independent travel <p>In order to achieve these ambitions, the programme is seeking to shift travel-related behaviour away from single occupancy journeys in higher emissions vehicles towards more sustainable forms of travel and active travel, or to avoid the journey if possible.</p>	SCC	Existing	Short-term	<p>The purpose of the pilot on Surrey Research Park is to influence the travel choices of people working on the Research Park resulting in a shift away from single-occupancy car journeys, towards increased use of multiple-occupancy and public transport, and where possible, active modes of travel.</p> <p>The Behaviouralist, a research consultancy draws upon behavioural science, data science, economic theory and strategic design in order to address complex issues such as travel choices. They will undertake research with businesses and employees working on the Research Park to gain an in-depth understanding of the issues relating to travel from their perspectives and to design and test interventions in accordance with their findings and current good practice with the aim of securing long-term behavioural change, resulting ultimately, in fewer journeys on the road, less congestion in the area, and improved air quality.</p>		Surrey Research Park - reducing private car use

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
					Broad timescale for the Surrey Research Park pilot: 5.3.20 - Initial conversation with The Behaviouralist and Phase 1 (scoping) begins. 31.3.20 - Scoping report submitted to the LGA April '20 - 31.3.21 - Delivery & evaluation of the trial 30.6.21 - Submission of evaluation report to LGA		
Guildford Railway Station Improvements – Solum Regeneration	Improvement to the local rail network including a bus interchange hub and a cycle hub at Guildford rail station.	Network Rail/Kier Properties	Existing	Long-term	In progress. Scheduled to complete in 2025. Stage 2 (Feasibility) of Network Rail's Governance for Railway Investment Projects (GRIP) Process undertaken to investigate the viability of the scheme. The GRIP process eliminated non-viable options and provided costs for preferred option construction and commissioning.	Funding	Guilford Town Centre 0 reducing private car use
Sustainable Movement Corridor (West Route Section)	Multi-modal transport schemes have been identified which would reduce demand and improve conditions for all users of the A3 corridor through Guildford. The 4-phase program will provide rapid, priority pathway	GBC / SCC / Highways England	Existing	Long-term	In progress. Phase 1 and 2A complete. Phases 2b and 3 are expected to commence in early 2021.	Funding - involves GBC and LEP funding, possibly also funding from SCC and developer contributions	Employment Areas and town centre - reducing private car use. Not known at this stage what the extent of modal shift will be

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
	<p>for active modes in Guildford urban area.</p> <p><u>Phase 1:</u> a new pedestrian and cycle path running through Bannister's Field, creating a safe route for people walking from the Royal Surrey Hospital to Tesco.</p> <p><u>Phase 2a:</u> cycle and pedestrian improvements linking Tesco to the University of Surrey, providing a safe route for residents, students and those working at the Royal Surrey Hospital and Research Park.</p> <p><u>Phase 2b:</u> pedestrian and bus lane improvements in Guildford Park Road at the back of Guildford Train station.</p> <p><u>Phase 3:</u> installation of traffic lights at Egerton Roundabout, in addition to bus lane improvements. Landscaping design to improve air quality working with University of Surrey.</p>						
Comprehensive Guildford Borough cycle network	<p>Delivery of schemes to realise the routes and infrastructure which comprise the Comprehensive Guildford borough Cycle Network</p> <p>Cycle infrastructure will be designed and adhere to the</p>	GBC / SCC / HE	New / Existing	Long-term	<ul style="list-style-type: none"> Surrey CC's Guildford Local Cycling Plan (from 2015) Guildford borough Local Plan: Strategy and Sites (2019) – scheme AM2 Guildford Route Assessments Feasibility Study (Transport Initiatives/Urban Movement 2020) 	To benefit the A3 (ie remove the receptor) a new bridge over the Railway would be required. Funding for this would be required.	Guildford Area - reducing private car use for short journeys

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
	<p>principles and quality criteria of Cycle Infrastructure Design (LTN 1/20).</p> <p>Schemes can be identified, and their feasibility and design development and delivery could be invested in by Highways England.</p> <p>In order to benefit exposure from the A3, the cycle/foot path along the A3 would need to be re-routed.</p>				<ul style="list-style-type: none"> SCC secured DfT funding for Guildford to Burpham Cycle Route – On road cycle track (as Scheme 1 in its successful bid for Emergency Active Travel Fund) 		
Introduction of a new Park & Ride	<p>This measure proposes the siting of a new P&R further out of Guildford than the current Onslow P&R, which currently sees little use due the fact that it requires a driver to drive a distance from the A3, moving further from the town centre to access the Onslow P&R.</p> <p>A P&R further out of town could be used by Surrey Research Park and Hospital visitors, reducing the volume of traffic on the section of the A3 in question.</p> <p>The proposed siting of a new P&R would be directly accessible from the A3 or A31, eliminating the location barrier for use of the scheme.</p>	GBC / SCC	New	Medium-term	For consideration by GBC	<p>Cost – Onslow P&R is not used enough and requires ongoing subsidies to operate.</p> <p>New location would only pick up traffic from the A3 OR the A31 – reducing the potential impacts.</p>	External trips to/from areas to the south west - - reducing private car use
Widen the electric charging network, particularly to target	A public consultation is currently ongoing into the Taxi and Private Hire Vehicle	GBC / HE (to respond to consultation)	New	Long-term	None	Impact on fleet unknown without further research, and number of journeys	Guildford Area – improving taxi emissions and move

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
Licensed Taxis and Private Hire vehicles.	Licensing Policy (ends Jan 2021). Currently this is not recommending a push towards hybrid and electric vehicles because of the cost of the vehicles and the lack of infrastructure. By improving the electric charging infrastructure the pressure to improve the fleet could be increased. Encourage a move away from diesel vehicles in particular, as the source apportionment shows this is a key source of emissions.					made by private hire fleet unknown without specific ANPR data.	towards cleaner private vehicles
Freight Consolidation Centre (FCC)	<p>Freight consolidation is where suppliers have goods delivered to a consolidation centre on the outskirts of a city. The goods are then combined into a single fuller load for the onward journey to the delivery point.</p> <p>For example, Bristol has a successful FCC - at its peak, the scheme reduced onward trips in the central area by 70% to 80% between 2004 and 2018. For every 10 vehicles that made a delivery to the consolidation centre, just two or three onward journeys to the central area were made. The scheme</p>	GBC	New	Long-term	None	Investment would be required. Due to the nature of Guildford and the A3 it is likely that two depots would be required, one to the north east and one to the south west. Further analysis would be required to identify the likely uptake and impact of such a scheme.	External to Guildford trips – reduction in heavy goods vehicle trips

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area and Type of Impact
	helped reduce negative impacts experienced by people living in deprived areas. ⁴						
Introduction of a Road User Charging Scheme or Civil Penalty Scheme	Including; <ul style="list-style-type: none"> • Charging Zones; • Clean Air Zone (charging by vehicle type e.g. diesels or emissions-based restrictions); Vehicles charged if leaving A3	GBC	New	Short-term	For consideration by GBC. Would require further research into its effectiveness	Funding and costs would be high. Political difficulties in securing agreement.	Employment Areas or town centre – vehicles charged if leave A3 encouraging a reduction in vehicle usage or move towards cleaner vehicles

Table 5-3 Table of Measures, Both Previously Considered and New Ideas – All Journeys on A3

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area of Impact
Safety Improvement Measures under 'Local Roads and Parking' strategy	In partnership with Surrey County Council, GBC have developed an extensive programme of 'hotspot' improvements to the Local Road Network to support journeys by private vehicles. This includes anticipated safety improvements to the A31 at Hog's Back.	GBC	Existing	Medium-term			A3 users - Improvements along the A3 at key junctions will help smooth traffic flow and ease congestion at pinch points
A3 Guildford (A320 Stoke interchange junction to A31 Hog's Back junction) 'Road Investment Strategy' scheme	This area was identified within Highways England's 'M25 to Solent Route Strategy' as an area of opportunity requiring further investigation. Currently, additional traffic joins the A3 from the A31 at Hog's Back, making this section a hotspot for both network capacity and safety issues. The RIS scheme seeks to facilitate major, long-term improvements to the A3 in order to be able to	Highways England	Existing	Long-term	Dismissed – the scheme did not appear in DfT's Road Investment Strategy 2: 2020-2025 (March 2020).		A3 users – As above

⁴ [Freight consolidation - Travelwest](#)

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area of Impact
	accommodate future planned growth both outside and within the borough.						
Traffic Management Measures	Implementation of an array of junction improvements, traffic management measures, and carriageway realignment on the A3 and/or A31. For example, ramp metering on the northbound A31/A3 junction would be beneficial.	GBC / Highways England	New	Medium-term	For consideration by SCC / HE	Cost, lack of evidence that impacts would be seen on the A3. Potential for diversion of traffic via the A31, thus increasing town centre emissions.	A3 Users – As above
Roadside Barriers on A3	Measures for consideration include: <ul style="list-style-type: none"> • Construction of a 9.5m high barrier; or • Construction of a tunnel, canopy or bypass. 	Highways England/GBC	Existing	Medium-term	Feasibility studies have been commissioned to determine whether the construction of a 9.5m high barrier is estimated to deliver a 2-5 µg/m ³ reduction in annual mean NO ₂ concentrations.	The current programme of tunnel, canopy or bypass construction is estimated to be between 5-10 years. Phase 3 modelling has indicated that exceedances of the EU limit values are anticipated up to and including the year 2030 and therefore further work will be required to assess whether this could be a viable option.	A3 Users – reduce exposure
Road surfaces to reduce pollution	Low-friction road surfacing	Highways England/GBC	Existing	Medium-term	Dismissed	Low friction road surfacing is not being pursued due to a lack of empirical evidence on the effects on NO _x emissions	A3 Users – reduce exposure

Measure	Description	Lead Authority	New / Existing	Delivery Timescale	Status/Progress to Date	Barriers to Implementation	Area of Impact
Mechanical filtration	Portable mechanical filtration	Highways England/GBC	Existing	Medium-term	Subject to further consideration by GBC.	Funding	A3 Users – reduce exposure
ANPR-Enforced Low Emission Lane	<p>An ANPR-enforced Low Emission Vehicle lane would allow more polluting vehicles to travel along the A3, but they would be restricted to one lane. If they enter the LEV lane they would be issued with a penalty notice. This would encourage people to move toward LEV where possible if speed of journey was important to them.</p> <p>Nottingham has implemented a ULEV + Bus lane on Daleside Road to encourage uptake of ULEVs: https://www.transportnottingham.com/driving/ultra-low-emission-vehicles/daleside-road-bus-lane/</p>	GBC	New	Medium-term	None	Cost, approval of Councillors. Would need further work into the effectiveness of the measure, and the application of the measure around slip roads.	A3 Users (primarily private cars) – encourage uptake of cleaner vehicles

Scoring of Options

- 5.2 The overall objective for HE in partnership with GBC is to deliver a scheme or schemes that leads to compliance with NO₂ concentration limits in the shortest possible time.
- 5.3 A high level qualitative appraisal has been conducted of the options above, based on professional judgement, evidence on the traffic and fleet characteristics on the A3 and O-D evidence, as well as knowledge from similar schemes implemented in other local authorities. These options and the ranking have been developed in discussions with GBC, SCC and HE and are presented in Table 5-4 and are split based on journey types.
- 5.4 In the first instance, the options suitable for the main destinations identified have been assessed on their potential air quality impact at locations close to the A3 and timescale to implement, i.e. are they likely to contribute to achieving compliance in the shortest possible time. Based on these primary factors, a number of these options are taken forward to secondary considerations. These include consideration of aspects such as the estimated cost of implementation, wider benefits (for example carbon and noise benefits or encouraging a transfer to other modes of transport) and acceptability to GBC, public and stakeholders. Options may be progressed to the short list if they score highly on these aspects.
- 5.5 It must be noted that the scoring is based on the options implemented in isolation and is specifically based on the impacts on Air Quality on the stretch of the A3 in question, and in no way rates the scheme as a whole, as there may be wider benefits on other aspects or locations.
- 5.6 The short-listed measures to be taken forward further are given in Table 5-5 with commentary and justification on the decisions made.
- 5.7 Conclusions and recommendations for further assessment are given in Section 6.

Table 5-4 Scoring of Options

Measure	Lead Authority	New / Existing	Barriers to Implementation	Air Quality Impact (Low/Medium/High) 1-3	Timescale (Short/Medium/Long) 3-1	Compliance in Shortest Possible Time? Pass/Fail	Estimated Cost of Implementation (Low/Medium/High) 3-1	Wider impacts (-2 to +2)	Acceptability (Public, Councillors etc) -2 to +2	Secondary Factors Pass/Fail	Progress to Shortlist
Traffic management measures – A3 Users											
Sustainable Movement Corridor	GBC / SCC / Highways England	Existing	Funding	1	2	Fail	2	2	2	Pass	NO
Local Roads and Parking strategy	GBC	Existing	Funding	1	3	Fail	2	1	2	Pass	NO
Road Investment Strategy schemes	Highways England	Existing	Not included in RIS2	1	2	Fail	2	1	1	Pass	NO
Introduction of a Road User Charging Scheme or Civil Penalty Scheme	GBC	New	Cost, potential lack of impact on traffic on the A3 as does not target through journeys. Political difficulties.	1	2	Fail	2	0	-2	Fail	NO
Traffic Management Measures	GBC / Highways England	New	Cost, lack of evidence that impacts would be seen on the A3.	1	3	Fail	2	0	0	Fail	NO
ANPR-Enforced Low Emission Lane	GBC/ HE	New	Cost, approval of Councillors.	2 (potentially)	1	Fail	2	1	0	Fail	NO
Employment Area Measures											

Measure	Lead Authority	New / Existing	Barriers to Implementation	Air Quality Impact (Low/Medium/High) 1-3	Timescale (Short/Medium/Long) 3-1	Compliance in Shortest Possible Time? Pass/Fail	Estimated Cost of Implementation (Low/Medium/High) 3-1	Wider impacts (-2 to +2)	Acceptability (Public, Councillors etc) -2 to +2	Secondary Factors Pass/Fail	Progress to Shortlist
Promoting sustainable travel - easitGUILDFORD	GBC /SCC	Existing	None	2	3	Fail	3	2	2	Pass	YES
Rethinking Transport	GBC / SCC	Existing		1	3	Fail	3	1	1	Pass	YES
Encouraging update of Electric Vehicles to reduce diesel vehicles	GBC	New		1	2	Fail	2	2	2	Pass	YES
Business Parking Levy in conjunction with other measures.	GBC	New	Opposition from businesses and Councillors	1 (standalone), 2 in combination with new railway station	1	Fail	3	0	-1	Fail	NO
Through traffic											
Change signs to re-route traffic	HE	New	Evidence shows minimal impact. May have adverse effects elsewhere on the strategic network.	1	1	Fail	3	0	1	Fail	NO
Bypass	GBC / Highways England	Existing	Dismissed due to cost, and highly sensitive receptors.	3	1	Fail	1	0 (+2 in some areas - 2 in others)	0 (+2 in some areas -2 in others)	Fail	NO
External to Guildford trips											

Measure	Lead Authority	New / Existing	Barriers to Implementation	Air Quality Impact (Low/Medium/High) 1-3	Timescale (Short/Medium/Long) 3-1	Compliance in Shortest Possible Time? Pass/Fail	Estimated Cost of Implementation (Low/Medium/High) 3-1	Wider impacts (-2 to +2)	Acceptability (Public, Councillors etc) -2 to +2	Secondary Factors Pass/Fail	Progress to Shortlist
Freight Consolidation Centre (FCC)	GBC	New	Investment would be required.	2	2	Fail	2	2	1	Fail	NO
Guildford Railway Station Improvements – Solum Regeneration	Network Rail/Kier Properties	Existing	Funding	1	2	Fail	1	1	2	Fail	NO
New rail station at Guildford West (Park Barn)	GBC / Network Rail	Existing	Funding	1 in isolation, 2 in combination with parking charges	2 (2025)	Fail	3	2	2	Pass	YES
Introduction of a new Park & Ride	GBC / SCC	New	Cost	1	2	Fail	2	1	1	Pass	NO
Within Guildford Borough											
Comprehensive Guildford Borough cycle network	GBC / SCC / HE	New / Existing	Funding	0 (No improvement to AQ, but removal of exposure)	3	Pass	2	1	1	Pass	YES
Encouraging update of Electric Vehicles to reduce diesel vehicles	GBC	New		1	2	Fail	2	2	2	Pass	YES
Widen the electric charging network, particularly to target Licenced Taxis and Private Hire vehicles.	GBC / HE (to respond to consultation)	New		1	2	Fail	2	1	1	Fail	NO

Table 5-5 Measures to be taken forward

Measure	Lead Authority	New / Existing	Barriers to Implementation	Air Quality Impact (1-3)	Timescale (3-1)	Shortest Possible Time?	Estimated Cost (3-1)	Wider impacts (-2 to +2)	Acceptability (-2 to +2)	Secondary Factors	Reasons for taking forward
Promoting sustainable travel - easitGUILDFORD	GBC /SCC	Existing	None	2	3	Fail	3	2	2	Pass	Implemented widely, this measure has the potential for reducing local traffic on the road network. If measures are focused on areas such as the Research Park then a switch towards electric vehicles could potentially make a difference, for example to encourage shift from diesels. Current evidence is minimal however, so further work to quantify is required. The initiative is an existing one, so potentially an “easy win” as GBC would just need to push the scheme more.
Rethinking Transport	GBC / SCC	Existing		1	3	Fail	3	1	1	Pass	As above this initiative is ongoing, although may have stalled due to COVID. Once the results of the initial phase are published it will be easier to quantify the potential impacts of the scheme and ascertain the impact to air quality on the A3.
New rail station at Guildford West (Park Barn)	GBC / Network Rail	Existing	Funding	1 in isolation, 2 in combination with parking charges	2 (2025)	Fail	3	2	2	Pass	This scheme is likely out of the control of HE and relies on investment from Network Rail. However it is the most likely way that a modal shift away from the car can be achieved for the Research Park and University, which would lower movements along the first stretch of the A3.
Comprehensive Guildford Borough cycle network (re-route away from A3)	GBC / SCC / HE	New / Existing	Funding, available route.	0 (No improvement to AQ, but removal of exposure)	3	Pass	2	1	1	Pass	This option removes the exposure along the A3 and therefore removes the issue. While it is not the most “sustainable” solution it is the most likely to remove the problem.
Encouraging update of Electric Vehicles	GBC	New		1	2	Fail	2	2	2	Pass	As with easitGUILDFORD and Rethinking Transport, increasing the proportion of electric vehicles on the network will reduce emissions and encourage shift from diesel vehicles, eg deliveries and commuters to employment areas. This should therefore be pursued via as many avenues as possible.

6. Conclusion and Recommendations

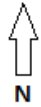
- 6.1 It is clear that based on the current and projected NO₂ concentrations close to the A3 and the analysis presented above that a large reduction in NO_x emissions from vehicles on the A3 is needed to achieve the EU Limit Value.
- 6.2 A large number of key interventions would be required in combination to work towards meeting the Limit Value in the shortest possible time would as individually, none of the measures set out above would result in significant reductions in NO₂ concentrations to achieve this.
- 6.3 The majority of journeys have been found to be due to through traffic (more than 60%). There are therefore few measures that would effectively reduce the numbers of these trips given the strategic nature of these journeys. For example, encouraging drivers to use alternative routes is likely to result in adverse effects elsewhere on the network. This also means that GBC has little influence on these trips and any local infrastructure improvements or schemes that target vehicles travelling to and from Guildford are likely to be less effective. However, there are still opportunities to reduce vehicle movements or encourage user of cleaner vehicles, particularly focusing on diesel cars and van journeys to key employment areas close to the A3 such as the Research Park and the University. As such, these journeys are the focus of the recommended interventions.
- 6.4 At this stage, there is insufficient information on the potential impacts on NO₂ concentrations along the A3 or wider impacts in Guildford, as well costs to implement the short-listed measures outlined in Table 5-5.
- 6.5 It is therefore recommended that the following measures warrant further investigation as outlined below:
- **Encouraging uptake of Electric Vehicles – Priority Option**
 - HE has already started research into reducing the emissions of the vehicle fleet travelling along the A3. Further work is needed to establish what kind of funding would encourage the uptake of electric vehicles, particularly for businesses and fleet drivers and which employment areas should be targeted to maximise the impact on the A3. It is also recommended that to inform this measure that further analysis is conducted to determine the key origin destinations of diesel cars and vans as these are the key contributor to NO_x emissions.
 - **Comprehensive Guildford Borough cycle network (re-route away from A3) – Priority Option**
 - The crucial part of this scheme is the re-routing of the cycle path away from the edge of the A3. This would not reduce emissions but would remove the main receptor. Research is required to establish alternative routes (considering constraints and opportunities), potential costs, and the number of cyclists and pedestrians affected.
 - **Promoting sustainable travel – easitGUILDFORD**
 - The current take-up of easitGUILDFORD is currently unknown, but it is likely that further take-up could be encouraged. Investment may be required from HE to increase the reach of the scheme, so it is recommended that data be obtained from Easit to allow the impacts to be quantified.
 - **Rethinking Transport**
 - The Rethinking Transport study should have been concluded according to the project timescales. It is recommended that the Rethinking Transport team at SCC/GBC be contacted and are included in the next stage of this work.
 - **New rail station at Guildford West (Park Barn)**
 - A rail station west of the town centre would serve employment areas on the outskirts that are currently not well served by public transport. Research is needed to establish how many trips could be shifted onto the rail network, and whether a parking levy would be required to make the push.

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Appendix A PCM Link 17736 Information



Census ID: 17736	A3, Guildford	Highways England Region: Area 3	Phase 3
AQ Description: PCM non-compliant. Sensitive receptors and public access within 15m.			

Highways England Verified Modelled NO ₂ Concentrations (µg/m ³)													
Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
NO ₂ Conc.	99	94	89	84	78	73	68	64	60	58	55	53	51

Highways England Diffusion Tube Monitoring Data	
Location	2018 Indicative NO ₂ Concentration (µg/m ³)
Guildford 1	86
Guildford 2	47
Guildford 3	71
Guildford 4	51
Guildford 5	27
Guildford 6	46
Guildford 7	37
Guildford 8	32
Guildford 9	53
Guildford 10	37
Guildford 13	47
Guildford 14	63
Guildford 15	33



AQMA
No AQMA

Regional Transport Model Traffic Data for 2017			
Road	RTM ID	AADT	%HDV
A3 northbound	SE_12300_12311	41917	6
A3 southbound	SE_12307_12289	35722	6

Key			
PCM Link		Sensitive Receptor/s within 15m of PCM Link	
NO ₂ monitoring		Footpath/s within 15m of PCM Link	
AQMA		RTM ID	
Bus Stop		Section of PCM link within 25m of junction	

Typical Traffic				Fast				Slow
AM (07:00 – 10:00)	IP (10:00 – 16:00)	PM (16:00 – 19:00)	OP (19:00 – 07:00)					
SB	NB	SB	NB	SB	NB	SB	NB	

Major Project Scheme in vicinity?
None.

Commentary
- Sensitive receptors are present within 15m of the PCM link carriageway (notably houses located along Ash Grove, Beckingham Road, Southway, The Drive, Downing Avenue and Queen Eleanors Road)

Appendix B Euro Fleet Proportions

Table A-1 to Table A-4 show the Euro Fleet proportions calculated from the A331 data and inputted into the EFT. Shaded rows indicate vehicle types which were not counted in the A331 data, and therefore default proportions in the EFT were used.

Table A- 1: Northbound LGV Euro Fleet Proportions from the A331

Vehicle Type	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c	Euro 6d	ZEC
Petrol Car	0.00	0.00	0.00	0.02	0.22	0.28	0.47	0.00	-	-
Diesel Car	0.00	0.00	0.00	0.01	0.18	0.41	0.40	0.00	0.00	-
Taxi (Black Cab)	0.00	0.00	0.00	0.00	0.67	0.33	0.00	0.00	0.00	0.00
Petrol LGV	0.00	0.00	0.00	0.07	0.07	0.27	0.60	0.00	-	-
Diesel LGV	0.00	0.00	0.00	0.01	0.14	0.36	0.49	0.00	0.00	-
Full Hybrid Petrol Car	-	-	-	0.02	0.06	0.37	0.56	0.00	-	-
Plugin Hybrid Petrol Car	-	-	-	-	-	0.11	0.89	0.00	-	-
Full Diesel Hybrid Car	-	-	-	-	-	0.40	0.60	0.00	0.00	-
Battery EV Car	0.00	0.00	0.00	0.00	0.00	0.06	0.94	0.00	0.00	0.00
Fuel Cell EV Car	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E85 Bioethanol Car	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
LPG Car	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Full Hybrid Petrol LGV	-	-	-	-	0.00	0.00	1.00	0.00	-	-
Plug-In Hybrid Petrol LGV	-	-	-	-	-	0.00	1.00	0.00	-	-
Battery EV LGV	0.00	0.00	0.00	0.00	0.00	0.17	0.83	0.00	0.00	0.00
FCEV LGV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E85 Bioethanol LGV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
LPG LGV	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-

Table A- 2: Northbound HGV Euro Fleet Proportions from the A331

Vehicle Type	1Pre-Euro I	2Euro I	3Euro II	4Euro III	5Euro IV	6Euro V_EGR	7Euro V_SCR	8Euro VI	9Euro II SCRRF	10Euro III SCRRF	11Euro IV SCRRF	12Euro V EGR + SCRRF
Rigid HGV	0.00	0.00	0.00	0.00	0.03	0.14	0.83	0.00	0.00	0.00	0.00	0.00
Artic HGV	0.00	0.00	0.00	0.00	0.01	0.11	0.88	0.00	0.00	0.00	0.00	0.00
Buses	0.00	0.00	0.00	0.00	0.19	0.33	0.00	0.48	0.00	0.00	0.00	0.00
Coaches	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B100 Rigid HGV	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B100 Artic HGV	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hybrid Buses - Single Decker	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
Hybrid Buses - Double Decker	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
Hybrid Buses - Articulated	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
H2 Fuel Cell Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CNG Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomethane Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biogas Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biodiesel Buses	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biodiesel Coaches	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A- 3: Southbound LGV Euro Fleet Proportions from the A331

Vehicle Type	Pre-Euro 1	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c	Euro 6d	ZEC
Petrol Car	0.00	0.00	0.00	0.02	0.21	0.29	0.48	0.00	-	-
Diesel Car	0.00	0.00	0.00	0.01	0.17	0.41	0.41	0.00	0.00	-
Taxi (Black Cab)	0.00	0.00	0.00	0.00	0.25	0.75	0.00	0.00	0.00	0.00
Petrol LGV	0.00	0.00	0.00	0.06	0.12	0.18	0.65	0.00	-	-
Diesel LGV	0.00	0.00	0.00	0.01	0.12	0.36	0.51	0.00	0.00	-
Full Hybrid Petrol Car	-	-	-	0.01	0.06	0.36	0.57	0.00	-	-
Plugin Hybrid Petrol Car	-	-	-	-	-	0.11	0.89	0.00	-	-
Full Diesel Hybrid Car	-	-	-	-	-	0.31	0.69	0.00	0.00	-
Battery EV Car	0.00	0.00	0.00	0.00	0.00	0.09	0.91	0.00	0.00	0.00
Fuel Cell EV Car	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E85 Bioethanol Car	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
LPG Car	-	0.00	1.00	0.00	0.00	0.00	0.00	0.00	-	-
Full Hybrid Petrol LGV	-	-	-	-	0.00	0.00	1.00	0.00	-	-
Plug-In Hybrid Petrol LGV	-	-	-	-	-	0.00	1.00	0.00	-	-
Battery EV LGV	0.00	0.00	0.00	0.00	0.00	0.33	0.67	0.00	0.00	0.00
FCEV LGV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E85 Bioethanol LGV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
LPG LGV	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-

Table A- 4: Southbound HGV Euro Fleet Proportions from the A331

Vehicle Type	1Pre-Euro I	2Euro I	3Euro II	4Euro III	5Euro IV	6Euro V_EGR	7Euro V_SCR	8Euro VI	9Euro II SCRRF	10Euro III SCRRF	11Euro IV SCRRF	12Euro V EGR + SCRRF
Rigid HGV	0.00	0.00	0.00	0.00	0.03	0.14	0.00	0.83	0.00	0.00	0.00	0.00
Artic HGV	0.00	0.00	0.00	0.00	0.01	0.12	0.00	0.88	0.00	0.00	0.00	0.00
Buses	0.00	0.00	0.00	0.05	0.10	0.33	0.00	0.52	0.00	0.00	0.00	0.00
Coaches	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B100 Rigid HGV	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B100 Artic HGV	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hybrid Buses - Single Decker	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
Hybrid Buses - Double Decker	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
Hybrid Buses - Articulated	-	-	-	-	0.00	0.00	0.00	0.00	-	-	-	-
H2 Fuel Cell Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CNG Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomethane Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biogas Buses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biodiesel Buses	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biodiesel Coaches	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix C Source Apportionment Results

Figure A-2: Percentage Contribution by Vehicle Type – A3 Northbound

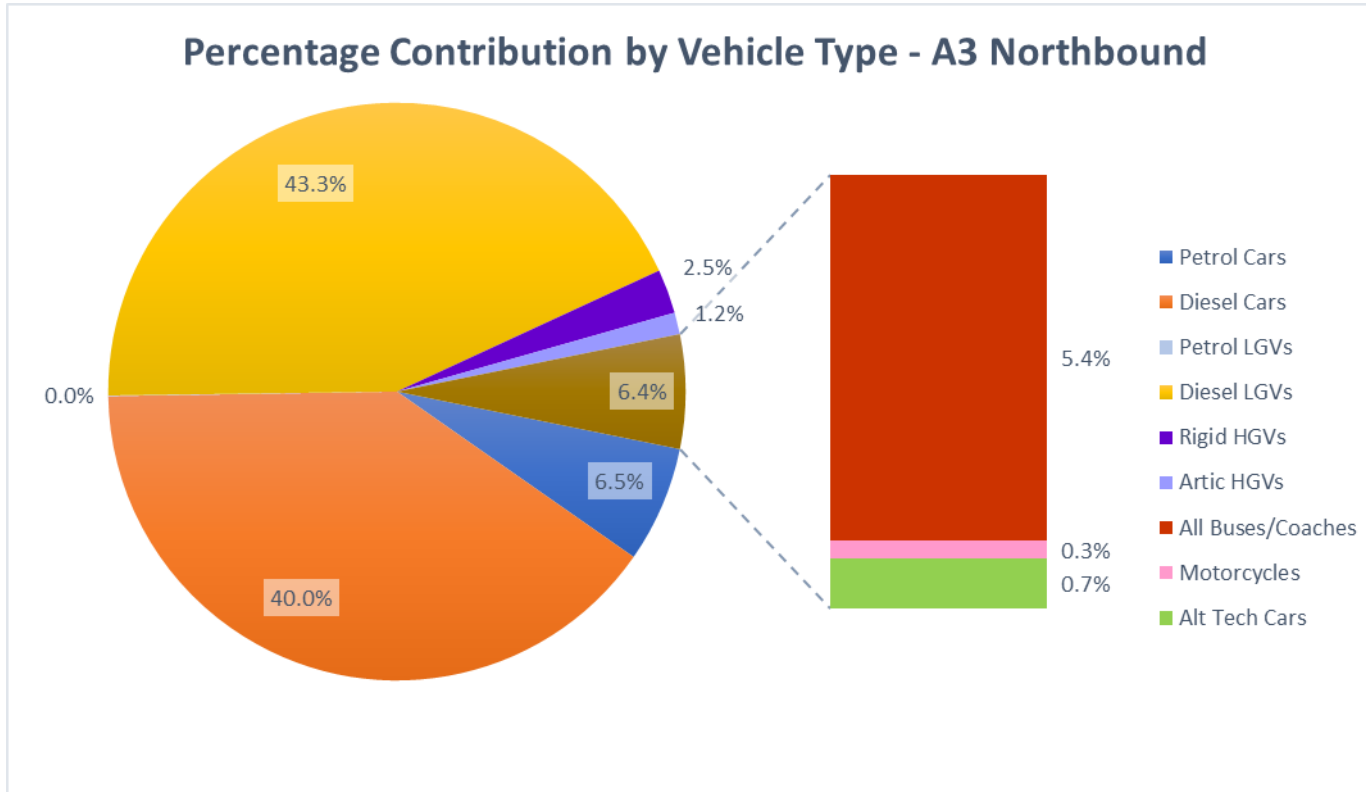


Figure A-3: Percentage Contribution by Vehicle Type – A3 Southbound

