

Land at
Providence Hill
Bursledon
Hampshire
SO31 8AU

Air Quality Assessment



May 2022

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1 Introduction, aims and objectives

1.1 Introduction

Apple Environmental Limited has been commissioned to undertake an air quality assessment for the proposed redevelopment of land adjacent to 4 Brookfield, Providence Hill, Eastleigh, in support of an outline planning application for the construction of a commercial veterinary practice and sixteen residential units.

This assessment was requested due to the site being located within close proximity to the A27.

1.2 Purpose

The UK National Air Quality Strategy (NAQS) sets standards and objectives for various airborne pollutants. Under the Air Quality (England) Regulations 2000 enacted by the Environment Act 1995, local authorities must review and assess air quality in their area for a number of pollutants taking into account these standards and objectives. The specific pollutants are carbon monoxide, benzene, 1,3-butadiene, nitrogen dioxide (NO₂), lead, sulphur dioxide (SO₂), and particles of 10µm diameter or less (PM₁₀).

Air quality objectives are health-based, and therefore the focus for air quality assessment is on public exposure. Relevant locations are considered for each pollutant and individual objective in turn. Any part of the local authority's area in which the standards and objectives are not being met, or are unlikely to be met within the relevant specified period, must be designated as an 'air quality management area' (AQMA). Following the designation of an AQMA, the local authority must draw up an action plan setting out the measures, and target dates by which it aims to meet the air quality standards.

Development has the potential to significantly affect local air quality. The impact on air quality is likely to be particularly important where a development is proposed inside, or adjacent to, an AQMA, or where the development itself could result in the designation of an AQMA. Equally, local air quality management has the potential to affect the location and design of a development in order to minimise environmental impact and public exposure. Therefore, consideration of air quality issues is a key aspect of the local development control process.

The designation of an AQMA is not intended to cause refusal of development in that area. However, where a development may have a significant effect on air quality or where the air quality will have an effect on the future occupants of the development, the local authority usually requires the applicant to provide an assessment of the likely impacts.

If the impacts are assessed to be harmful, or likely to affect local air quality management objectives then developers are expected to incorporate mitigation measures into the development, and demonstrate that the proposed measures will reduce the impacts to an acceptable level.

1.3 Aim

The aim of this work is to undertake an air quality assessment by means of collating available data for known problematic airborne pollutants in the general area of the site.

The data is to be used to assess the significance of any potential impacts on future occupants of the proposed development site, as well determining any potential impacts that the development itself could have on local air quality.

1.4 Objectives

In achieving this aim, the following objectives have been identified:

- to provide details of the site location and the proposed development;
- to review existing air quality data with regard to airborne pollutants in the area through reference to air quality review and assessments published by the local authority;
- to identify any potential impacts of the present and future air quality (with specific regard to nitrogen dioxide) on the future occupiers/visitors/workers of the proposed development;
- to put forward a construction phase assessment with specific regard to dust mitigation measures; and
- to propose or recommend mitigation measures where deemed necessary.

1.5 Guidance

This assessment has been carried out in accordance with The National Planning Policy Framework (2021), Eastleigh Borough Council Air Quality Annual Status Report June 2020, the Design Manual for Roads and Bridges Volume 11, Section 3 Part 1 (Air Quality) and Local Air Quality Management Technical Guidance LAQM.TG16 (2021), and has additionally made reference to the following information sources:

- Eastleigh Borough Local Plan 2016 - 2036 (Policy DM8);
- Air Pollution in the UK 2018, DEFRA, September 2021, http://uk-air.defra.gov.uk/library/annualreport/viewonline?year=2020_issue_1;
- National Atmospheric Emissions Inventory, <http://naei.defra.gov.uk/>;
- DEFRA Local Air Quality Management Support (<http://laqm.defra.gov.uk/>);
- National Air Quality Information Archive (NAQIA) (<http://www.airquality.co.uk>);
- Compilation of New Roadside Monitoring Data Obtained by Local Authorities as Part of the Review and Assessment Process: Update, Air Quality Consultants Ltd and University of Bristol on behalf of DEFRA, 2002;
- Air Quality Expert Group: nitrogen dioxide in the United Kingdom, prepared for the Department of the Environment, Food and Rural Affairs; Scottish Executive, Welsh Assembly Government; and the Department of Environment in Northern Ireland, 2009;
- <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>; and
- IAQM document Land-use Planning & Development Control: Planning for Air Quality January 2017 (<https://iaqm.co.uk/guidance/>).

2 Background

2.1 Eastleigh Borough Council Plan 2016 - 2036

Policy DM8 of the Local Plan states that the Council has an on-going duty to review and assess air quality, and has declared a number of air quality management areas (AQMA) associated with traffic.

More specifically, air quality will be a material consideration within and adjacent to such areas, or where the development could give rise to the need for such an area to be designated, or where the development would prevent an air quality action plan being implemented.

The Borough Council require developers to address means of mitigating air pollution, in particular measures to reduce traffic congestion (including the implementation of Travel Plans by businesses and developers). While the provision of green infrastructure such as trees has been shown to have some beneficial effects on ambient air quality (and the Council will seek the replacement of at least two trees for each one lost in the Borough); although this is not to be regarded as a measure that will be effective on its own in addressing air pollution in the designated AQMA.

Planning Practice Guidance states that measures should be specific to the location and development, and proportionate to the likely impact.

2.2 Site location and description

The application site is located adjacent to the A27 trunk road and currently exists as a largely unused area of unmanaged vegetated land, located within a predominantly residential part of Bursledon. This report has been prepared in support of an outline planning application for the construction of 16 residential units and a commercial veterinary practice.

The site is located within Hamble Lane air quality management area (AQMA), which was extended to include the area in which the site lies in 2019.

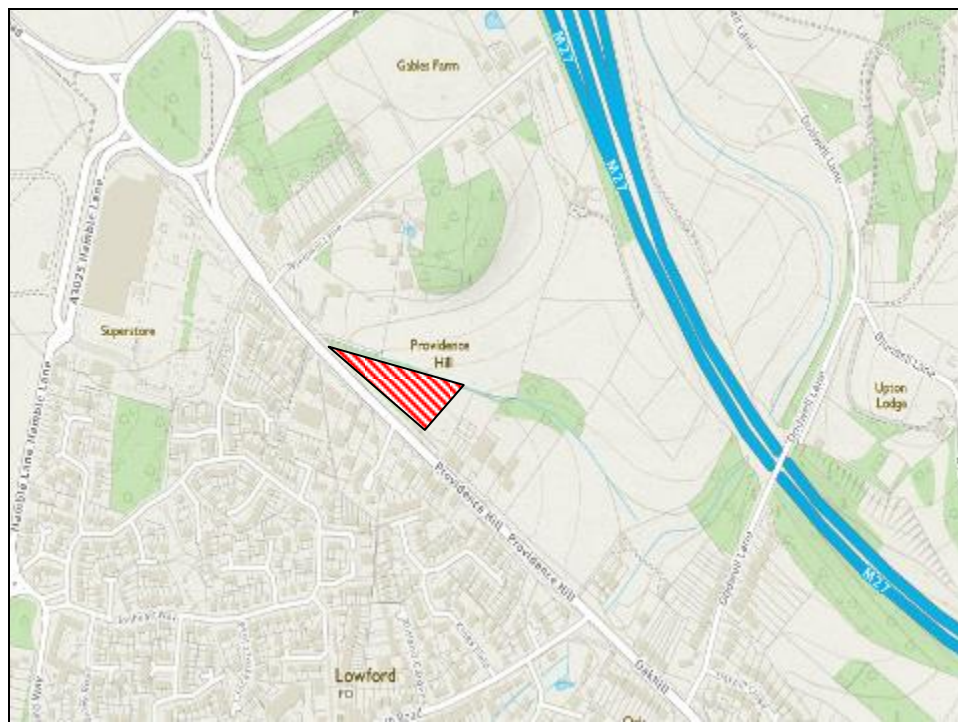
The site slopes steeply down from the A27, and essentially sits within a valley. At its lowest point the site is around 10m lower than the road. The land subsequently ascends steeply away northwards up from the site, towards the M27 motorway. The site is entirely soft landscaped, being surrounded on all sides by trees.

The A27 to the immediate south of the site also slopes downhill steeply. Other than private driveways and Windmill Lane (no-through access road), there were no through-roads leading off Providence Hill in the vicinity of the site. The nearest potentially influential feature is the Windhover Roundabout, some 270m to the northwest of the site at its closest.

The site location and other identified features are shown below in Figure 1 and in Photographs 1 to 4.

The prevailing wind at the site is expected to come from a southwesterly direction, which has the potential to bring vehicle pollution onto the site from the A27.

Figure 1 The location of the proposed development site



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Site 

Photograph 1 Looking southeast along Providence Hill (A27)



Photograph 2 Looking northwest along Providence Hill (A27)



Photograph 3 Showing the eastern section of the site



Photograph 4 Showing the northwestern section of the site



2.3 Vehicle movement

Providence Hill (A27) generally slopes downhill in a northwest to southeast direction. The ground surface consists of tarmacadam roads, and tarmacadam or concrete paved pavements.

There is a roundabout present approximately 500m to the northwest of the site, following which the road itself continues on towards the village of Bursledon. To the southeast of the site the road continues on towards the village of Sarisbury.

Vehicle movement was observed on Providence Hill during a site visit on the 24th March 2022, which was post-pandemic, and most likely to be representative of a normal situation. A traffic count was carried out here for a period of 15-minutes from 13:00H to 13:15H in order to obtain an idea of typical vehicle characteristics within the area.

A count of 248 vehicles was recorded during this period, 1.2% of which were lorry movements, 6.5% were light goods vehicle movements, 1.6% were motorcycles and the remainder were car movements. This equates to an estimated 17856 vehicles using Providence Hill, over an 18-hour day.

For the purposes of running the DMRB model daily vehicle values of 17856 have been used for the link for 2022. These have been subdivided into light vehicles and heavy vehicles, as required by the model. There is also the presumption that the proposed residential development will provide parking for an extra 35 vehicles, with the possibility that there will be an average of 2 movements per vehicle per day, giving a potential increase in vehicle movements of 70, whilst the proposed veterinary surgery will see around 40 vehicles both entering and leaving per day. Hence in 2023 the expected vehicle movement on Providence Hill could potentially increase by 150, giving a value of 18006 (for cars only) plus any expected natural increase for light and heavy goods vehicles.

In running the model, breakdown percentages have also been referred to along Providence Hill. Light vehicles accounted for 99% of all movements, whereas heavy vehicles accounted for around 1% of all movements.

Transport trends have been affected by the COVID-19 measures, and statistics show that domestic trips in 2020 were down by 33% from 2019, after long-term growth since 1960. During 2020 179000 ultra low emission vehicles were registered in the UK, an increase of 125% on 2019, whilst more alternative cars (338000) were registered than diesel cars (295000). Between 2016 and 2020, new diesel registrations fell by 77%.

Due to both the COVID-19 pandemic and the change in driving habits it is expected that there will be fewer cars on the road in the forthcoming years. However as there are no current statistics to refer to estimated vehicle numbers for this report for future years remain the same and are shown below in Table 1

Table 1 Vehicle numbers for Providence Hill

Year	Cars	Light goods	Total light vehicles	Heavy goods	Total vehicles
2022	16620	1170	17790	216	18006
2023	16620	1170	17790	216	18006
2024	16620	1170	17790	216	18006
2025	16620	1170	17790	216	18006

2.4 Local air quality assessment

The borough of Eastleigh has boundaries with Southampton City Council, Winchester City Council, Test Valley Borough Council and Fareham Borough Council.

It is noted in the 2020 EBC Annual Status Report prepared that two of the existing AQMAs (Eastleigh A335 and Hamble Lane) have been extended since declaration. The Hamble Lane AQMA was extended in response to exceedences found on the A27 in Bursledon.

Four air quality management areas (AQMA) have been declared within the Borough to-date.

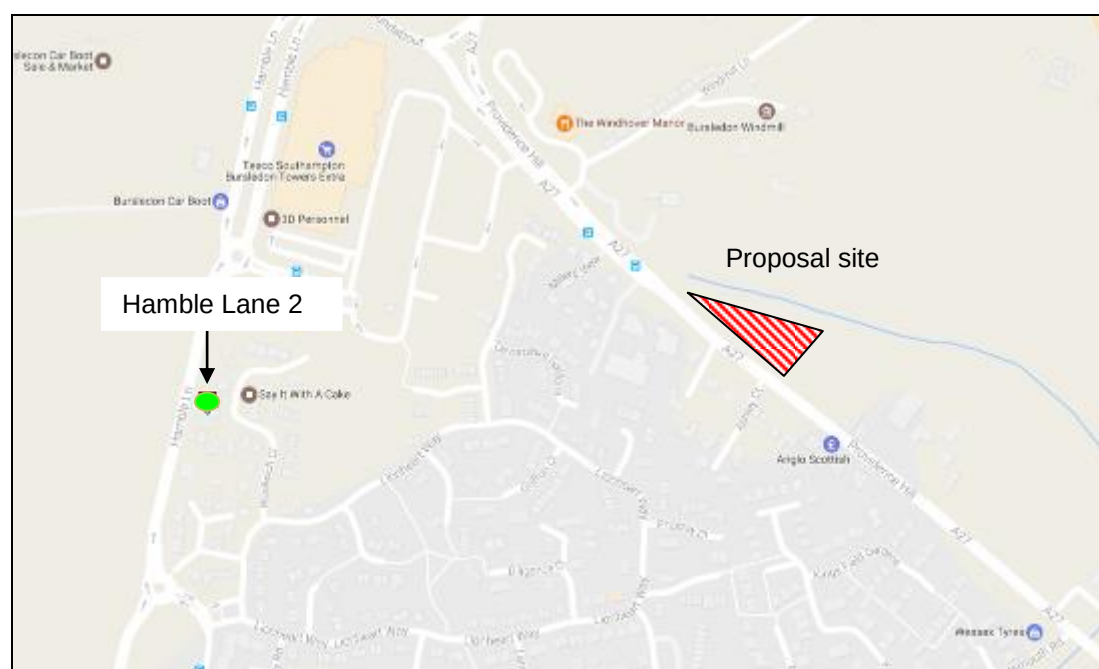
A review of new monitoring data in the 2020 report identifies the following:

- four nitrogen dioxide diffusion tube sites inside of existing AQMA boundaries recorded an annual mean concentration in excess of the $40\mu\text{g}/\text{m}^3$ objective in 2019 and;
- in the Eastleigh AQMA No 1 (A335), an overall falling trend is seen since 2012, however; the decrease over the last four years has slowed, whilst there have been no exceedences for the last five years in Eastleigh AQMA 2 (M3) and High Street Botley AQMA with clear downwards trends showing.

Eastleigh Borough Council measured nitrogen dioxide within the Borough in 2021 at 53 diffusion tube sites. The number of tubes has increased from 50 since 2016. Non-automatic monitoring was carried out at all these sites apart from three analysers located at Southampton Road, the Point and Steele Close respectively. The site locations include roadside, background and industrial areas.

The closest non-automatic monitoring site to Providence Hill, SO31 8AU is Hamble Lane 2, approximately 600m from the subject site; as shown below in Figure 2. The details relating to this monitoring site have been reproduced below in Table 2

Figure 2 Closest non-automated monitoring site to Providence Hill.



● Diffusion tube site

Source - Gridreferencefinder.com

Table 2 Details of non-automatic monitoring (diffusion tube) sites for NO₂ only

Site ID and name	Site type	OS grid ref	In AQMA	Distance to kerb of nearest roadside (m)	Distance from site (m)
Hamble Lane 2	Roadside	447745 110478	Yes	1.4	650

2.5 National Air Quality Standard Objectives

The NAQS objectives have been reproduced in Table 3 below.

Table 3 National Air Quality Strategy Objectives included in Regulations for the purpose of Local Air Quality Management in England

Substance	Concentration	Measured as	Objective date
Benzene	16.25 µg/m ³	Annual mean	31/12/2003
	3.25 µg/m ³	Annual mean	31/12/2010
1,3-Butadiene	2.25 µg/m ³	Running annual mean	31/12/2003
Carbon monoxide	10.0 mg/m ³	Maximum daily running 8 hour mean	31/12/2003
Nitrogen dioxide (NO ₂)	200 µg/m ³	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40 µg/m ³	Annual mean	31/12/2005
Particulates (PM ₁₀)	50 µg/m ³	24 hour mean not to be exceeded more than 35 times per year	31/12/2004
	40 µg/m ³	Annual mean	31/12/2004
Sulphur dioxide (SO ₂)	350 µg/m ³	1 hour mean not to be exceeded more than 24 times per year	31/12/2004
	125 µg/m ³	24 hour mean not to be exceeded more than 3 times per year	31/12/2004
	266 µg/m ³	15 minute mean not to be exceeded more than 35 times per year	31/12/2005

2.6 Local authority measured data

For the purposes of this assessment NO₂ is the principal substance that has been routinely assessed over the long-term in the borough, as this is deemed to be the main potential air quality concern for the area. Other pollutants have however been measured on occasions, and these have been discussed below.

With specific regard to nitrogen dioxide, it is considered to be toxic and acts as an irritant, although it is additionally a problem due to it being a precursor for ground-level ozone. Any location where the NO₂ concentration exceeds 40µg/m³ as a yearly average is considered to pose a potential risk to health.

According to national statistics, traffic flows have been generally increasing in the UK but improved vehicle technology has led to more fuel efficient engines which initially offset the rise in NO₂ concentrations. There is evidence to suggest that this situation may have reverted recently.

NO₂ has been non-automatically monitored at the Hamble Lane 2 site for the past 9 years, as detailed below in Table 4. As stated the annual mean concentration limit is 40µg/m³.

Table 4 Results of NO₂ diffusion tube monitoring - annual mean

Location						
	2011	2012	2013	2014	2015	2016
Hamble Lane 2	40.3	41.3	37.87	37.65	30.5	40.0
	2017	2018	2019	2020	2021	
Hamble Lane 2	42.3	39.2	38.2	29.5	41.1	

Data up to November 2021.

The annual mean concentration at Hamble Lane 2 was above the annual NO₂ limit of 40µg/m³ for two consecutive years on two separate occasions, 2011 to 2012, and 2016 to 2017.

In 2018 and 2019 the reported concentration was close to the annual NO₂ limit, before a rapid decrease in 2020. This is presumed to be associated with the nationwide COVID-19 'lockdown' where fewer cars were on the road that year. In 2021 however the annual mean concentration was again above the annual NO₂ limit of 40µg/m³.

As stated above, Eastleigh Borough Council has also been measuring other NAQS pollutants, which are as follows:

- between 2006 and 2007 benzene monitoring was carried out following which it was concluded that no detailed assessment would be necessary;
- between April 2011 and March 2012, in response to several residential complaints about a sulphurous odour in the area of Bursledon, Hamble and Netley, monitoring for sulphur dioxide was undertaken over a period of 12 months. The 2012 Updating and Screening assessment did not highlight any notable conclusions as a result of this monitoring. There is no NAQS annual mean concentration objective for SO₂;
- since 2016 PM₁₀ monitoring has been carried out in eight AQMA locations during which time the annual mean concentration objective of 25µg/m³ was not exceeded; and
- PM_{2.5} monitoring has been undertaken at Southampton Road since February 2020.

3 DMRB assessment

3.1 Input data

Using the results above from the closest monitoring site of Hamble Lane 2, the DMRB model has been employed to determine the possible future traffic related NO₂ trends for the receptor area of the development site.

The data sources used for the model are summarised below in Table 5.

Table 5 Data sources used for the DMRB model

Component	Source
Pollution data	2011-2021 nitrogen dioxide monitoring results data provided by Eastleigh Borough Council.
Traffic data	On-site traffic count on 24 th March 2022 (See Table 1) adjusted for future trends.
Vehicle speed data	Observations during on-site traffic count on 24 th March 2022.

As stated above, the scenario used for the model will consider the traffic flow data obtained from the manual count carried out on the 24th March 2022 on Providence Hill.

The count was undertaken over a 15-minute period and has been used to extrapolate a daily mean traffic count over a 'daytime' period of 18-hours. This is presumed to be representative of a typical 'normal' day.

The number of new vehicles that the development may bring in to the area is expected to be around 70; which when considering the existing traffic flow along the A27, would not appear to be a significant increase. In actuality, such an increase in vehicle numbers would correspond to an increase in vehicle movement of around 0.7% overall.

In the absence of specific data, the average speed used for the model was 40mph. This figure was obtained from observation where the traffic count was undertaken; i.e. within a 40mph zone.

The input values used to run the model are shown below in Table 6.

Table 6 Scenario 1 Link 1 - A27 Providence Hill

Substance	Background concentration	Distance from link centre to receptor (m)	Traffic flow (vehicles per 18-hour day)	Annual mean speed (km/h)	Road type	LDV (%)	HDV (%)
CO	N/A	15	18006	65	A	99	1
Benzene	N/A						
1,3-butadiene	N/A						
NO _x	N/A						
NO ₂	41.1 µg/m ³						
PM ₁₀	N/A						

3.2 DMRB output

The findings from the scenario have been summarised below in Table 7. The contribution of each pollutant for the link is also presented within this table. The model data output sheets can be found in Appendix I.

Only data for NO₂ has been used for this assessment.

The model specifies 'zero' to be entered for any substances that are not required, in order to make the projected calculations, therefore the output shows projected values for these substances based upon this (in this case, carbon monoxide, benzene, 1,3-butadiene, and NO_x; hence for the purpose of this assessment, the output values for these substances can be ignored.

Table 7 DMRB output for Providence Hill using $41.1 \mu\text{g}/\text{m}^3$

Year	CO (mg/m^3)	Benzene ($\mu\text{g}/\text{m}^3$)	1,3- butadiene ($\mu\text{g}/\text{m}^3$)	NO _x ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	PM ₁₀ ($\mu\text{g}/\text{m}^3$)	PM ₁₀ ($\mu\text{g}/\text{m}^3$)
	Annual Mean						Days >50 $\mu\text{g}/\text{m}^3$
2022	0.05	0.06	0.03	6.92	43.85	0.82	0.00
2023	0.05	0.06	0.03	6.92	43.85	0.82	0.00
2024	0.05	0.06	0.03	6.92	43.85	0.83	0.00
2025	0.05	0.06	0.03	6.93	43.85	0.84	0.00

Predictive outcomes from using the model suggest that the annual mean pollutant concentrations likely to be experienced at the receptor site show no increase between 2022 and 2025, although all of which would marginally exceed the annual mean for nitrogen dioxide of $40 \mu\text{g}/\text{m}^3$; although the situation is not expected to be exacerbated by the introduction of new dwellings in this location.

3.3 Distance adjustment

The model output concentration for nitrogen dioxide of $43.85 \mu\text{g}/\text{m}^3$ has effectively been based on the measurement obtained nearby at a kerbside position, 1.4m back from the road.

On the understanding that the proposed dwellings would be positioned further away from the road (the source) into an area where the nitrogen dioxide generation potential should be significantly lower, it can be argued that to some extent the airborne concentration at any position should decrease with distance from the road.

The extent to which this occurs can not be simply determined due to there being many potentially influential factors, however reference has been made to the concentration calculator published by Air Quality Consultants, which follows the procedure set out the LAQM TG(09) guidance.

For this purpose the 2021 background diffusion tube data for Eastleigh have been referred to giving a mean local nitrogen dioxide concentration of $28.18\mu\text{g}/\text{m}^3$ and an average measurement distance of 2m from the kerb. This input data has been used alongside the DMRB output concentration of $43.85\mu\text{g}/\text{m}^3$, which itself is based on the 2021 measured concentration at Hamble Lane 2 of $41.1\mu\text{g}/\text{m}^3$.

The findings have been summarised below in Table 8, where it can be seen that the nitrogen dioxide concentration at the façade of all of the proposed dwellings has been calculated to be below the $40\mu\text{g}/\text{m}^3$ NAQS objective, when expressed as the annual mean concentration.

Table 8 Predicted impact of traffic noise at each receptor façade closest to the road

Dwelling No.	Approx. distance from source / m	Estimated NO2 measurement at façade $\mu\text{g}/\text{m}^3$	Dwelling No.	Approx. distance from source / m	Estimated NO2 measurement at façade $\mu\text{g}/\text{m}^3$
1	40	32.9	9	28	34.2
2	40	32.9	10	22	35.0
3	25	34.6	11	20	35.4
4	22	35.0	12	42	32.7
5	20	35.4	13	48	32.2
6	44	32.5	14	52	<32.0
7	48	32.2	15	54	<32.0
8	30	33.9	16	56	<32.0

4 Future Trends

4.1 Information source

The National Atmospheric Emissions Inventory compiles information regarding UK emissions from a variety of sources such as traffic and industrial plant. These emissions are predicted to assist in finding methods of reducing the impact of human activities on human health and the environment. The national trend for a number of known traffic related substances are discussed below.

4.2 Nitrogen oxides

Road transport is the largest source of nitrogen oxides in the UK currently accounting for around one third of the UK emissions, with diesel vehicles and vehicles travelling at high speeds contributing most. Stationary combustion and power generation also form significant sources.

The estimation of nitrogen oxide emissions attributed to road transport is complex since the nitrogen can be derived from either the fuel or atmospheric nitrogen. The emission is dependent on the conditions of combustion, in particular temperature and excess air ratio, which can vary considerably. Thus combustion conditions, load and even state of maintenance are important.

Studies show that since 1970, overall nitrogen oxides emissions have decreased by more than 60%, although this decrease has not been constant. The emission profile up to 1984 was relatively flat with small peaks in 1973 and 1979 largely due to harsh winters in those years. Emissions rose sharply from 1984 as a result of a growth in road traffic, peaking in 1989. Since then, a decline in total emissions has been observed largely as a result of emission reductions from power stations as well as the road transport sector.

With specific regard to road transport related emissions in the UK these have largely decreased due to technological advances in vehicle engine design and management.

In 2009, UK emissions fell below the National Emissions Ceilings Directive target for 2010 for the first time. Overall however, although NO_x emissions decreased notably during the period 1990 to 2002, urban concentrations had largely remained stable since due to an increased ownership of diesel-fuelled cars, although according to the DEFRA report December 2016, the period from 2015 to 2016 actually saw a 4% decrease nationally.

Since 2016 there has once again been another slight fall in concentration, with the annual level at roadside sites between 2007 and 2019 actually having reduced nationally by an average of 1.8ug/m³ each year. Furthermore, through reference to UK National Statistics (April 2020), 2019 saw the fewest hours of 'moderate' air pollution per site due to nitrogen dioxide nationally, since 1997 (DEFRA).

Going forward, new diesel-fuelled cars and vans will be banned in the UK from 2030, with the prediction that diesel models themselves are expected to fall from 39% to 17%. This should see a potentially significant impact on nitrogen oxide presence in urban areas, as a diesel engine produces around 30% more NOx than a petrol engine.

In addition to this the UK is expecting to see a significant growth in the use of electric vehicles, which will presumably partially replace the use of petrol-driven vehicles; thereby decreasing nitrogen dioxide emissions even further.

More specifically, in 2020 there was a 66% increase on 2019 numbers with a further 175000 more electric vehicles registered in the UK. The associated infrastructure appears to be supporting these changes, whereby in 2016 there were around 5000 charging points in the UK, but as of March 2022 there are now 30312.

The National Grid projection is for there to be some 36 million electric vehicles on the road by 2040.

5 Construction phase assessment

5.1 Construction activities

During the construction phase of any development project there are a number of activities that have the potential to adversely affect air quality.

Of these, the demolition of existing buildings and structures would normally be the main potential concern; however in this instance - due to the absence of buildings on the subject site - the principal concern during construction is likely to be the disturbance of soil and dust during groundworks and excavations. This can have a high potential for the release of particulate material into the air, particularly during periods of warm dry weather.

In addition to this, building projects will generally see a significant increase in plant and vehicle activity; including their movement in and out of a site. This not only brings a possible concern from HGV exhaust fumes but can also result in soil, mud and dust deposition on nearby roads; which can similarly become airborne during periods of dry and windy weather.

5.2 Mitigation

To minimise the potential effects of emissions from the site, it is necessary that on-site activities follow best practice guidance for the control of dust and nitrogen oxides from construction site activities.

The Institute of Air Quality Management (IAQM) provides a direct guidance framework for controlling these substances during activities such as earthworks, construction and track-out. Mitigation details in the document concentrate on a number of key areas, as summarised below:

- a need for communication between all stakeholders and regulators;
- the drawing up and implementation of a dust management plan;
- site management should ensure that air quality is considered at all times during the project and assume a position of ultimate responsibility accordingly;
- logs and record keeping - including and recording all dust and air quality complaints, identifying causes and taking appropriate measures to reduce emissions;

- monitoring and inspections;
- careful planning and preparation to ensure adverse effects from all site activities are minimised at all times - and especially near sensitive receptors;
- maintaining the site environment;
- the operation and use of machinery and vehicles, including the introduction and enforcement of site-specific policy requirements, whereby all tools and plant should be used carefully and sympathetically to minimise dust particulate generation and liberation;
- the loading of waste onto vehicles for off-site disposal should be undertaken carefully and sympathetically to minimise dust particulate production; and
- all vehicles removing waste from the site should ensure that loads are appropriately covered to prevent fugitive release, and hence complaint with the Waste (England and Wales) Regulations 2011 (now superseding the Duty of Care Regulations 1991).

It is expected that if the above guidance measures are fully implemented during the construction phase, there should be no significant residual impacts.

6 Post-construction assessment

6.1 Vehicle emissions

The most potentially significant impact on air quality arising from any new development is likely to be from vehicle emissions due to an increase in road traffic. However, unless the development results in a significant increase in the number of vehicle movements for an area, the overall effect on that area is likely to be negligible.

In this specific instance the proposed development is considered to be relatively small for the area, hence the net increase in associated traffic is only expected to be in the region of 0.7%, which is deemed unlikely to have any significant impact on the local air quality.

UK Government guidance requires planning authorities to promote and exploit public transport as a means of accessing jobs, education, health facilities, shopping, leisure and local services. Developments should therefore encourage sustainable modes of transport, such as buses, trains, cycling and walking. Guidance also requires local authorities to place the needs of people before ease of traffic movement when designing the layout of a residential development.

To facilitate this, developments should aim to make use of the most accessible sites, such as those in existing town centres, located close to local amenities and public transport facilities.

In this instance, the application site is ideally placed to conform to this guidance through its urban location and good public transport connections, thereby assisting in reducing the dependency on private vehicle use. It is located within close proximity of a number of sustainable links, including: a railway station and bus routes.

6.2 Reduction of car dependency and vehicle movements

As described above in Section 6.1, the proposed development site is within very easy access of a number of local amenities including public road and rail transport links, thus making it a favourable location compliant with the government's target of reducing personal vehicle use.

6.3 Exposure of residents to vehicle pollution

This report has shown that despite the fact that the roadside kerb is expected to exhibit an unacceptable level of nitrogen dioxide, the exposure concentration at the façade of each of the proposed dwellings is expected to be slightly below the 40µg/m³ NAQS objective concentration when expressed as the annual mean.

In addition to this, it has been argued that the increase in vehicle movements attributed to those using the proposed development itself, is negligible when considering the current amount of movement, and therefore the development itself is not expected to have any significant adverse impact on the local air quality.

With further regard to airborne nitrogen dioxide it has also been indicated within this report that the existing concentration in this part of the borough has been slowly decreasing marginally in recent years, other than an increase in 2021 after the COVID-19 pandemic. This downward trend is expected to continue thereafter, due in part to the aforementioned expected reduction in diesel fuel vehicles on the roads, an increase in vehicles using cleaner technology and an overall change in driving habits.

In regards to the proposed residential dwellings and commercial veterinary surgery it is imperative that consideration to air quality should form an important part of the design process, in order to minimise exposure to airborne traffic pollution within the buildings.

It is presumed that the veterinary practice will have a mechanical air management system in place, thereby ensuring that those working within, or visiting the facility, should be exposed to an internal clean air environment.

With specific regard to the proposed dwellings, it is expected for the nitrogen dioxide exposure concentration to naturally decrease marginally with distance from the source (Providence Hill); however it is further expected for the concentration to be attenuated by vegetation and vertical material surfaces as it migrates away from the road.

The degree of attenuation here can not be quantified, although it would be expected for attenuation to become greater with increasing distance due to an increase in the number of vertical obstacles with distance. The greatest impact may be attributed to the first line of dwellings which should go some way to protect those that lie behind, as would other features closer to the road such as garden boundary fences; due to the fact that being heavier than air the greatest nitrogen dioxide concentration is expected to be at ground level.

With further specific consideration to the proposed dwellings which are to be located closest to the road, despite the expectation that nitrogen dioxide concentration here should still not exceed $40\mu\text{g}/\text{m}^3$ as an annual average, it is understood that these dwellings would be fitted with mechanical ventilation in order to address potential noise issues, thereby additionally allowing cleaner air to be brought into the dwelling without the need for opening a road-facing window

As stated above, the precise extent of any attenuation, or decrease in concentration with distance, can not easily be quantified without more detailed modelling; however when this situation is considered alongside the general view that nitrogen dioxide levels are expected to fall with the imminent reduction of diesel vehicle numbers along with the increase in electric vehicle usage, there is a realistic probability that nitrogen dioxide levels here will begin to diminish in the coming years even lower than the model has predicted.

It is therefore questionable as to whether or not other means of artificial mitigation would actually be necessary in this instance; given the conclusion that in the absence of any of the above mitigatory measures, the concentration of nitrogen dioxide is not expected to exceed the NAQS objective level of $40\mu\text{g}/\text{m}^3$ at the façade of, or within the recreational areas of, any of the proposed dwellings.

7 Conclusion

A qualitative assessment has been undertaken on the potential impact on local air quality from traffic related nitrogen dioxide for the future occupiers of the proposed residential and commercial development at land adjacent to 4 Brookfield, Eastleigh.

In doing so, pollutant data and statistics from local authority sources and UK national databases has been used in conjunction with the DMRB model and the Air Quality Consultants model to identify the projected pollution concentration from the present day to 2025.

The findings suggest that the NAQS objective (annual mean) value for traffic-related nitrogen dioxide is currently likely to be marginally exceeded at the roadside; although unlikely to be exceeded in the immediate vicinity of any of the proposed dwellings on the site, now or in the near future years. It is further noted that this conclusion does not consider the imminently forthcoming changes in legislation, vehicle technology, and driving habits, all of which are expected to eventually see vehicle related nitrogen dioxide fall further.

This report has also noted that the dwellings would additionally benefit from some degree of attenuation and subsequent protection offered by the roadside tree-line, as well as by garden boundary fences, and the numerous other vertical surfaces expected to be present throughout the development site.

In view of the overall findings there is little to suggest that there should be a need for further mitigation to address concerns from nitrogen dioxide exposure within any of the proposed dwellings or at the veterinary facility.

The report has also made reference to the potential for air quality to be affected during the construction phase of the development, and therefore the IAQM guidelines should be consulted and adhered to in order to mitigate for, and minimise, any such impact. This should be achievable through the application of appropriate procedures during the design and construction of the development, allowing the associated risk to be lessened accordingly.

Finally consideration has also been given to the potential for this development itself to have an impact on an existing air quality situation in this locality. In this specific instance, it is believed that the application site is ideally placed to conform to current planning guidance through its location, as it lies close to public transport routes, schools and local amenities, thereby potentially minimising the need to use private road vehicles.

8 Limitations

The results, comments and recommendations within this report are based upon the information made available at the time of undertaking this work, and relate to this specific work only. They must not be used to assess similar concerns at any other time, or at any other location.

Furthermore it should be pointed out that Apple Environmental Limited has aimed to provide an objective review and assessment only, and as such has made every effort to achieve this aim.

Apple Environmental Limited will not be held responsible for the accuracy of referenced third-party information quoted within the report, or any other information provided by other sources. Furthermore it can not be held responsible for any subsequent outcomes arising from the implementation of any recommendations herein based on this information.

Appendix

DMRB model input and output data

DMRB Input Parameters

DMRB: Assessment of Local Air Quality					INPUT SHEET																																																																																																																																																																																																									
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Step 5	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92D050;"> <th rowspan="2">Link number</th> <th rowspan="2">Distance from link centre to receptor (m)</th> <th colspan="2">Traffic flow & speed</th> <th rowspan="2">Road type (A,B,C,D)</th> <th colspan="6">Traffic composition</th> </tr> <tr style="background-color: #92D050;"> <th>AADT (combined, veh/day)</th> <th>Annual average speed (km/h)</th> <th colspan="3">Vehicles <3.5t GVW (LDV)</th> <th colspan="3">Vehicles >3.5t GVW (HDV)</th> </tr> <tr style="background-color: #92D050;"> <th></th> <th></th> <th></th> <th></th> <th></th> <th>% passenger cars</th> <th>% light goods vehicles</th> <th>Total % LDV</th> <th>% buses and coaches</th> <th>% rigid HGV</th> <th>% articulated HGV</th> <th>Total % HDV</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>15</td> <td>18006</td> <td>65</td> <td>A</td> <td></td> <td></td> <td>99</td> <td></td> <td></td> <td></td> <td>1</td> </tr> <tr><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>13</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>14</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>						Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Road type (A,B,C,D)	Traffic composition						AADT (combined, veh/day)	Annual average speed (km/h)	Vehicles <3.5t GVW (LDV)			Vehicles >3.5t GVW (HDV)								% passenger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV	1	15	18006	65	A			99				1	2												3												4												5												6												7												8												9												10												11												12												13												14												15											
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DMRB Output

DMRB: Assessment of Local Air Quality								OUTPUT SHEET																			
Current receptor								CLEAR RESULTS - CURRENT RECEPTOR				CLEAR RESULTS - ALL RECEPTORS															
Receptor Name		Providence Hill			Receptor number		4																				
Assessment year		2025																									
Results														Contribution of each link to annual mean													
Pollutant	Annual mean				For comparison with Air Quality Standards									Link number	CO (mg/m ³)	Benzene (µg/m ³)	1,3-butadiene (µg/m ³)	NO _x (µg/m ³)	PM ₁₀ (µg/m ³)								
	Background concentration	Road traffic component	Total	Units	Metric	Value	Units																				
CO	0.00	0.05	0.05	mg/m ³	Annual mean*	0.05	mg/m ³								1	0.05	0.06	0.03	6.93	0.84							
Benzene	0.00	0.06	0.06	µg/m ³	Annual mean	0.06	µg/m ³								2												
1,3-butadiene	0.00	0.03	0.03	µg/m ³	Annual mean	0.03	µg/m ³								3												
NO _x	0.0	6.9	6.9	µg/m ³	Not applicable										4												
NO ₂	41.1	2.8	43.9	µg/m ³	Annual mean*	43.9	µg/m ³								5												
PM ₁₀	0.0	0.84	0.84	µg/m ³	Annual mean	0.8	µg/m ³								6												
					Days >50 µg/m ³	0	Days								7												
* See Footnote 32 in DMRB Volume 11 Chapter 3														8													
														9													
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														13													
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All receptors				Pollutant concentrations at receptor																							
Receptor number	Name	Year	CO *	Benzene	1,3-butadiene	NO _x	NO ₂ *	PM ₁₀																			
			Annual mean mg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Days >50µg/m ³																		
1	Providence Hill	2022	0.05	0.06	0.03	6.92	43.85	0.82	0.00																		
2	Providence Hill	2023	0.05	0.06	0.03	6.92	43.85	0.82	0.00																		
3	Providence Hill	2024	0.05	0.06	0.03	6.92	43.85	0.83	0.00																		
4	Providence Hill	2025	0.05	0.06	0.03	6.93	43.85	0.84	0.00																		