AIR QUALITY ASSESSMENT – THORNCLIFFE ROAD, LEEK, STAFFORDSHIRE

SYSTRA

THORNCLIFFE ROAD, LEEK, STAFFORDSHIRE

AIR QUALITY ASSESSMENT

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1. INTRODUCTION

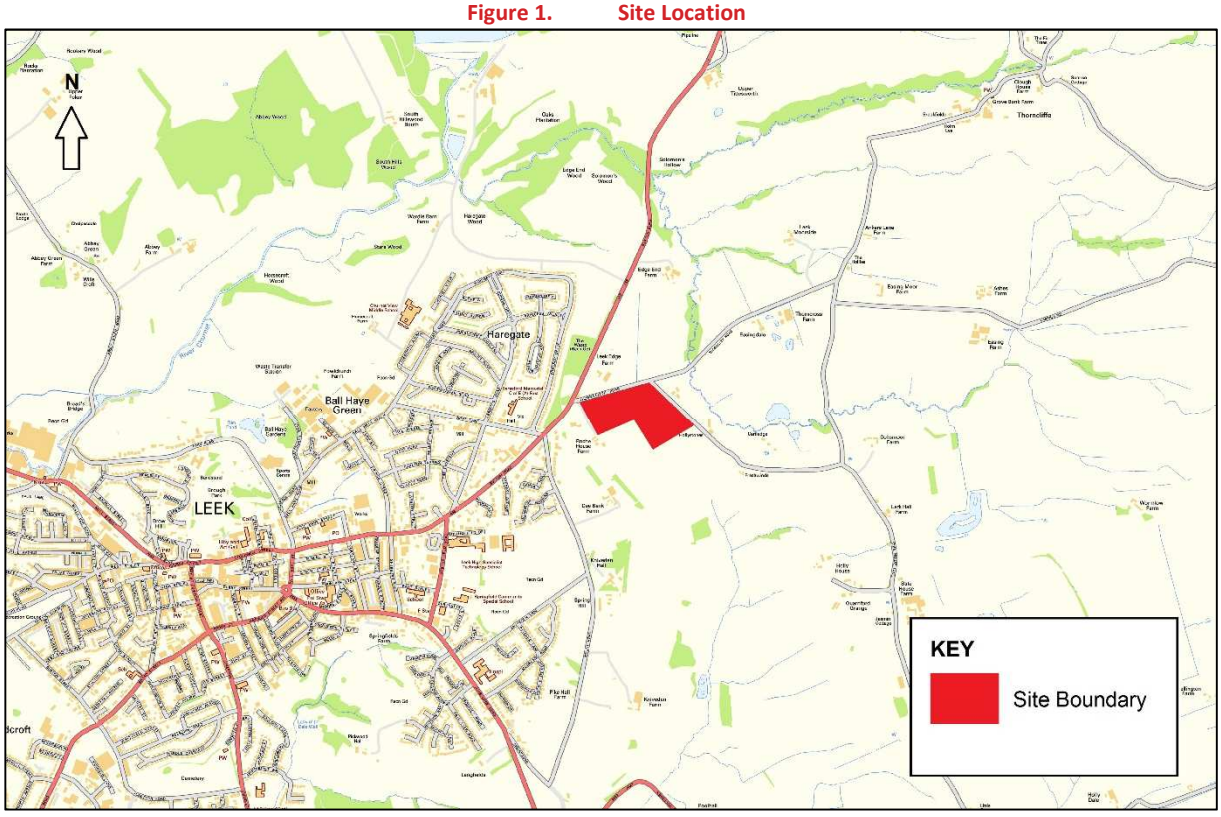
1.1 Overview

1.1.1 SYSTRA Limited [SYSTRA] has been commissioned by Land Designation Ltd. to produce an Air Quality Assessment [AQA] in support of an Outline Planning Application for a proposed residential development located in Leek, Staffordshire.

1.1.2 The proposed site lies in a rural environment, it is the land immediately south of Thorncliffe Road, and the land immediately west of Stile House Lane. The site is positioned east of the A53 Buxton Road, and rests approximately 3km south of the Peak District National Park. The heart of Leek town centre is located approximately 1.54 km to the southwest of the development site.

1.1.3 Currently, the site comprises five fields that are bordered by hedgerows on most of the boundaries. They are all undeveloped agricultural land. **Figure 1** shows the site location.

Figure 1. Site Location



1.2 Development Proposals

1.2.1 The applicant is seeking planning permission for a residential development, comprising of 154 dwellings (30dph), and having a footprint of approximately 5.5 hectares. This includes access and all matters reserved for future approval.

1.3 Scope of Report

1.3.1 The AQA is required to understand the traffic related pollutant implications of the proposed development, in addition to determining the appropriateness of the existing air quality environment for introducing new sensitive Receptors i.e. residents.

1.3.2 An initial overview of the site indicates that local road traffic is likely to be the dominant source of emissions. It is noted that sensitive Receptors (i.e. residential dwellings) are located in the vicinity of the proposed development site, along the A53 Buxton Road.

1.3.3 It is therefore envisaged that traffic associated with the proposed development may introduce new exposure to these Receptors; thus the air quality impact of the new development will be a key consideration for the Staffordshire Moorlands District Council [SMDC].

1.3.4 To assess the potential change in air quality, SYSTRA has undertaken a desktop based air pollution modelling study using the DfT Design Manual for Road and Bridges (DMRB) Screening Tool to assess the 2017 Baseline Scenario and to provide a comparison of the 'Without Development' and 'With Development' scenarios in the future years. The key transport related pollutants Nitrogen Dioxide (NO2) and Particulate Matter (PM10) have been assessed.

1.3.5 To confirm the scope of the AQA work, SYSTRA liaised with the Pollution Officer at the SMDC from the outset (Dr Daniel McCrory). The scoping confirmation is provided in **Appendix A.**

1.4 Report Structure

1.4.1 Following this introductory section the structure of this report is as follows.

- **Section 2 -** air quality policy and legislative context at a national, regional and local level;
- **Section 3 -** baseline air quality conditions prevailing throughout the local area;
- **Section 4 -** assessment methodology;
- **Section 5 -** assessment results;
- **Section 6 -** discussion of the assessment results;
- **Section 7 -** summary of the assessment.

2. POLICY CONTEXT

2.1 National Policy

The National Air Quality Strategies

2.1.1 Due to the trans-boundary nature of air pollution, it is appropriate to have an overarching strategy with common aims covering all parts of the UK. For this reason, the National Air Quality Strategy (NAQS) is presented as a joint UK Government and devolved administrations document.

2.1.2 There are a wide range of terms and concepts used in international, national and local air quality policy and legislation and the NAQS discusses air quality in terms of standards and Objectives. These terms are defined below:

- Standards are the concentrations of pollutants in the atmosphere which can be broadly taken to achieve a certain level of environmental quality. The standards are based on the effects of each pollutant on human health and on the effects on sensitive sub groups and ecosystems.
- Objectives are policy targets often expressed as a maximum ambient concentration not to be exceeded either without exception or with a permitted number of exceedances within a given timescale.

2.1.3 The pollutants of concern in the UK and addressed in the NAQS are,

- Particulate Matter (PM_{10} and $PM_{2.5}$)
- Nitrogen Dioxide (NO_2)
- Ozone (O_3)
- Sulphur Dioxide (SO_2)
- Polycyclic Aromatic Hydrocarbons (PAH's)
- Benzene (C_6H_6)
- 1,3-Butadiene (C_4H_6)
- Carbon Monoxide (CO)
- Lead (Pb)
- Ammonia (NH_3)

2.1.4 The current National Air Quality Strategy (NAQS) was published in July, 2007 and established a framework for further air quality improvements across the UK.

2.1.5 The NAQS pollution objectives are generally not exceeded across the UK except for Particulate Matter (PM10) and Nitrogen Dioxide (NO2). These pollutants are typically related to road traffic, and areas that breach the NAQS Objectives can be designated as Air Quality Management Areas (AQMA's).

The National Air Quality Strategy 2007

2.1.6 The most recent National Air Quality Strategy (NAQS) was published in July, 2007 and established a framework for further air quality improvements across the UK. The NAQS sets out standards and Objectives to help quantify the improvement in air quality.

2.1.7 The NAQS is a statement of policy targets and as such there is no legal requirement to meet these Objectives except in so far as these mirror an equivalent legally binding 'limit value' in EU legislation.

2.1.8 This latest Strategy NAQS does not remove any of the Objectives set out in previous versions, apart from replacing the provisional 2010 PM10 Objective in England, Wales and Northern Ireland with the exposure reduction approach for PM2.5. In Scotland, the PM2.5 Objective is an addition to the retained 2010 PM10 Objective.

2.1.9 The NAQS Objectives have generally been met across the UK for all pollutants except Particulate Matter (PM10) and Nitrogen Dioxide (NO2). These pollutants are generally related to road traffic pollution and many of the areas that breach the NAQS Objectives - designated Air Quality Management Areas (AQMA's) - are located close to major roads.

Air Quality (England) (Standards) Regulation 2010

2.1.10 The UK has a legislative requirement to meet air quality 'Limit Values' for key pollutants defined at a European level by European Council Directives:

- Directive 2008/50/EC on ambient air quality and cleaner air for Europe; and
- Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and PAH.

2.1.11 These Directives are transposed into UK legislation by the Air Quality (Standards) Regulations 2010. **Table 1** summarises the NAQS Objectives and European 'limit value' obligations for NO2, PM2.5 and PM10, the key transport-related pollutants of concern in the UK.

Table 1. Summary of NAQS and EU Obligations Applicable in England

POLLUTANT		MEASURED AS	NAQS OBJECTIVE	ACHIEVED BY	EUROPEAN OBLIGATIONS	ACHIEVED BY
Nitrogen Dioxide (NO_2)		Annual Mean	$40\mu gm^{-3}$	31-Dec-05	$40\mu gm^{-3}$	01-Jan-10
		1 hour Mean	$200\mu gm^{-3}$ not to be exceeded more than 18 times a year	31-Dec-05	$200\mu gm^{-3}$ not to be exceeded more than 18 times a year	01-Jan-10
Particulate Matter	($PM_{2.5}$)	Annual Mean	$25\mu gm^{-3}$	2020	$25\mu gm^{-3}$	2010
	(PM_{10})	Annual Mean	$40\mu gm^{-3}$	31-Dec-04	$40\mu gm^{-3}$	01-Jan-05
		24 hour Mean	$50\mu gm^{-3}$ not to be exceeded more than 35 times a year	31-Dec-04	$50\mu gm^{-3}$ not to be exceeded more than 35 times a year	01-Jan-05

Source: The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1), 2007

2.1.12 Development scale and sensitivity are the key components of the Environmental Impact Assessment (EIA) Directive 2011/92/EU which has now been amended by Directive 2014/52/EU (effective from May, 2017).

Land-Use Planning & Development Control, Institute of Air Quality Management (IAQM) (2017)

2.1.13 This guidance has been produced by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) to show how air quality should be adequately considered in the land-use planning and development control process. It is particularly applicable to assessing the effect of changes in exposure of members of the public to pollution that may result from residential and mixed-use developments.

2.1.14 The IAQM land use planning guidance Stage 1 Criteria stipulates that any development over 10 or more residential units or a site area of more than 0.5ha with 10 or more parking spaces must be assessed under Stage 2 criteria. Under Stage 2 criteria, if a development is likely to cause a change of Light Duty Vehicle (LDV) flows of more than 500 trips measured as annual average daily traffic (AADT) flow, an Air Quality Assessment will be required to determine the air quality impact of a development.

National Planning Policy Framework (NPPF)

2.1.15 The NPPF is the 2012 Spatial Planning Policy guidance document which covers all areas of strategic and spatial planning. It states:

> 'The planning system should contribute to and enhance the natural and local environment by, 'preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability'

2.1.16 With regard to the development of planning policies, the NPPF suggests that polices should sustain compliance with and contribute towards EU limit values or National Objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions need to ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.

Environment Act 1995

2.1.17 Part IV of the Environment Act 1995 (The Act) requires UK government and devolved administrations to produce a national air quality strategy containing standards, Objectives and measures for ameliorating poor ambient air quality and to continually review these policies.

2.1.18 The Act also provides a legislative framework for a system of Local Air Quality Management (LAQM). This system is an integral part of delivering the UK's air quality obligations.

2.1.19 Under the LAQM regime, 'responsible' authorities are required to carry out a regular review and assessment (R&A) of air quality in their area against defined national Objectives, which have been prescribed in regulations for the purposes of LAQM.

2.2 Local Policy

Local Air Quality Management (LAQM) Guidance

2.2.1 LAQM guidance requires Local Authorities to undertake a regular Review and Assessment (R&A) of air quality. Current guidance dictates that there are three types of assessment that a Local Authority can undertake.

2.2.2 The first is an Updating and Screening Assessment (USA), which is undertaken every three years. The USA considers the changes that have occurred in pollutant emissions and sources since the last round of R&A that may affect air quality. The USA is then followed by either a Detailed Assessment (DA) or a Progress Report (PR).

2.2.3 A Detailed Assessment is required when the USA identifies a risk of exceeding an air quality objective at a location of relevant public exposure and the objective is to determine whether it is necessary to declare an AQMA. If the USA does not identify any risk, then a Progress Report is prepared annually in the intervening years between USA's.

2.2.4 The most up to date SMDC local air quality report is covered in 3.2.

3. BASELINE CONDITIONS

3.1 Local Highway Network

3.1.1 The proposed development will be accessed via a new priority junction with Thorncliffe Road. Thorncliffe Road is a single carriageway subject to a 60mph speed limit (National Speed Limit), which runs between the A53 Buxton Road (west) to Thorncliffe Village (east).

3.1.2 The heart of Leek town centre is located approximately 1.54 km to the southwest of the development site.

3.1.3 As such the site is located close to some heavily trafficked roads including the A53 Buxton Road, Ball Haye Street, and Broad Street.

3.1.4 However, after reviewing the associated Transport Assessment (TA), Broad Street and Ball Haye Street will not be affected by the proposed development in terms of traffic increase. The TA sets out that the following roads are forecasted to have a traffic increase, and as such these are the roads that will be considered in the air quality calculations and assessment:

- Thorncliffe Road (eastbound);
- Thorncliffe Road (westbound);
- A53 Buxton Road (northbound); and
- A53 Buxton Road (southbound).

3.2 Local Air Quality

3.2.1 Local Authorities have a duty under the Environment Act 1995 to review and assess local air quality within their areas, against a set of health-based Objectives for a number of specific air pollutants. Where exceedances of the Objectives are identified, authorities are then required to declare an Air Quality Management Area (AQMA) and to prepare an Air Quality Action Plan (AQAP).

SMDC Progress Report (PR) 2014

3.2.2 SYSTRA has acquired the latest PR (noted in 2.2.2) and most up to date air quality data through SMDC. This report was produced in 2014, since then no up to date local air quality report has been produced, which is confirmed in **Appendix A**.

3.2.3 In the PR, results from ongoing nitrogen dioxide (NO_2) monitoring has not yet led to the declaration of any AQMAs in the district. However, exceedances of the 40μgm^{-3} annual mean NO_2 have been identified on two roads in Leek:

- Broad Street
- Ball Haye Street

Due to recent road improvements, a detailed assessment (DA) of these roads has not been recommended. Instead, continued monitoring at these locations to validate the predicted reductions in NO_2 levels has been advised.

3.2.4 SMDC do not have Particulate Matter (PM_{10}) monitoring devices. A need to verify model predictions has been agreed via a Section 106 agreement (Town and Country Planning Act, 1990), and the resources have now been secured and it is hoped that a PM_{10} monitor will be initiated sometime during 2015.

3.2.5 The proposed site lies east and on the edge of the Leek town centre. Broad Street and Ball Haye Street are both located centrally in the town centre. In terms of traffic increase, the associated Transport Assessment has determined that none of those roads will be affected from the proposed development.

4. ASSESMENT METHODOLOGY

4.1 General

4.1.1 This section of the report describes, in detail, the methodology adopted to evaluate the air quality environment at the proposed residential development.

4.2 The DMRB Model Methodology

4.2.1 The assessment methodology is based on the Local Screening Method set out in DMRB Section 11.3.1, published in May, 2007 and guidance given in the Department for Environment, Food and Rural Affairs (DEFRA) Local Air Quality Management Technical Guidance, 2009 (LAQM.TG(09)).

4.2.2 The DMRB Local Screening Method spreadsheet has been designed to assess transport related air quality impacts and is widely used by industry specialists. It is available to carry out regional air quality calculations at the simple assessment level for developments located outside of Air Quality Management Areas (AQMAs). The aim of the screening assessment is to identify impacts on a small sample of properties early in the development planning process so that any potential problems are identified and addressed quickly at the planning and design stage.

4.2.3 Regarding air pollution modelling, the DMRB Local Screening Method spreadsheet, version 1.03c, published in July, 2007 (hereinafter referred to as 'the DMRB model') has been used. The DMRB model assesses the contribution of individual roads to the long-term (daily or annual average) pollutant concentrations at specified Receptor locations from the roadside. The DMRB model requires the following input data:

- Background pollutant concentration data;
- Annual Average Daily Traffic (AADT) flows;
- Average vehicle speed;
- Vehicle classification by light and heavy duty vehicles (LDV/HDV);
- Type of road; and
- Distance from the centre of the road to the Receptor being assessed.

4.2.4 However, recent LAQM.TG(09) guidance has led to some changes in the way the DMRB model should be used from those set out in DMRB 11.3.1. Specifically, LAQM.TG(09) and the 'Guidance on Running the DMRB Screening Model' published in April, 2009 notes that the DMRB model is now known to underestimate the conversion of NO_x to NO_2.

4.2.5 In order to correct for this, current guidance requires that the DMRB model to be run without background concentrations of NOx or NO2, so that it is used solely to derive road-based concentrations of NOx. These are then input into the 'NOx to NO2 Calculator' (version 3.2, released September, 2012), to convert the modelled, road-based NOx to road-based NO2. When added to the background concentrations, total NOx and NO2 concentrations can then be established.

4.2.6 This conversion calculator has therefore been applied to all the modelled results included in this assessment and a detailed explanation of the methodology follows.

4.3 DfT Updated Air Quality Advice on Assessment of Future NO_x and NO_2 projections using DMRB method (Interim Advice Note 170/12)

4.3.1 Recent DfT advice for users of the DMRB 11.3.1 air quality assessment method enables highway scheme assessments to take into account the impact of future alternative Nitrogen Dioxide projections. The advice is in relation to the report on long term NOx and NO2 trends issued by DEFRA in July, 2011 and their subsequent note dated April, 2012. A spreadsheet is provided to support the implementation of the guidance. The guidance is intended for relevant projects in England, where air quality assessments are undertaken and where such projects are yet to be submitted for statutory process, including determination of the need for a statutory Environmental Impact Assessment.

4.3.2 The guidance has come about in relation to DEFRA's 2011 report assessing the long term trends in NOx and NO2 at roadside monitoring sites which clearly decreased between 1996 and 2002 and then stabilised, with minimal reduction from 2004 to 2010. The conclusion of the analysis of long term trends is that there is now a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality (as previously published in DEFRA's technical guidance) and observed trends. Highways Agency (HA) (now Highways England) analysis of long term monitored NO2, between 2006 and 2010, investigated whether trends published in DEFRA's report were observed at monitoring sites in close proximity to HA schemes. The analysis indicates that the observed trends from monitoring data closely aligns with long term trends indicated in DEFRA's recent 2011 report.

4.3.3 The guidance stipulates that air quality modelling should continue to be completed in accordance with existing guidance but some additional steps should be undertaken to adjust the verified modelled NO2 concentrations to account for the long term profiles through use of the DfT spreadsheet. An additional scenario (called the 'Projected Base Year) is required to enable the Gap Analysis to be completed.

4.3.4 In order to provide a robust assessment for the proposed residential development proposal, the additional Projected Base Year Scenario has been assessed in line with the new guidance within this report.

4.4 Model Inputs

Assessment Scenarios

4.4.1 The assessment focuses on identifying the existing baseline air quality environment at the proposed development site and the likely pollution in the future when the proposed development is fully operational.

4.4.2 Predictions of NO_2 and PM_{10} concentrations have therefore been undertaken for the following scenarios in alignment with the associated Transport Assessment for the site:

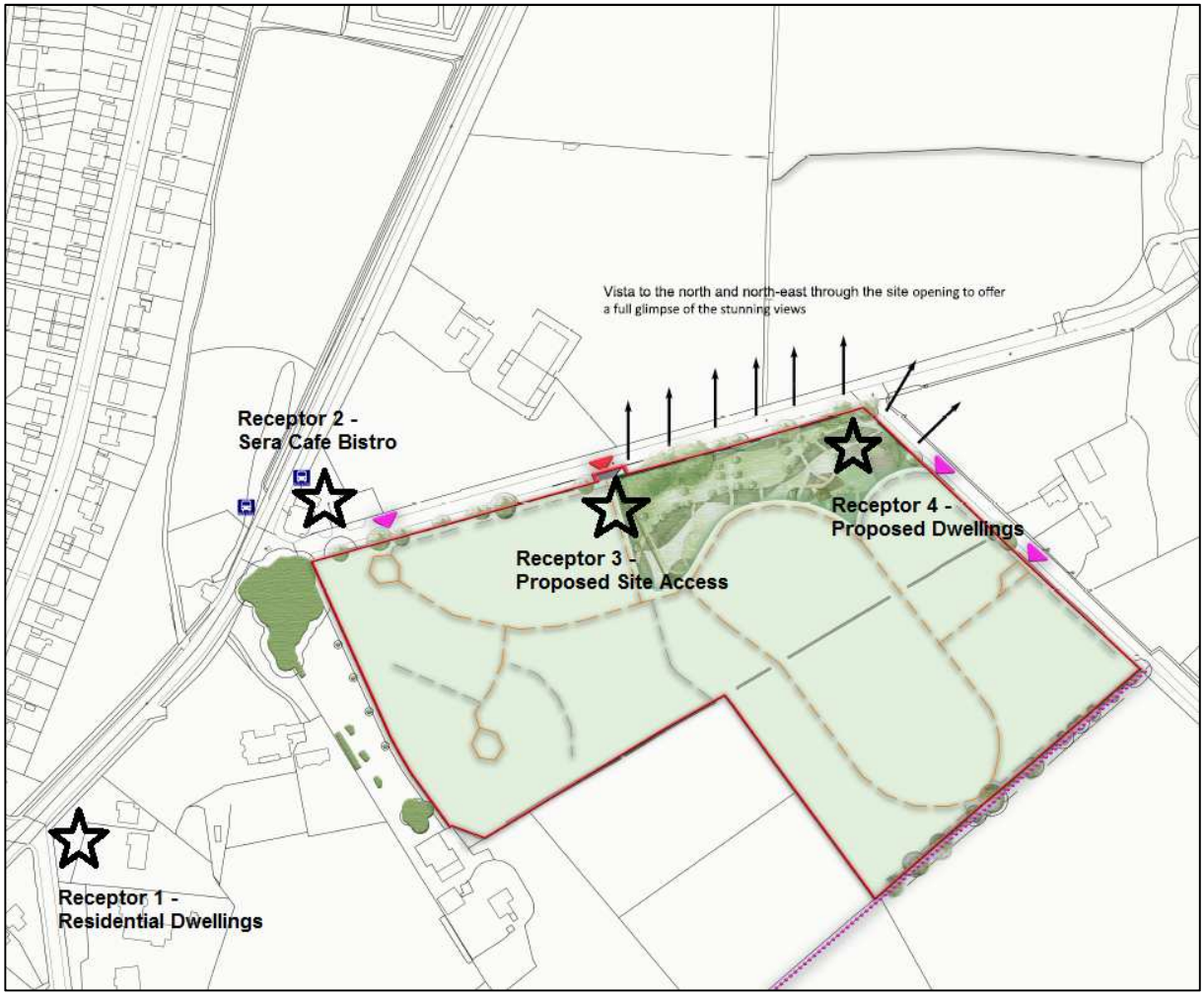
- Baseline Year 2017 (existing air quality baseline); and
- 2022 Future Year (with and without development).

Receptors

4.4.3 DMRB 11.3.1 notes that, for the purpose of an AQA, sensitive receptors can be thought of as areas within 200m of the roadside where people may be subject to change in air quality. Beyond 200m from the roadside, atmospheric dispersion and chemistry render emissions from road traffic negligible.

4.4.4 Four Receptors have been identified and agreed with the Pollution Officer in order to understand the air quality environment within and surrounding the proposed development site, as set out in **Figure 2**.

Figure 2. Receptor Locations



4.4.5 Receptors are generally considered to represent a 'worst case' scenario in air quality terms, being located at the boundaries of the development site which are closest to traffic emission sources.

4.4.6 The location description of each Receptor is highlighted in **Table 2**.

Background Concentrations

4.4.7 Local background pollutant concentration data has been obtained from the DEFRA Background Air Quality Maps. The maps show estimated UK background concentrations of NO_x, NO_2, and PM_{10} for each year from 2010 to 2030. The road-based NO_x is used in the 'NO_x to NO^2 Calculator' (version 3.2, released September, 2012), with the background NO_2, to convert the modelled, road-based NO_x to road based NO_2 and total NO_2. Data is available for each 1 km by 1 km grid square in each Local Authority area. The grid square with a centre point nearest to each Receptor has been used to obtain the background pollutant concentrations.

4.4.8 The maps for PM_{10} provide the total background pollutant concentration as well as the contribution from individual emission sectors. This information enables the pollutant concentrations attributable to individual sectors to be subtracted from the total when detailed local modelling of that sector has been carried out. Therefore, as this assessment involves pollution from road sources using the DMRB screening model, the road emissions sectors within the background pollutant concentrations have been removed to avoid double counting.

4.4.9 For NO_2, total background concentrations are provided. However, the NO_2 levels must be calculated using the specific background NO_x to NO_2 calculator (version 3.2), which uses the modelled road-based NO_x concentration predicted by the DMRB model (run without any background concentrations) and the background NO_2 values to determine the total NO_2.

4.4.10 For the assessment, the 2017 and 2022 background concentration maps (Background Maps 2013) have been extracted. The derived background concentrations for each assessment year are shown in **Table 2**.

Table 2. Background Pollutant Concentrations at Receptors

RECEPTOR	OS COORDINATES	POLLUTANT CONCENTRATION ($\mu g m^{-3}$)			
		2017		2022	
		NO_2	PM_{10}	NO_2	PM_{10}
1	(399592, 357010)	12.47	12.94	10.29	12.60
2	(399824, 357261)	12.47	12.94	10.29	12.60
3	(399979, 357282)	12.47	12.94	10.29	12.60
4	(400100; 357312)	11.22	12.08	9.26	11.73

Traffic Data

4.4.11 The traffic data for this AQA was extracted from the associated Transport Assessment, which was produced by 'encon associates'.

4.4.12 Automatic Traffic Count (ATC) survey equipment had been installed along the northern boundary of the proposed development (Thorncliffe Road), and had been left in situ for a 7-day period.

4.4.13 The proposed traffic generation for the 154 dwelling development was calculated using the TRICS database, and the 2011 Census data for Staffordshire Moorlands area.

4.4.14 Traffic growth rates from 2017 to 2022 were determined using Tempro V7.2 software.

4.4.15 SYSTRA utilised the traffic flow and trip generation information provided by encon associates to determine appropriate Annual Average Daily Traffic (AADT) flows at the development site, as follows:

- To derive the development related annual average daily traffic flows, an appropriate peak hour – AADT factor was derived using the available peak hour count data in the Transport Assessment and AADT data available via a Department for Transport continuous monitoring site (A53 Buxton northbound and southbound).
- The TRICS data and Census data provided in the Transport Assessment were used to derive an appropriate daily trip rate at the development, for use in the 'With Development' scenarios.

4.4.16 **Table 3** overleaf shows all the traffic flow inputs.

Table 3. Traffic Flow Data

	DISTANCE (RECEPTOR - LINK) m	AADT			ROAD TYPE	HDV %
		2017 BASE	2022 WITHOUT DEV	2022 WITH DEV		
Receptor 1						
A53 Buxton Road (southbound)	5	6924	7048	7300	A	6
Receptor 2						
A53 Buxton Road (northbound)	6	6411	6415	6428	A	6
Thorncliffe Road (westbound)	6	160	168	260	C	10
Receptor 3						
Thorncliffe Road (westbound)	6	160	168	260	C	10
Receptor 4						
Thorncliffe Road (eastbound)	5	122	128	140	C	14
Thorncliffe Road (westbound)	5	160	168	260	C	10

5. ASSESSMENT RESULTS

5.1 Modelled Impact

5.1.1 The findings of the assessment of pollutant concentrations at the Receptor locations for the assessment scenarios are discussed below. These results should be compared with the NAQS Objectives listed in **Table 1** and summarised as follows:

- NO_2 average annual mean not to exceed 40µgm^{-3} by 31st December, 2005;
- PM_{10} average annual mean concentrations not to exceed 40µgm^{-3} by 31st December, 2004; and
- PM_{10} average daily concentrations not to exceed 50µgm^{-3} more than 35 times per year by 31st December, 2004.

5.2 Nitrogen Dioxide (NO_2) DMRB Assessment

5.2.1 The adjusted, modelled NO_2 concentration at the Receptors for the assessment scenarios are shown in **Table 4** (as addressed in 4.2.5).

Table 4. Predicted NO_2 Concentrations (µgm^{-3})

RECEPTOR	NO_2 CONCENTRATION ($\mu g/m^3$)		
	2017	2022	2022 WITH/ DEV
1	15.74	13.51	13.62
2	15.57	13.29	13.35
3	12.58	10.4	10.46
4	11.43	9.47	9.53

5.3 Nitrogen Dioxide (NO_2) DMRB Assessment – Updated NO_2 Projections Through Gap Analysis

5.3.1 The gap analysis adjusted, modelled NO_2 concentration at the Receptors for the assessment scenarios are shown in **Table 5** (as addressed in 4.3.4).

Table 5. Gap Analysis Adjusted Modelled Average Annual Mean NO_2 Concentrations

RECEPTOR	NO_2 CONCENTRATION ($\mu g/m^3$)		
	2017	2022	2022 W/ DEV
1	15.74	15.0	15.2
2	15.57	14.9	15.0
3	12.58	12.1	12.1
4	11.43	10.9	11.0

5.3.2 The DMRB assessment for the Base Year 2017 and Future Year 2022 (with and without development) indicate that all the average Annual Mean NO_2 concentrations at all Receptor locations fall below 50% of the 40µgm^{-3} NAQS Objective level.

5.3.3 Receptor 1 has the greatest value in each assessment scenario, which is expected due to it being the closest Receptor to the Leek town centre, and thus has the most AADT exposure. Oppositely, Receptor 4 has the least NO_2 concentrations in each assessment scenario. Receptor 4 lies furthest from the town centre, adjacent to a rural and minor road (Thorncliffe Road), and experiences significantly lower AADT.

5.3.4 As documented within the Technical Guidance LAQM.TG (09/16), authorities may assume that exceedances of the 1-hour Mean Objective for NO_2 are only likely to occur where Annual Mean NO2 concentrations reach 60µgm-3 and above. It is therefore unlikely that the daily Objective level for NO_2 would be exceeded in any assessment scenario.

5.3.5 In existing conditions, the NO_2 DMRB screening results therefore indicate that the proposed residential development site is suitable for operation in air quality terms.

5.4 Particulate Matter (PM_{10}) DMRB Assessment

5.4.1 The modelled Annual Mean PM_{10} concentrations at the Receptors for the assessment scenarios are shown in **Table 6**.

Table 6. Predicted Average Annual Mean PM_{10} Concentrations (µgm^{-3})

RECEPTOR	NO_2 CONCENTRATION ($\mu g/m^3$)		
	2017	2022	2022 W/ DEV
1	13.47	13.14	13.16
2	13.45	13.11	13.12
3	12.96	12.62	12.63
4	12.11	11.77	11.78

5.4.2 The DMRB assessment for the Base Year 2017 and Future Year 2022 (with and without development) indicate that all the average annual mean PM_{10} concentrations at all Receptor locations fall well below the 40µgm^{-3} NAQS Objective level. This implies the Objective Level is unlikely to be exceeded at any Receptor location in any of the development scenarios.

5.4.3 Given the low predicted average annual mean PM_{10} concentrations, it is also unlikely that the daily Objective level for PM_{10} would be exceeded.

5.5 Development Impact

5.5.1 The AQA modelling results therefore indicate, in terms of the air borne pollutants NO_2 and PM_{10} the impacts of the residential units on the future developmental scenarios, do not appear to have any detrimental effect in terms of levels of pollutants to the surrounding area.

5.5.2 In terms of the construction phase, the main air quality impacts that need to be considered are the generation of dust and the potential increase in NO_2 and PM_{10} concentrations arising from construction plant use.

5.5.3 The construction phase of the proposed development therefore has the potential to generate nuisance dust which could affect adjacent properties. A Construction Management Plan (CMP) may need to be prepared in accordance with best practice, to minimise this impact.

6. ASSESSMENT OF SIGNIFICANCE OF AIR QUALITY IMPACTS

6.1.1 An assessment of the significance of change in NO_2 and PM_{10} as a result of the residential proposals has been assessed using the 'Significance in air quality' LAQM guidance (2009), specifically with reference to its Tables 1 and 2.

6.2 Magnitude of Change

6.2.1 To assess the impact, the magnitude of change in pollutants as a result of development has been assessed for each Receptor in the future year 2022. The assessment for each pollutant is based on a percentage impact scale in relation to its Objective Level. The potential magnitude of impact ranges from large (>10% of the Objective level) to imperceptible (>1% of the objective level). Medium Impact is classified as a 5% to10% increase/decrease of the Objective Level and Small Impact as a 1% to 5% μgm^{-3} increase/decrease. The difference in pollutant levels with and without development in μgm^{-3} has been calculated to establish the appropriate impact scale. The results in terms of the magnitude of change when comparing the 2022 'with' and 'without' development scenario is provided in **Table 7**.

Table 7. Predicted Average Annual Mean PM_{10} Concentrations (μgm^{-3})

POLLUTANT AND IMPACT LEVELS IMPACT SCALE: LARGE > 10% *i.e.* > 4 μgm^{-3} MEDIUM 5-10% *i.e.* 2 - 4 μgm^{-3} SMALL 1-5% *i.e.* 0.5 - 2 μgm^{-3} IMPERCEPTIBLE <1% *i.e.* <0.4 μgm^{-3}	RECEPTOR	CALCULATION	2022 FUTURE YEAR MAGNITUDE OF CHANGE (W/ DEV) IN RELATION TO THE OBJECTIVE LEVEL
Gap Analysis Adjusted, modelled Annual Mean Nitrogen Dioxide (NO_2): Objective level 40μgm^{-3}	1	((15.2-15.0)/15.2)*100 = 1.3158%	Small
	2	((15.0-14.9)/15.0)*100 = 0.6666%	Imperceptible
	3	((12.1-12.1)/12.1)*100 = 0.0000%	Imperceptible
	4	((11.0-10.9)/11.0)*100 = 0.9090%	Imperceptible
Modelled Average Annual Mean Particulate Matter (PM_{10}): Objective level 40μgm^{-3}	1	((13.16-13.14)/13.16)*100 = 0.1520%	Imperceptible
	2	((13.12-13.11)/13.12)*100 = 0.0762%	Imperceptible
	3	((12.63-12.62)/12.63)*100 = 0.0792%	Imperceptible
	4	((11.78-11.77)/11.78)*100 = 0.0849%	Imperceptible

6.2.2 The magnitude of change of NO_2 and PM_{10} in the 2022 assessment year as a result of the proposed residential development is considered 'imperceptible' at most Receptors, except for one instance. In terms of NO_2 concentrations, Receptor 1 is predicted to have a 'small' increase of 1.3158%.

6.2.3 The air quality assessment results have been assessed against Tables 1 and 2 of the LAQM Significance in Air Quality Guidance (2009). The absolute concentration of both NO_2 and PM_{10} concentrations is below the Objective Value both with and without the development scheme (<40µgm-3) at all Receptors.

6.2.4 In determining the air quality impact, there is no real change in pollutant concentration as a result of development for both NO_2 and PM_{10}.

6.3 Mitigation

6.3.1 The results of the AQA show that concentrations of NO_2, and PM_{10} within the vicinity of the proposed development are below the NAQS Annual Mean Objectives. The development itself will not initiate any significant increase in traffic-related emissions. Therefore, it is anticipated that no development specific mitigation will be required in relation to air pollution.

7. CONCLUSIONS

7.1.1 SYSTRA has been commissioned by Land Designation Ltd to undertake an Air Quality Assessment (AQA), to support a proposed residential development in Leek, Staffordshire. The applicant is seeking planning permission for a residential development, comprising of 154 dwellings (30dph).

7.1.2 The AQA predicts the air quality concentrations associated with the 2017 Base Year, and the Future Year Scenario 2022, in alignment with the associated Transport Assessment (produced by encon associates).

7.1.3 The assessment methodology is based on the Local Screening Method set out in DMRB Section 11.3.1, published in May, 2007 and guidance given in the Department for Environment, Food and Rural Affairs (DEFRA) Local Air Quality Management Technical Guidance, 2009 (LAQM.TG(09/16)). For modelling purposes, the DMRB Local Screening Method spreadsheet, version 1.03c, published in July, 2007 has been used. The DMRB model assesses the contribution of individual roads to the long-term (daily or annual average) pollutant concentrations at specified Receptor locations near to the roadside.

7.1.4 The DMRB model requires AADT flows and the proportion of HDV's for each road source affecting the Receptors for each assessment scenario. Traffic data has been obtained from the Department for Transport monitoring sites and the associated Transport Assessment.

7.1.5 Background pollutant concentrations have been obtained from DEFRA background concentration maps.

7.1.6 The AQA focuses on the key transport-related pollutants, Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}). The results indicate that NO2, and PM10 concentrations at Receptor locations are below NAQS Objective levels for all assessment scenarios. In addition, the number of days where NO2 and PM10 concentrations are forecast to exceed daily Objectives is also below the NAQS Objective levels.

7.1.7 Given there has been no exceedance of the key transport-related pollutants identified through DMRB screening calculations and the impact of development is considered negligible, it can be concluded that further detailed Air Quality Assessment is not required in relation to this Planning Application.

7.1.8 As the proposed development will not be exposed to pollutant concentrations exceeding the objective level, it is concluded that no specific mitigation measures are required to limit the impact on future residents of the site. Similarly, no mitigation measures are required to control pollutant levels beyond the site boundary.

SYSTRA provides advice on transport, to central, regional and local government, agencies, developers, operators and financiers.

A diverse group of results-oriented people, we are part of a strong team of professionals worldwide. Through client business planning, customer research and strategy development we create solutions that work for real people in the real world.

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Little Falls, Los Angeles, Montreal, New-York, Philadelphia, Washington

SYSTRA

Appendix A

SCOPING DISCUSSION

From: Mccrory, Daniel <Daniel.Mccrory@staffsmoorlands.gov.uk>
Sent: 08 November 2017 11:28
To: LAU James
Subject: RE: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN - Residential Development - Air Quality

Hi James,

That is fine for now, provided the TA has been accepted by highways. If its not accepted/ considered as reflection of actual impacts by them, then obviously this will be reassessed accordingly.

Thanks

Dan

_____

Dr. Daniel McCrory

Senior Pollution Officer
Regulatory Services
Staffordshire Moorlands District Council & High Peak Borough Council
Moorlands House
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Direct Dial: 01538 395400 Ext: 4413
Mobile: 07736380776

From: LAU James [mailto:jlau@systra.com]
Sent: 07 November 2017 12:28
To: Mccrory, Daniel
Subject: FW: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN - Residential Development - Air Quality

Afternoon Daniel,

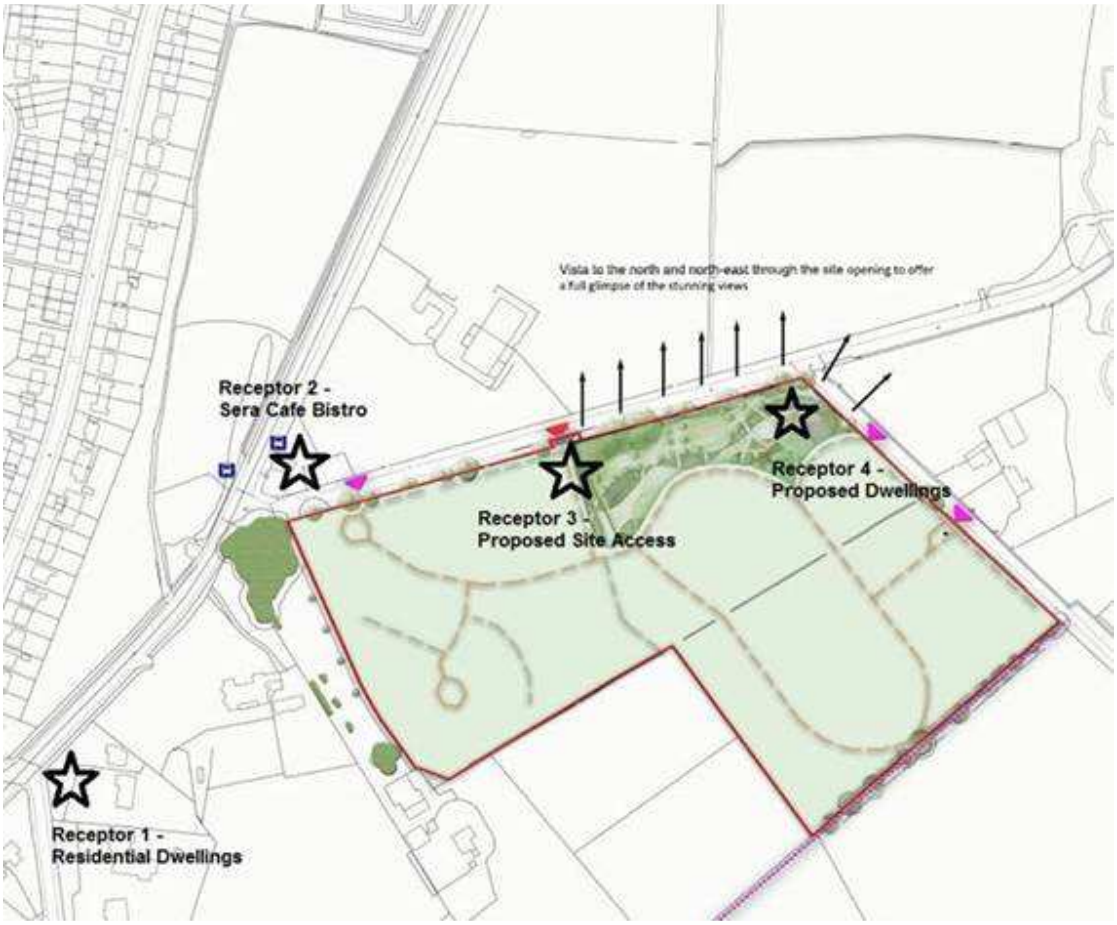
Apologies for bothering you again.

I've looked at the TA in more detail, and not much traffic data is provided for the roads that will be affected by the proposed residential development. However, the A53 Buxton Road and Thorncliffe Road have been assessed in detail. Thus I propose to use these roads in the AQA:

- A53 Buxton Road – located west of the Proposed Development; and

. Thorncliffe Road – located immediately north of the site.

Furthermore, I've made a minor amendment on the receptor locations plan for a more robust assessment:



Will this amended methodology be acceptable?

Thanks,

James

From: LAU James
Sent: 06 November 2017 13:53
To: 'Mccrory, Daniel' <Daniel.Mccrory@staffsmoorlands.gov.uk>
Subject: RE: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN - Residential Development - Air Quality

Hi Daniel,

Excellent news. I shall proceed in writing the AQA report.

Thank you for helping me to confirm the scope of the work required.

James

From: Mccrory, Daniel [mailto:Daniel.Mccrory@staffsmoorlands.gov.uk]
Sent: 06 November 2017 13:45
To: LAU James <jlau@systra.com>
Subject: RE: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN - Residential Development - Air Quality

Hi James,

Thanks for the info and yes it would be beneficial to include those roads I think.

Regards,

Dan

_____

Dr. Daniel McCrory

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From: LAU James [mailto:jlau@systra.com]
Sent: 06 November 2017 13:40
To: Mccrory, Daniel
Subject: RE: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN - Residential Development - Air Quality

Afternoon Daniel,

Thank you for your response.

I've looked at the TA, and in terms of traffic increase the roads Broad Street and Ball Haye Street are not mentioned (affected). However, these are the roads that will experience a net increase in traffic volumes (less than 5%) of 30 or more vehicles:

- A53 with Thorncliffe Road;
- A523/Springfield Road with A53 priority T-junctio;
- A523 with ~Bath Street (to A523 and A53); and
- A523 with St Edward Street (to A53 and A520).

Shall I involve these roads in the Air Quality Assessment instead?

James

From: Mccrory, Daniel [mailto:Daniel.Mccrory@staffsmoorlands.gov.uk]
Sent: 06 November 2017 11:38
To: LAU James <jlau@systra.com>
Subject: RE: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN - Residential Development - Air Quality

Hi James,

Apologies for the delay.

In essence yes this initial approach is acceptable given the distance out of town.

However, we d have issues / exceedances in Leek town centre and broad street, so we could do in seeing if there are any impacts in the town (Broad street and Ball Haye Street and Buxton Road, once the TA has been completed (and assuming these are assessed in the TA!)

Unfortunately, we are a little way behind with our reporting due to resource issues and these are currently being produced by a AQ consultancy. Attached is the latest report and updated data. This work will include a detailed assessment of the roads Broad St and Ball Haye noted above.

Regards

Dan

_____

Dr. Daniel McCrory

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From: LAU James [mailto:jlau@systra.com]
Sent: 03 November 2017 16:38
To: Mccrory, Daniel
Cc: PICKARD Steve
Subject: RE: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN – Residential Development – Air Quality

Hi Daniel,

A gentle reminder, will the methodology below satisfy an Air Quality Report for Thorncliffe Road?

Thanks,

James

From: PICKARD Steve
Sent: 31 October 2017 12:40
To: Daniel.Mccrory@staffsmoorlands.gov.uk
Cc: LAU James <jlau@systra.com>
Subject: Land south of Thorncliffe Road, Leek, Staffordshire ST13 7LN – Residential Development – Air Quality

Daniel

SYSTRA has been commissioned by Land Designation Ltd to prepare and agree the scope of an Air Quality Assessment (AQA) to support an application that has been submitted to Staffordshire Moorlands District Council (SMDC) [ref: SMD/2017/0434]. The proposed site lies in a rural environment of Staffordshire, Leek. It is the land south of Thorncliffe Road and west of Stile House Lane. The residential development consists of 154 dwellings (30dph), and has a footprint of approximately 5.45 hectares.

The site is located within the administrative area of SMDC, which has no existing Air Quality Management Areas (AQMAs) declared within the district. Thus, a simple DMRB Screening Assessment seems to be appropriate.

Our intended methodology for AQA is as follows:

- The assessment will quantify the existing baseline air quality situation at the site and determine the future air quality situation in respect to the development impact on local air quality;
- Due to the considerable distance from the nearest Air Quality Management Area (AQMA), which is in Stoke-On-Trent approximately 16km away, and rural location of the Proposed Development, it is envisaged that a DMRB screening air quality assessment will suffice to predict and evaluate the appropriateness of the site in air quality terms and the impact of the Development on local air quality;
- Therefore, it is proposed to undertake an operational assessment using the most recent version of Design Manual for Roads and Bridges (DMRB) Screening tool and will assess NO_2 and PM_{10} concentrations associated with road traffic in the baseline (TBC), opening year (TBC) and future assessment year (five years after opening) within and around the Proposed Development area. The assessment will consider the existing air quality levels and identify the areas that may exceed the national air quality objectives;
- The DMRB method will be supplemented by the use of the 'NO_x to NO_2 converter' (version 2.1, January 2010) to establish roadside NO_2 levels in the vicinity of the Proposed Development site.

- For robustness, SYSTRA will also undertake a gap analysis assessment required by Highways England for large developments and a determination of significance of the assessment results as set out in the Institute of Air Quality Management (IAQM) Guidance.

Roads to be included in AQA:

- A53 Buxton Road – located west of the Proposed Development;
- Thorncliffe Road – located immediately north of the site; and
- Stile House Lane – located immediately east of the site.

Assessment Scenarios

The assessment scenarios will be aligned to the associated Transport Assessment for the site and will be confirmed in due course.

The assessment will assess baseline air quality conditions in addition to the impact of the operation of the proposed development on concentrations of NO2 and PM10 as a result of both future local traffic flows and development flows in the various assessment scenarios, both 'with' and 'without' development.

Background Concentrations

Background concentrations will be extracted from the DEFRA website for the assessment years.

Receptor Locations

The AQA will predict impacts at worst-case receptor locations, including consideration of receptors located within the Proposed Development (given the residents themselves will be sensitive receptors) and in areas surrounding the site (locations likely to be particularly sensitive). We have also selected to include a sensitive receptor at the junction of the A68 and Church Street and South Road.

Figure 1 identifies proposed receptor locations around the development, based on the site layout plan and **Table 1** provides the receptor details.

Figure 1 Receptor Locations

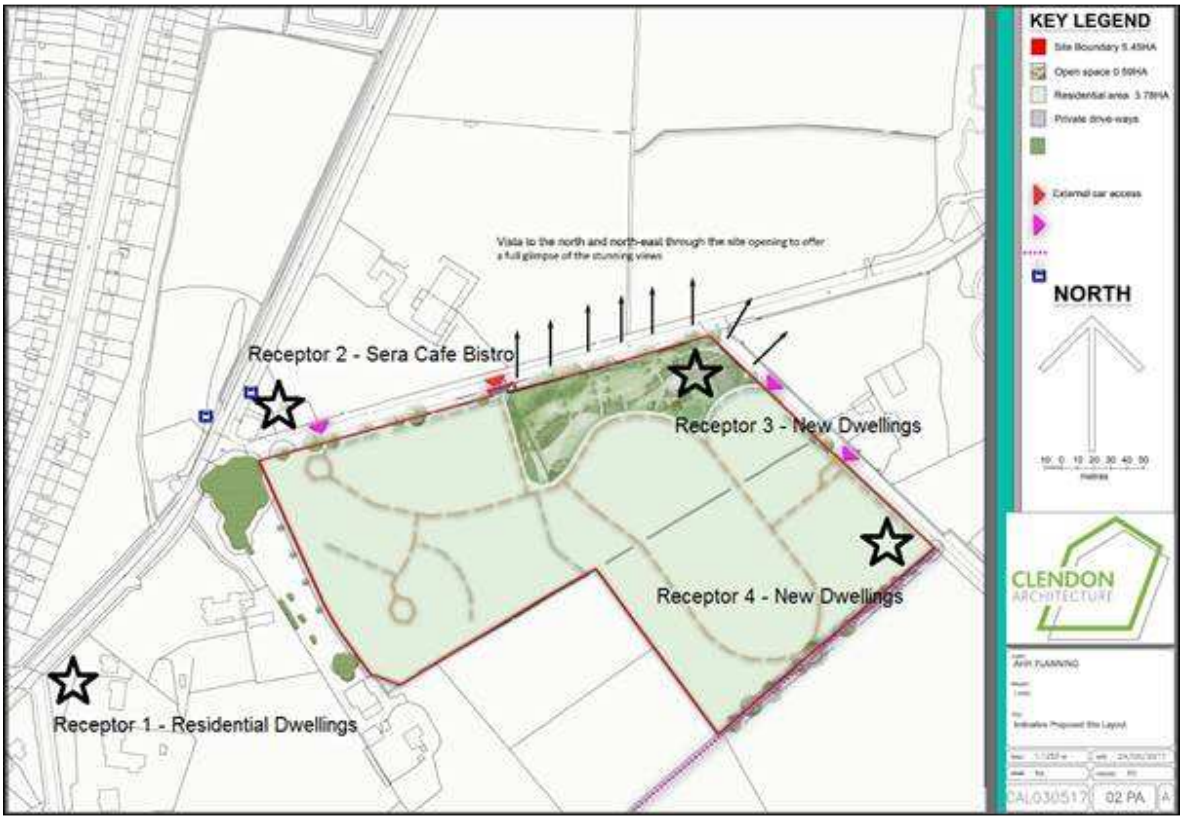

Table 1: Information on the proposed receptors

Number	Grid Reference	Receptor
Receptor 1	399592; 357010	Residential Dwellings (A53 Buxton Road)
Receptor 2	399824; 357261	Sera Café Bistro
Receptor 3	400100; 357312	New Dwellings
Receptor 4	400210; 357201	New Dwellings (Stile House Lane)

Air Quality Assessment Report:

The AQA report will include the following:

- Introduction - including development proposals and scope of the report;
- Policy Context
- Baseline Conditions - including both local highway network and local air quality (traffic data will be derived from the associated Transport Assessment - report will include a description of input data used, assessment years and location of receptors);

. Assessment Methodology;
. Assessment Results - including NO_2 and PM_{10}
. Assessment Discussion (including determination of significance);
. Qualitative review of Construction Impacts;
. Mitigation;
. Conclusions.

The AQA will align to the Transport Assessment (TA) with committed development accounted for in the traffic forecasts, if necessary.

Can you please confirm that the methodology described above satisfies the full requirements of the AQA. Many thanks in anticipation.

Regards
Steve Pickard
Business Director - North
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