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M1 Junction 36 Corridor (Phase 2 Goldthorpe) Employment Site ES10

Noise Modelling and Assessment

Barnsley Metropolitan Borough Council

Project number: 60609165

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Quality information

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Table of Contents

Figures

Tables

Executive Summary

AECOM have been commissioned by Barnsley Metropolitan Borough Council to carry out an assessment into the potential impact of the proposed roundabout and link road from the A365 to facilitate the proposed employment site ES10.

The noise assessment has considered the impact of construction activity on local housing. There is the potential for some temporary construction noise impacts if night-time works are required, however this will be subject to confirmation by the appointed contractor. Appropriate best practicable measures shall be employed to control and manage construction works noise.

AECOM has performed facade noise map calculations of the operational scheme for selected noise sensitive receptors on the nearby road network. Changes in road traffic noise levels are predicted to be negligible and no mitigation measures for operational noise are considered to be required.

1. Introduction

AECOM have been appointed by Barnsley Metropolitan Borough Council (BMBC) to undertake an assessment of the potential noise impacts resulting from the proposed roundabout and link road, from the A365 west of Goldthorpe, to facilitate the proposed employment site at ES10 (hereafter referred to as the 'proposed development') (Ref 1). This report outlines relevant planning policy, the approach to the assessment and the results.

2. Planning Policy

2.1 National Planning Policy

The following planning guidance has been taken into account as part of identifying the assessment methodology, receptor selection and sensitivity, potential significant environmental effects and mitigation:

- National Planning Policy Framework (NPPF) (Ref 2);
- Noise Policy Statement for England (NPSE) (Ref 3); and
- Web-based resource "Planning Practice Guidance on Noise" (PPG-N) (Ref 4).

The aims in the NPPF provide the guiding principles for the mitigation of noise and vibration impacts, within the context of sustainable development, as follows:

- Avoid significant adverse impacts on health and quality of life from noise, as a result of the new development;
- Minimise and mitigate other adverse impacts on health and quality of life, from noise from the new development; and
- Contribute to improvements to health and quality of life through the effective management and control of noise, where possible.

The Explanatory Note to the NPSE informs the assessment methodology in terms of the guidance on *adverse impacts* and *significant adverse impacts* through the introduction of the following concepts:

- No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.

The NPSE recognises that 'it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations'. The levels are likely to be different for different noise sources, for different receptors and at different times of the day, therefore the assessment methodology outlines the proposed LOAEL and SOAEL for each potential impact. The setting of these levels has been informed by the additional guidance in the Planning Practice Guidance on Noise (PPG-N).

2.2 Regional Planning Policy

2.2.1 Sheffield City Region (SCR) Combined Authority

The SCR Transport Strategy 2018-2040 (Ref 5) adopts a healthy streets approach to improving the environment and recognises, in Section 4.4, that *"Transport can play a major role in improving the quality of our outdoors."*

2.3 Local Planning Policy

2.3.1 BMBC Local Plan

BMBC's new Local Plan was adopted on the 3rd January 2019 (Ref 6). Policy GD2 states that developments will be approved if *"Any adverse impact on the environment, natural resources, waste and pollution is minimised and mitigated"*. The Local Plan cites the proposed development under a list of employment land allocation, and states that the development will be subject to the production of a phased Masterplan Framework.

3. Assessment Methodology

3.1 Methodology for Determining Construction Impacts

3.1.1 Construction Noise

As the construction of the proposed development would be the responsibility of the appointed contractor, detailed information on the construction activities such as the programme or number, type and % on-time of construction plant is still to be confirmed. Therefore, detailed construction noise predictions at specific noise sensitive receptors (NSRs) have not been undertaken. Instead, a qualitative assessment has been adopted, focussing on the guidance in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' (Ref 7), considering proximity of receptors to the works, the potential works involved, existing noise levels and best practicable mitigation measures.

BS 5228 contains a number of example methodologies for identifying construction noise impacts based on fixed thresholds or noise level changes. Taking into account the guidance set out in Table 1 below, the threshold values have been adopted for this assessment to define the SOAEL and the LOAEL for residential receptors.

Table 1. Guidance and Threshold Values

Time of day	SOAEL $L_{Aeq,T}$ dB (façade)	LOAEL $L_{Aeq,T}$ dB (façade)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	75	65
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	65	55
Night-time (23:00 – 07:00)	55	45

The criterion for the SOAEL at residential receptors corresponds to the threshold values for Category C in the BS 5228 example ABC method as described in Annex E of the standard. Similarly, the criterion for the LOAEL corresponds to the threshold values for Category A in the BS 5228 example ABC method. In accordance with the NPPF and NPSE, it is important to consider receptors that exceed the LOAEL and that adverse effects are mitigated and minimised.

When considering exceedances of the SOAEL and LOAEL, other project-specific factors are taken into account, such as the existing ambient noise levels, number of receptors affected and the frequency and duration of the impact.

Based upon the above, the magnitude of the impact of construction noise on sensitive receptors is classified in accordance with the descriptors in Table 2.

Table 2. Classifications for the Magnitude of the Construction Noise Impact

Magnitude of Impact	Daytime $L_{Aeq,T}$ dB (façade)	Evening / Weekend $L_{Aeq,T}$ dB (façade)	Night-time $L_{Aeq,T}$ dB (façade)
Major	> 80	> 70	> 60
Moderate	>75-80	>65-70	>55-60
Minor	>65-75	>55-65	>45-55
Negligible	≤ 65	≤ 55	≤ 45

3.1.2 Construction Vibration

The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228 provides data on measured levels of vibration for various construction works, with particular emphasis on piling and blasting. Impacts are considered for both damage to buildings and annoyance to occupiers.

For human receptors the LOAEL is defined as a PPV of 0.3 mms^{-1} (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mms^{-1}, this being the level at which construction vibration can be tolerated with prior warning.

In addition to human annoyance, building structures may be damaged by high levels of vibration. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. Consequently, if vibration levels within buildings are controlled to those relating to annoyance (i.e. 1.0 mms^{-1}), then it is highly unlikely that buildings will be damaged by construction vibration levels.

Given the likely activity involved in constructing the roundabout and access road and the distance of the closest NSRs (around 200m) construction vibration levels above the LOAEL are not expected from work on the proposed development and has not been further assessed.

3.2 Methodology for Determining Operational Impacts

3.2.1 Receptors

Receptors that are representative of the surrounding residential areas have been selected for the calculation of operational road traffic noise. Each of the receptors chosen represents the maximum level of exposure that could be experienced at other receptors in their vicinity. In the most part, the façades facing the nearest road have been selected for the façade noise map calculation. However, the impacts on the receptors closest to the development (R03 & R04) have been calculated for the façades facing the proposed development site.

Selected receptor locations are illustrated in Figure 1 and presented in Table 3 (G = ground floor, 1 = 1st floor).

Figure 1: Site location and selected receptors

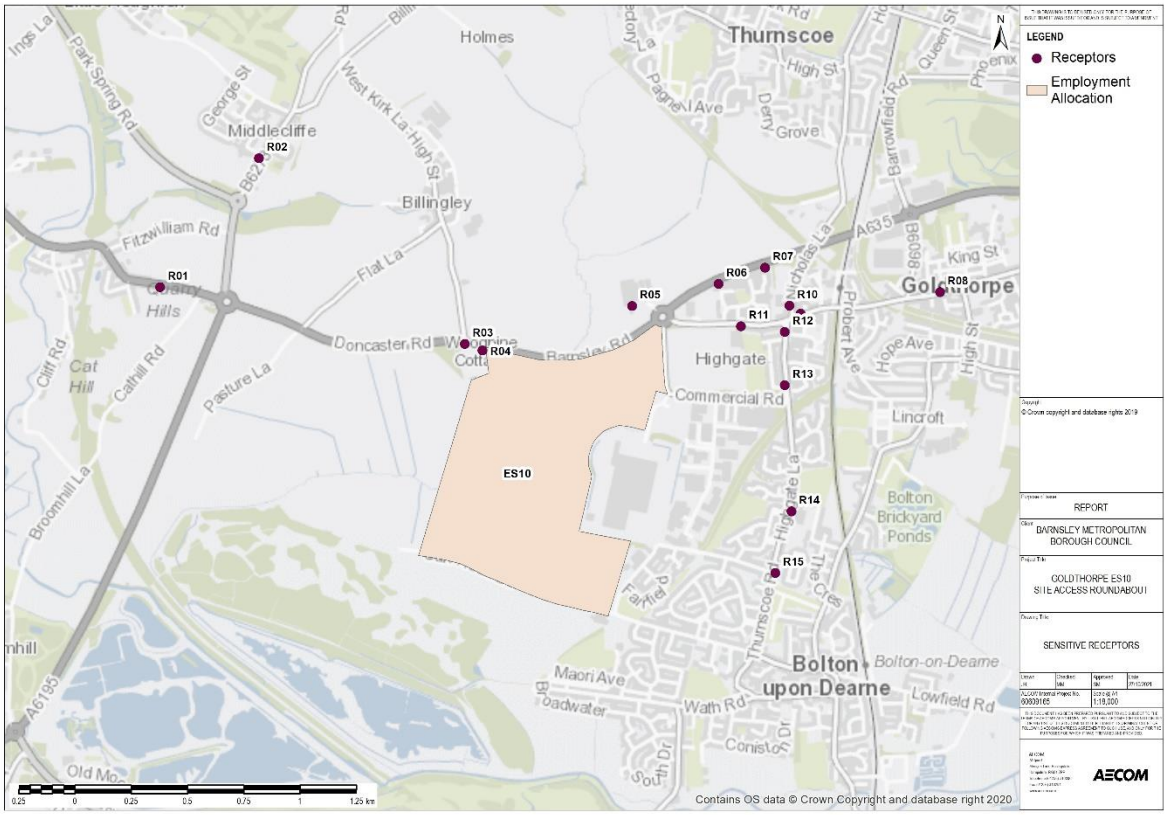


Table 3. Selected Sensitive Receptors

ID	Address/Description	Facade	Type	Floors
R01	172 Doncaster Road	N	Residential	G/1
R02	78 Rotherham Road	SE	Residential	G
R03	Cottage on South edge of A635, opposite Billingley Green Lane	E	Residential	G/1
R04	House on South edge of A635, approx. 50m West of R03	E	Residential	G/1
R05	Farm house, North of Hollygrove roundabout	S	Residential	G/1
R06	House at North Western point of Mulberry Close	N	Residential	G/1
R07	House at North Eastern point of Cherry Grove	N	Residential	G/1
R08	54 Barnsley Road	S	Residential	G/1
R09	1 Halfway Close	S	Residential	G/1
R10	Highgate Primary Academy	S	School	G
R11	243 Barnsley Road	N	Residential	G/1
R12	14 Highgate Lane	E	Residential	G/1
R13	112 Highgate Lane	E	Residential	G/1
R14	Carrfield Primary Academy	W	School	G
R15	9 Highgate Lane	W	Residential	G/1

3.2.2 Operational Traffic Noise Modelling

Noise from a flow of road traffic is generated by both vehicles' engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or occupants of a building, is influenced by a number of factors including traffic flow, speed, composition (percentage heavy duty vehicles), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

Noise from a stream of traffic is not constant; therefore, to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) (Ref 8) to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the eighteen 1-hour periods between 06:00 and 24:00, and then calculating the arithmetic mean. A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures. When CRTN was first validated it was found to have a mean error of 0.3 dB(A) with a standard deviation of 2.4 dB(A) (Ref 9).

CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level in the UK. Noise levels are predicted at a point 1 m measured horizontally externally from the façade of the building and therefore are 'façade' rather than 'free-field' levels. Façade levels include the reflection of noise from the building façade. CRTN applies a standard 'façade correction' of +2.5 dB to convert free-field levels (unaffected by façade reflections) to 'façade' levels (including façade reflections).

Details of the road layout with and without the proposed scheme have been provided by BMBC. The noise modelling has not included buildings being constructed as part of the development as the footprints of such developments are unknown at the time of writing. In addition, any new building development will only have an attenuating effect on nearby receptors.

Traffic flow and composition data were taken from Annual Average Weekly Traffic (AAWT)[1] data supplied from the AECOM traffic team for the following scenarios:

- 2021 Network with 2021 traffic data – Future baseline;
- 2021 Network with 2021 traffic data – Future with proposed development (including development traffic).

In absence of traffic speed data, the speed limits of each road have been used. This is likely to result in calculated traffic noise levels being higher than those actually experienced but should not unduly impact the reported change in noise levels between the two scenarios.

Based on the provided information noise models of the 'with' and 'without' scheme situations have been developed using the SoundPLAN (v8.0) noise mapping software. SoundPLAN implements the standard UK CRTN road traffic noise prediction methodology. Further details of the traffic noise modelling approach are provided in Appendix A.

3.2.3 Operational Traffic Noise Impact Criteria

The assessment of the impact of the proposed scheme on traffic noise levels is based on the guidance in the DMRB on the magnitude of traffic noise changes. Table 4 is adapted from the DMRB classification of the magnitude of impact in the short term, in this case 2021 when the proposed development would be completed.

Table 4. Road Traffic Noise Magnitude of Impact Criteria

Change in Traffic Noise Level $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-0.9	Negligible
1.0-2.9	Minor

[1] The annual average weekday traffic data cover the aforementioned 18-hour period and account for seasonal variations in the existing and expected traffic flow.

3.0-4.9	Moderate
5.0+	Major

In light of the introduction of the NPPF, NPSNN and NPSE a greater consideration of absolute noise levels is considered appropriate, including an acknowledgement that where existing traffic noise levels are high (above the SOAEL as defined below), even small changes in traffic noise in the short-term, on road scheme opening, may be significant.

With respect to absolute road traffic noise levels, for daytime, the SOAEL is set at 63 dB $L_{Aeq,16h}$ (free field). This is equivalent to 67.5 dB $L_{A10,18h}$ (façade), which is consistent with the daytime trigger level in the Noise Insulation Regulations. The LOAEL is set at 50 dB $L_{Aeq,16h}$ (free field), based on the information provided in the Guidelines for Community Noise (Ref 11).

For night-time, the SOAEL is set at 55 dB $L_{Aeq,8h}$ (free field) for residential properties. This aligns with the interim night-time outdoor target level provided in the Night Noise Guidelines for Europe. The LOAEL is set at 40 dB $L_{Aeq,8h}$ (free field), which is explicitly defined as the LOAEL for transport noise in the Night Noise Guidelines for Europe (Ref 12).

3.2.4 Operational Traffic Vibration

Highways England's Design Manual for Roads and Bridges (DMRB) (Ref 10) states that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances, can generate similar levels of vibration to that from traffic in most circumstances.

It is a requirement of new highway constructions that the highway surface is smooth and free from any discontinuities. Paragraph A5.26 of DMRB states, in relation to ground borne vibration: *"Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances".* Hence, no adverse impact from traffic induced ground borne vibration due to the passage of vehicles over irregularities on road surfaces of the proposed development are anticipated and no further assessment has been completed.

4. Predicted Impacts

4.1 Construction

Details of the plant that will be used and construction methods that will be employed in the construction works will not be defined until the contractor is appointed.

The main construction activities are set up of site compounds, earthworks, drainage installation and road construction/surfacing. In general, earthworks are likely to generate the highest noise levels at NSRs. In addition, it may be necessary to carry out some of these works, such as road planing (associated with the road construction/surfacing) at tie-ins to existing roads, during the night-time.

The impact of the noise of these construction activities on NSRs would vary. For instance, earthworks, drainage installation and road pavement construction would be transitory, with high noise levels only experienced at nearby NSRs for a limited amount of time when works are at their closest approach. Night-time works have the potential to result in greater effects at NSRs due to the higher sensitivity of residential properties at this time.

The potentially worst affected NSRs by construction noise impacts would be the houses just south of the A365 near the junction with Billingley Green Lane. The nearest of these, Woodbine Cottage, is approximately 200m from the site of the proposed roundabout.

Depending upon the exact construction methods and plant employed works that occur during the night could result in moderate impacts at the closest properties. These potential impacts could be mitigated through best practicable measures such as:

- the selection of quiet and low vibration equipment and methodologies;
- a review of construction programme and methodology to consider low noise/low vibration methods (including non-vibratory compaction plant where required);
- the optimal location of equipment on site to minimise noise disturbance;
- the provision of acoustic enclosures around static plant, where necessary;
- the use of less intrusive alarms, such as broadband vehicle reversing warnings;
- compliance with working hours, as agreed with BMBC.

Traffic on the A635 is of sufficient volume for the impact of the additional construction traffic to be considered negligible on NSRs located along this road (both to the east and west of the proposed development).

4.2 Operation

The results of the modelling of road traffic noise levels, in terms of $L_{A10,\ 18h}$ (dB) and L_{night} (dB)[2], with and without the scheme are presented in Table 5 for the scheme opening year (2021). These results are also illustrated in Figure 2.

Table 5. Change in opening year traffic noise levels

ID	Floor	$L_{A10,\ 18hr}$ dB			L_{night} dB			Magnitude of Impact
		DM2021	DS2021	Change	DM2021	DS2021	Change	
R01	G	77.1	77.3	+0.2	65.6	65.8	+0.2	Negligible
	1	78.1	78.3	+0.2	66.5	66.7	+0.2	
R02	G	71.1	71.1	+0	60.3	60.3	+0	Negligible
R03	G	76.0	76.6	+0.6	64.6	65.2	+0.6	Negligible
	1	77.1	77.7	+0.6	65.6	66.2	+0.6	

[2] L_{night} is the $L_{Aeq,\ 8h}$ noise level between 2300 and 0700 and is derived from the $L_{A10,\ 18h}$ level according to method 3 in (Ref 13)

ID	Floor	$L_{A10, 18hr}$ dB			L_{night} dB			Magnitude of Impact
		DM2021	DS2021	Change	DM2021	DS2021	Change	
R04	G	70.9	71.6	+0.7	60.0	60.7	+0.7	Negligible
	1	73.1	73.7	+0.6	62.1	62.6	+0.5	
R05	G	66.5	66.9	+0.4	56.1	56.5	+0.4	Negligible
	1	67.6	68.1	+0.5	57.0	57.5	+0.5	
R06	G	72.1	72.3	+0.2	61.1	61.3	+0.2	Negligible
	1	73.7	74.0	+0.3	62.6	62.8	+0.2	
R07	G	73.5	73.8	+0.3	62.4	62.6	+0.2	Negligible
	1	74.2	74.4	+0.2	63.0	63.2	+0.2	
R08	G	75.7	76.6	+0.9	64.3	65.1	+0.8	Negligible
	1	75.5	76.4	+0.9	64.2	65.0	+0.8	
R09	G	74.2	75.1	+0.9	63.0	63.8	+0.8	Negligible
	1	73.9	74.8	+0.9	62.8	63.5	+0.7	
R10	G	65.1	65.5	+0.4	54.9	55.2	+0.3	Negligible
R11	G	73.8	74.7	+0.9	62.7	63.4	+0.7	Negligible
	1	73.6	74.5	+0.9	62.5	63.3	+0.8	
R12	G	74.2	74.7	+0.5	63.0	63.4	+0.4	Negligible
	1	74.1	74.5	+0.4	62.9	63.3	+0.4	
R13	G	73.8	74.2	+0.4	62.6	63.0	+0.4	Negligible
	1	73.7	74.1	+0.4	62.5	62.9	+0.4	
R14	G	72.0	72.4	+0.4	61.0	61.4	+0.4	Negligible
R15	G	73.4	73.8	+0.4	62.3	62.7	+0.4	Negligible
	1	73.6	74.0	+0.4	62.5	62.9	+0.4	

Although the majority of road traffic noise levels reported in Table 5 are above the SOAEL this should not be considered representative of the local environment since (a) all selected receptors are situated next to primary routes represented in the traffic model and are therefore some of the properties most exposed to traffic noise in the area and (b) the use of road speed limits within the noise modelling with mean that these noise levels are likely higher than those experienced in practice.

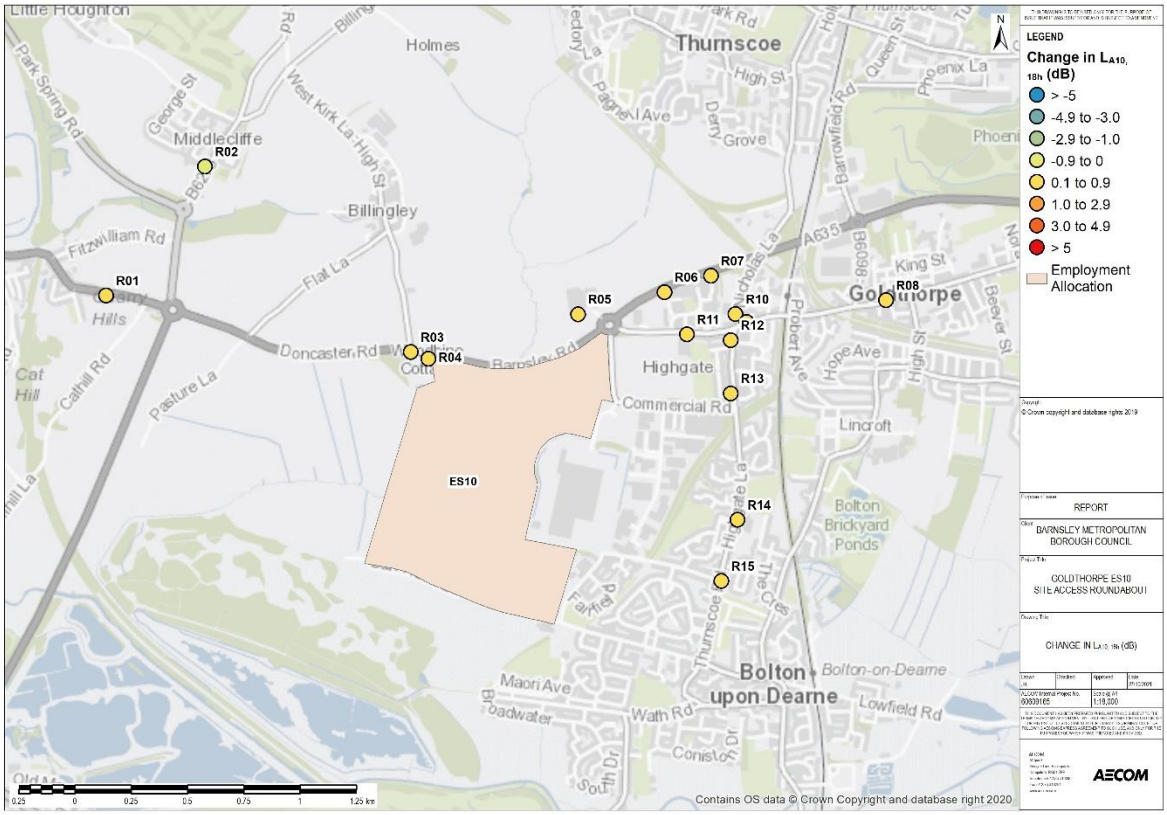
To give an idea of the magnitude of over estimation in the traffic noise levels, a 20 km/h reduction in mean traffic speed under the conditions of the modelled roads would result in approximately a 1.5 dB reduction in the predicted $L_{A10, 18h}$ level.

These considerations do not however impact the expected changes in road traffic noise level as a result of the proposed development and in all cases these changes and the resulting impacts are predicted to be negligible. This is as a result of a relatively small percentage increase in traffic on the existing major routes in the area.

To put this into context, whilst the development is expected to add around 3500 vehicles to the AAWT (see Section 3.2.2) on the A365 this is a relatively small fraction of the existing flow which is around 25000 AAWT. In road traffic noise terms a 25% increase in traffic is required for a 1 dB increase and the development traffic does not meet this threshold.

As such, no mitigation with respect to operational traffic is proposed.

Figure 2: Operational road traffic noise impacts



5. Conclusion

This report presents the results from an assessment of noise impacts due to the implementation of the proposed roundabout and link road west of Goldthorpe, to facilitate the development at site ES10.

There is the potential for some temporary construction noise impacts at local residential properties if night-time works are required, however this will be subject to confirmation by the appointed contractor. Appropriate best practicable measures shall be employed to control and manage construction works noise.

Operational noise impacts are considered to be negligible and therefore no further mitigation is required.

6. References

Ref 1 Barnsley Metropolitan Borough Council (BMBC), (2019); “06/02/2019 – M1 Junction 36 Economic Growth Corridor, Goldthorpe Phase 2”; (https://www.barnsley.gov.uk/statements/060219-m1-junction-36-economic-growth-corridor-goldthorpe-phase-2/)

Ref 2 Ministry of Housing, Communities & Local Government (2019) National Planning Policy Framework.

Ref 3 Department for Environment, Food & Rural Affairs, (2010); Noise Policy Statement for England.

Ref 4 Department for Communities and Local Government (DCLG), (2014) Planning Practice Guidance (https://www.gov.uk/guidance/noise-2).

Ref 5 Sheffield City Region (2017) Sheffield City Region Transport Strategy 2018-2040

Ref 6 Barnsley Metropolitan Borough Council (2019) Barnsley Local Plan

Ref 7 British Standards Institute (2014) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.

Ref 8 Department of Transport/Welsh Office (1998) Calculation of Road Traffic Noise (CRTN)

Ref 9 Delany M E, D G Harland, R A Hood and W E Scoles (1976) The prediction of noise levels L10 due to road traffic. Journal of Sound and Vibration, 48(3) pp305-25.

Ref 10 Highways Agency (2011), Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7, HD 213/11 Revision 1.

Ref 11 WHO Guidelines for Community Noise, 1999

Ref 12 WHO Night Noise Guidelines for Europe, 2009

Ref 13 PG Abbott and PM Nelson (2002), Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping, Transport Research Laboratory, PR/SE/451/02

Appendix A Data and Assumptions

6.1 Data Provided

- Ground heights from publicly available LIDAR Digital Terrain Map data, downloaded at http://environment.data.gov.uk/ds/survey/index.jsp#/survey on 11th July 2019.
- Building heights from OS TOPO layer provided by BMBC (through emapsite) on 29th July 2019.
- OS mapping files from MasterMap® and TOPO layer from BMBC (through emapsite) on 29th July 2019.
- Road scheme layout provided by AECOM traffic team in pdf format on 2nd May 2019.
- Traffic data provided by AECOM traffic team for the future baseline and proposed development situation (2021) on 7th August 2019.

6.2 Noise Modelling Assumptions

- Traffic speeds are presumed to be equal to the speed limit of each road, including at entries and exits.
- Predominantly soft ground assumed across the study area (ground absorption 0.25) except for built up residential areas where hard ground assumed (ground absorption 0.9).
- Road surface correction: road surface correction of -1 dB(A) applied to roads of speed limits below 75 km/h; -0.5 dB(A) applied to roads of speed limits above 75 km/h in accordance with guidance in DMRB and CRTN for Hot Rolled Asphalt.
- Existing building heights and number of floors based on a combination of Building heights from OS TOPO layer and aerial photography.
- Buildings being constructed have been digitised based on public information available and determined by AECOM.
- Noise modelling did not include any buildings to be constructed as part of the development.