

Birmingham Eastside Extension

APP/P5.1

Transport and Works Act 1992

The Transport and Works
(Applications and Objections Procedure)
(England and Wales) Rules 2006

APP/P5.1 Rupert Thornely-Taylor Noise and Vibration Main Proof of Evidence



WEST MIDLANDS
COMBINED AUTHORITY

TRANSPORT AND WORKS ACT 1992

PROPOSED MIDLAND METRO (BIRMINGHAM EASTSIDE EXTENSION) ORDER 201[X]

PROOF OF EVIDENCE

OF

**Rupert Thornely-Taylor
Noise and Vibration**

FOR

WEST MIDLANDS COMBINED AUTHORITY

13 October 2017

CONTENTS

1. QUALIFICATIONS AND EXPERIENCE	4
2. SCOPE OF EVIDENCE.....	6
2.1 Overview.....	6
2.2 Structure of proof.....	6
3. THE STATEMENT OF MATTERS.....	7
4. REVIEW OF CURRENT POLICY AND PRACTICE IN NOISE CONTROL.....	8
4.1 The National Planning Policy Framework.....	8
4.2 The Noise Policy Statement for England.....	8
4.3 Planning Practice Guidance (Department for Communities and Local Government, 2014)	9
4.4 Regional and local Policies	10
4.5 Other planning considerations	11
4.6 The Design Manual for Roads and Bridges.....	11
4.7 World Health Organization Guidance	11
4.8 Controls on Construction Activities.....	11
4.9 Controls on Operational Noise and Vibration	12
5. SUMMARY OF WORK CARRIED OUT.....	14
5.1 Introduction	14
5.2 Noise and Vibration Issues Considered	14
5.3 Geographical Scope	15
5.4 Temporal scope	15
5.5 Receptors considered	15
5.6 Baseline noise levels	16
5.7 Evaluation Criteria.....	16
5.8 Construction – Noise and Vibration.....	16
5.9 Operation.....	17
6. PROPOSED CONTROLS ON NOISE AND VIBRATION.....	19
6.2 Construction.....	19
6.3 Operation.....	20
7. OVERVIEW OF ASSESSMENT	21
7.2 Findings of assessment of construction phase.....	21
7.3 Findings of assessment of operational phase	22
8. Issues Raised by Objectors.....	23
8.2 Hotel La Tour (HLT) [OBJ/12]	23
9. CONCLUSIONS.....	25
10. STATEMENT OF TRUTH.....	26

Appendices (bound separately APP 5.3)

Appendix 1 Glossary and abbreviations

Appendix 2 Explanation of noise and vibration scales and indices

Appendix 3 Birmingham City Council Document: EPU Response to Planning Consultation
Note. 1 Noise & Vibration

Appendix 4 Tables

Appendix 5 Figures

1. QUALIFICATIONS AND EXPERIENCE

- 1.1.1 My name is Rupert Maurice Thornely-Taylor.
- 1.1.2 I am a Fellow of, and was a founder member of, the Institute of Acoustics, a Member of the Institute of Noise Control Engineering of the USA and a Member of the International Institute of Acoustics and Vibration. I have specialised exclusively in the subjects of noise, vibration and acoustics for 53 years. I have been an independent consultant in these subjects for the past forty-nine years, and head the Rupert Taylor Ltd consultancy practice.
- 1.1.3 I am a past President and Honorary Member of the Association of Noise Consultants and was for eight years a Director of the International Institute of Acoustics and Vibration. I was, for ten years, a member of the Noise Advisory Council chaired by the Secretary of State for the Environment, and I was chairman and deputy chairman of two of its working groups; I was a member of the Scott Committee, which drafted the basis of the noise section of the Control of Pollution Act 1974. In 2016 I was awarded the Rayleigh Medal by the Institute of Acoustics for outstanding contributions to acoustics.
- 1.1.4 I am the author of the Pelican book NOISE, and editor or co-author of many other books including the Association of Noise Consultants Guidelines “Measurement and Assessment of Groundborne Noise and Vibration”. I am a member of the Working group that produced ISO Standard 14837-1:2005 “Mechanical vibration - Groundborne noise and vibration arising from rail systems - Part 1: General guidance” and subsequent parts. I have prepared reports on noise for the OECD.
- 1.1.5 I have been expert witness in the House of Commons and House of Lords Select Committees on the High Speed Rail (London - West Midlands) Bill and previously on the Channel Tunnel Rail Link Bill, and in the House of Commons and House of Lords Select Committees on the Crossrail Bill. I have been consultant to the Crossrail Project since 1991.
- 1.1.6 With regard to my rail experience, I have been consultant to London Underground Ltd and/or Transport for London (and their predecessors) for over 37 years, having advised on projects including Croydon Tramlink and Docklands Light Railway as well as the Jubilee Line Extension. I was expert witness in the Northern Line Extension and Bank Station Capacity Upgrade public inquiries. For Network Rail and its predecessors, I was expert witness in the Thameslink 2000 public inquiries have been involved in vibration studies for Edinburgh Tram, Dublin Luas and Metro North

and the Merseyrail scheme. I was expert witness for objectors to the Transport for Greater Manchester Metro Trafford Park Extension and the Network Rail (Manchester Piccadilly and Oxford Road Capacity) inquiries.

2. SCOPE OF EVIDENCE

2.1 Overview

2.1.1 My evidence covers the topics of noise and vibration, from the construction and operation of the Birmingham Eastside Extension (BEE). It includes or refers to information contained in the Environmental Statement (the ES) [BEE/A13/1] and the Update to the Environmental Assessment [BEE/A13/5].

2.1.2 The items covered by my evidence include:

- i. assessment of baseline conditions;
- ii. prediction and assessment of impacts due to demolition and construction noise and vibration, including construction traffic noise;
- iii. operational noise and vibration assessment including the plant and equipment associated with the BEE; and
- iv. an assessment of operational groundborne noise.

2.1.3 In Appendix 2 I provide an explanation of noise and vibration scales and indices

2.2 Structure of proof

2.2.1 My evidence addresses the topics included in the Statement of Matters insofar as they relate to noise and vibration.

2.2.2 In section 4 I review current policy and practice in noise control, and then set out the controls on noise and vibration that would be used in construction and operation of the BEE. In section 5 I summarise the work carried out in the process of assessing the environmental impact, environmental impact of the scheme. In section 6 I discuss ways in which noise and vibration from the construction and operation of BEE will be controlled, and in Section 7, taking account of these controls, I give an overview of the environmental assessment of noise and vibration.

2.2.3 My evidence addresses matters raised by Objectors in Section 8.

2.2.4 I set out my conclusions in Section 9.

3. THE STATEMENT OF MATTERS

3.1.1 On 5 July 2017, the Secretary of State for Transport issued a Statement of Matters which sets out, pursuant to rule 7(6) of the Transport and Works (Inquiries Procedure) Rules 2004, the matters about which the Secretary of State for Transport particularly wishes to be informed of for the purposes of his consideration of the BEE Order and associated applications [INQ/3]. This evidence addresses the following parts of the Statement of Matters, namely 4a and 5:

4. The likely impacts of constructing and operating the scheme on land owners, tenants and local businesses, the public, utility providers and statutory undertakers, including any adverse impact on their ability to carry on their business or undertaking. Consideration under this heading should include:

(a) the impacts of noise, dust and vibration including the effects of construction and operation on the local road networks and bus services;

5. The adequacy of the Environmental Statement submitted with the application for the TWA Order, having regard to the requirements of the Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006, and whether the statutory procedural requirements of the Transport and Works (Applications and Objections Procedure) Rules 2006 have been complied with.

4. REVIEW OF CURRENT POLICY AND PRACTICE IN NOISE CONTROL

4.1 The National Planning Policy Framework

4.1.1 The National Planning Policy Framework (NPPF) [BEE/E1] was published in March 2012 and replaced Planning Policy Guidance Note 24: 'Planning and Noise' (PPG24).

4.1.2 The NPPF [BEE/E1] paragraph 109 states that 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, water or noise pollution or land instability”.

4.1.3 The NPPF [BEE/E1] does not define what it considers to be an 'unacceptable risk' or an 'unacceptable level'. To this end, it is the role of assessors and decision makers to determine what is and is not acceptable in each case.

4.2 The Noise Policy Statement for England

4.2.1 The national policy on the approach to noise is set out in The Noise Policy Statement for England (NPSE) [BEE/E27] published in 2010.

4.2.2 The NPSE [BEE/E27] sets out the long-term vision of Government noise policy. The Noise Policy Vision is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”.

4.2.3 The NPSE [BEE/E27] draws on two established concepts from toxicology that are currently being applied to noise effects namely NOEL 'No Observed Effect Level' and LOAEL 'Lowest Observed Adverse Effect Level'. The NPSE extends these concepts and introduces the concept of a SOAEL 'Significant Observed Adverse Effect Level'. This is the level above which significant adverse effects on health and quality of life occur.

4.2.4 The second aim of the NPSE [BEE/E27] refers to the situation where the effect lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development

(paragraph 1.8 of the Noise Policy Statement for England [BEE/E27]). This does not mean that such adverse effects cannot occur.

- 4.2.5 The third aim seeks, where possible, to positively improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.
- 4.2.6 Potential noise impacts associated with new developments, transport and street works are primarily addressed through the implementation of appropriate planning and licensing policies, designed to make the development acceptable in planning and licensing terms.
- 4.2.7 In the explanatory note to the NPSE [BEE/E27] paragraph 2.3 it also says that, in reality, although it has not always been stated, the aim has tended to be to minimise noise as far as reasonably practicable. This concept can be found in the Environmental Protection Act 1990, when in some circumstances there is a defence of “best practicable means” in summary statutory proceedings.
- 4.2.8 The former Planning Policy Guidance PPG24 Planning and Noise was replaced by the NPPF [BEE/E1] in 2012. The NPPF refers to the NPSE [BEE/E27] which states in paragraph 1.3 that “*the aim of this document is to provide clarity regarding current policies and practices*” and paragraph 1.4 states that it “*seeks to clarify the underlying principles and aims in existing policy documents*”. These paragraphs make clear that when the policy came out in 2010, it was not changing Government policy, but was clarifying it.

4.3 Planning Practice Guidance (Department for Communities and Local Government, 2014)

- 4.3.1 In March 2014, the Department for Communities and Local Government (DCLG) released its national planning practice guidance web-based resource to support the NPPF [BEE/E1]. The guidance was updated in December 2014 and the noise sections are referred to below as PPGN.
- 4.3.2 This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly

affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is ‘noticeable’, ‘very disruptive’ and should be ‘prevented’ (as opposed to SOAEL, which represents a situation where noise is ‘noticeable’ and ‘disruptive’, and should be ‘avoided’).

- 4.3.3 In December 2014 the National Policy Statement for National Networks (NN NPS) was presented to Parliament [BEE/E28]. It applies to nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England dealt with under the development consent (DCO) process applicable to such projects, and is therefore not directly applicable to BEE as a Transport and Works Act order application although as the NPS explains it may be a material consideration. The NN NPS restates the aims of the NPSE and advises that the Secretary of State should not grant development consent unless satisfied that the proposals will meet these aims, within the context of Government policy on sustainable development.

4.4 Regional and local Policies

- 4.4.1 The Birmingham Development Plan 2031 (BDP) [BEE/E3] is the City’s statutory planning framework guiding decisions on all development and regeneration activity to 2031. It was adopted by Birmingham City Council on 10th January 2017 and sets out a vision and a strategy for the sustainable growth of the City.
- 4.4.2 Policy TP37 on health states “The City Council is committed to reducing health inequalities, increasing life expectancy and improving quality of life by:” inter alia “seeking to improve air quality and reduce noise within the *City*.”
- 4.4.3 Policy TP38 refers to sustainable transport. Paragraph 9.10 of the reasoned justification states “*TravelWise is a national campaign to encourage people to think about the impact that their daily journeys have on the environment, their community and on their own health. TravelWise schemes can also help people to look for more environmentally friendly alternatives to driving alone, such as car sharing, using public transport, walking or cycling. People can save money and improve their health whilst helping to reduce congestion, air and noise pollution and the negative effects of road traffic.*”
- 4.4.4 Regional and local policies are further referred to in the evidence of Mr Paul Ellingham.

4.5 Other planning considerations

- 4.5.1 A Birmingham City Council document “EPU Response to Planning Consultation Note. 1 Noise & Vibration” [Appendix 3 in APP/P5.3] is referred to in the Environmental Statement. It is not an adopted policy, but it is well circulated amongst environmental consultants and regularly used as the standard for within Birmingham.

4.6 The Design Manual for Roads and Bridges

- 4.6.1 The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7; HD213/11 [BEE/E29] describes a methodology for the assessment Noise and Vibration impacts from road projects in the UK. A method for assessment of both long and short-term impacts is provided.

4.7 World Health Organization Guidance

- 4.7.1 Current guidance on noise has been based on guidance issued by the World Health Organization both in its Community Noise Guidelines and the Night Noise Guidelines for Europe.

4.8 Controls on Construction Activities

- 4.8.1 Noise and vibration impacts from the construction of the development (including demolition) will be subject to the construction noise provisions of the Control of Pollution Act, 1974 [BEE/B16], Sections 60 and 61 and to the CoCP [Appendix D2 to the ES BEE/A13/2]. To the extent set out in the CoCP, the Contractor may apply to the Local Authority for formal consent in accordance with Section 61 of the Control of Pollution Act.
- 4.8.2 The Section 61 procedure has the effect of securing the “best practicable means” (BPM) for reducing noise. BPM is defined in the Control of Pollution Act 1974 [BEE/B16], Section 72. “Practicable” means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications. The means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures.
- 4.8.3 Vibration is also subject to control by the mechanisms of Sections 60 and 61 [BEE/B16].

4.8.4 The project also has a Code of Construction Practice including sections of noise and hours of working and on vibration [Appendix D2 to the ES BEE/A13/2]. This sets out façade noise limits for occupied dwellings and the circumstances and procedure for offering noise insulation or temporary rehousing. The contractor will be required to comply with this scheme, where it is reasonably possible to do so, in addition to any requirements in a Section 61 consent which may be obtained. The scheme follows the precedents set by recent major infrastructure projects.

4.9 Controls on Operational Noise and Vibration

4.9.1 The project has a Noise and Vibration policy which sets out a commitment that Midland Metro will strive to keep tram noise below the qualifying limits in the Noise Insulation Regulations for Railways and below a further qualifying free-field target level of 82dB L_{Amax} , slow, up to a maximum of 6 times per hour at night (00:00 – 06:00) which will apply for the purposes of avoiding sleep disturbance, where at-source mitigation measures are not practicable.

4.9.2 The Policy includes the following mitigation thresholds

55dB L_{Aeq} Day-time Hours 06:00 – 00:00 hours

45dB L_{Aeq} Night-time Hours 00:00 – 06:00 hours

4.9.3 Where tram noise is measured to be at least 3 dB(A) above these thresholds, mitigation measures to reduce the adverse impact of noise intrusion shall be implemented according to the extent to which the pre-existing ambient (L_{Aeq}) noise levels are increased, with increasing priority for greater noise increase

4.9.4 Mitigation measures shall be implemented using “Best Practicable Means”, i.e. measures shall be reasonably practicable, having regard to local conditions and circumstances, to the current state of technical knowledge and to the financial implications, in so far as compatible with safe working practice and any duty imposed by law. For example, mitigation will usually take the form of technically proven measures, such as trackside noise bunds, noise barriers and track treatments, with due regard to local considerations such as potential conflicts with road traffic, concerns of track safety, driver sightlines, visual impact, security and construction and maintenance considerations. In each case, the measures shall be commensurate with the noise impact and at reasonable cost.

4.9.5 Buildings used for particularly sensitive activities, such as public musical performances, may need special attention. These will be considered on a case-by-

case basis, with any necessary mitigation measures developed using Best Practicable Means

5. SUMMARY OF WORK CARRIED OUT

5.1 Introduction

- 5.1.1 The activities considered that could give rise to noise and vibration effects, the locations and types of premises, the periods of assessment, the baseline, and the criteria for assessing effects are described below.
- 5.1.2 Following the publication of the Environmental Statement in 2016, revised traffic modelling has taken place which takes into account changes in the operation of the city centre highway network and publication of the latest version of the underlying SATURN transport model for Birmingham. This has had the effect of changing the noise assessment in the ES, and the Update to the Environmental Statement of October 2017 [BEE/A13/5] includes a noise chapter giving the revised assessment along with some other updates including more information concerning the prediction and assessment of groundborne noise from the operation of trams. It was subsequently found that an error occurred in the processing of the traffic data used as input to the noise model and an erratum note [Appendix 4 of APP/P5.3] has been prepared containing amended versions of tables 3.6, 3.7 and 3.8. It is accompanied by a revised plan of the study area [Appendix 5 of APP/P.5.3]. The correction of the error does not materially change the outcome of the assessment. The disappearance from table 3.7 of the single receptor with an increase in LAeq,T of 10.0+ dB is due to the fact that in the DMOY case it is a building on Park Street near Seymour Street and for the DSDY case the building has been replaced by the HS2 station (not actually a sensitive receptor) with façades that are much closer to trafficked roads causing the large apparent increase from one building to another, both of which, in the model, are incorrectly treated as being the same sensitive receptor.

5.2 Noise and Vibration Issues Considered

- 5.2.1 Noise and vibration effects could arise from the following activities during construction:
- i. noise and vibration from activities carried out at surface worksites including demolition and utilities diversions;
 - ii. secondary groundborne and structure-borne noise and vibration from underground works including tunnelling; and
 - iii. noise associated with construction traffic using the public highway.
- 5.2.2 During operation, noise and vibration effects could arise from:

- i. airborne noise and vibration from the operation of trams and associated plant and machinery; and
- ii. groundborne noise and vibration from the operation of trams on the new alignment.

5.3 Geographical Scope

5.3.1 The geographical scope for the construction assessment was determined during the prediction and assessment process using professional judgement. The areas within which noise and vibration has been assessed include:

- i. areas near to construction/work sites where significant activities will affect sensitive receptors;
- ii. construction traffic routes, and routes subject to changes in traffic flow which will experience changes in flows where sensitive receptors will potentially be affected;
- iii. buildings close to the alignment of the proposed BEE alignment tunnel have also been assessed with regard to noise and vibration during the operating phase.

5.3.2 The geographical scope for the operational noise assessment was determined using the method set out in paragraphs 10.2.75 to 10.2.77 of the ES.

5.4 Temporal scope

5.4.1 For the construction phase, the period considered is the duration of the construction programme which is expected to run from 2019 to 2022.

5.4.2 For the operational phase, the period considered extends to the lifetime of the system.

5.5 Receptors considered

5.5.1 The resources and receptors with high sensitivity have been identified as residential properties, hotels and places of worship. Medium sensitivity receptors are considered to be commercial premises including offices and shops, subject to professional judgement.

5.5.2 Receptors assessed as being potentially affected by effects due to construction works are listed in table 10.4 of the ES [BEE/A13/1]. Streets containing receptors

assessed as being potentially affected by the operation are listed in table 10.19 of the ES [BEE/A13/1] which is updated in Appendix 4 of my evidence [BEE/P5.3].

5.6 Baseline noise levels

5.6.1 Ambient noise levels were monitored during the period November 2015 to June 2016. The monitoring locations were chosen to be representative of noise sensitive receptors in the area around the proposed works and are shown in Figure 1.3 of Technical Appendix M1 of the ES [BEE/A13/1] where the summary of the results is given in Table 1.7.

5.6.2 Measured baseline noise levels at the monitoring locations listed in Table 10.4 are summarised in Table 10.15 of the ES.

5.7 Evaluation Criteria

5.7.1 In line with the NPPF [BEE/E1] and associated NPSE [BEE/E27], the SOAEL and LOAEL are defined for each class of receptor, against which predicted noise levels are assessed, before mitigation measures are proposed where exceedances of the SOAEL and/or LOAEL are identified.

5.7.2 The evaluation of noise and vibration effects due to surface construction works including construction traffic is based upon criteria that are referred to in paragraph 5.8.4 of this proof.

5.8 Construction – Noise and Vibration

5.8.1 For airborne noise from surface construction activity, levels generated will be considered significant if they exceed the SOAEL threshold values in the ES Table 10.9 and the total noise including the pre-construction baseline exceeds the pre-construction baseline by 5dB or more.

5.8.2 Changes in road traffic flow have been assessed on the basis of the degree of change in noise level adjacent to a given section of road based on the approach adopted by the Highways Agency's "Design Manual for Roads and Bridges" [BEE/E29]. This comparison takes into account construction traffic using the highway and non-construction traffic diverted from its normal route. The criteria for identifying significance are given in 10.2.94 and in Table 10.1 of the ES.

5.8.3 Potential vibration effects are of three kinds:

- i. effects on buildings

- ii. 'feelable' vibration experienced by occupiers of buildings; and
- iii. groundborne noise (also termed secondary noise or re-radiated noise). This will be explained further in Section 6.

5.8.4 Criteria for assessing these three effects are as follows:

- i. criteria for identifying the significance of effects on buildings are set out in the promoter's Code of Construction Practice section 5.1, namely "To protect buildings from physical damage, peak particle velocity levels are not to exceed 5mm/sec except for particularly sensitive buildings where the level is not to exceed 3mm/sec".
- ii. criteria for identifying the significance of 'feelable' vibration experienced by residents are set out in Table 10.10 and paragraph 10.2.136 of the ES [BEE/A13/1]. These are based on the guidance given in BS 5228-2:2009+A1:2014.
- iii. Unlike the effects of vibration the effects of secondary noise, also called re-radiated noise, groundborne or structure-borne noise are not subject to guidance in a British or International Standard, and the assessment approach that has been adopted for the proposed BEE is contained in the promoter's Noise and Vibration Policy.

5.9 Operation

- 5.9.1 The potential effects arising from the noise of tram traffic during the operational phase have been assessed using the criteria given in table 10.11 and paragraph 10.2.137 of the ES.
- 5.9.2 The potential effects arising from substation noise during the operational phase have been assessed using the criteria given in table 10.13 of the ES.
- 5.9.3 The significance criteria for effects of 'feelable' vibration from tram traffic on people in buildings during the operational phase are set out Table 10.12 of the ES. These are based on guidance provided in the relevant British Standards.
- 5.9.4 For secondary noise radiated into sensitive spaces by vibrating wall, floor and/or ceiling surfaces, the effect thresholds are set out in table 3.9 of the Update to the Environmental Statement.

- 5.9.5 An explanation of the interpretation of the criteria mentioned above in order to determine the significance of a potential effect is set out in paragraphs 10.2.125 to 10.2.138 of the ES [BEE/A13/1].

6. PROPOSED CONTROLS ON NOISE AND VIBRATION

6.1.1 Noise and vibration from the BEE scheme will be controlled in the following ways.

6.2 Construction

6.2.1 A draft CoCP has been prepared that applies the key principles of minimising noise at the source and also reducing noise transmitted to the receiver. The CoCP [Appendix D2 to the ES BEE/A13/2] commits the project to using Best Practicable Means in respect of all activities. Draft planning condition 7 [Schedule 2 to BEE/A2] requires that:

“The development shall not commence until a Code of Construction Practice (which must be in substantial accordance with the draft Code of Construction Practice at Appendix D2 of the Environmental Statement) has been submitted to and approved in writing by the local planning authority. The development shall be carried out in accordance with the approved Code of Construction Practice.”

6.2.2 The CoCP requires the contractor to apply for a consent under Section 61 of the Control of Pollution Act 1974 and for noise limits to be agreed with the local authority.

6.2.3 Sections 60 and 61 have the effect of securing the “best practicable means” (BPM) for reducing noise. “Best Practicable Means” is defined in Section 72 of the Control of Pollution Act 1974. “Practicable” means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications. The means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures’.

6.2.4 Vibration is also subject to control by the mechanisms of [BEE/B16] Sections 60 and 61

6.2.5 A key mechanism for managing the impact of noise will be through adherence to site working hours.

6.2.6 Mitigation will start with noise and vibration minimisation at source: for example the avoidance of noisier methods of working in the vicinity of residential properties or hotels. In addition, noise and vibration will be minimised by screening and positioning: for example local screening of equipment or perimeter hoarding; as well as careful selection of the location of equipment on site.

6.3 Operation

- 6.3.1 Incorporated mitigation of operational noise and vibration consists of the provision of resilient rail encapsulation and, if required, floating track slab. As explained in 10.2.4 of the ES and 3.3.36 of the Update to the ES, additional potential sources of noise from tram operation include curving noise and wheel squeal which will be controlled by rail lubrication points and in-tram lubricators. Friction modifiers will be applied to rails to reduce curving noise.

7. OVERVIEW OF ASSESSMENT

7.1.1 This section summarises the significant residual effects of the scheme. More detailed information in relation to premises associated with objectors is provided Section 9.

7.2 Findings of assessment of construction phase

7.2.1 Following the incorporation of proposed mitigation measures, the assessment of demolition and construction noise shows, in table 3.5 of the Update to the ES [BEE/A13/5] also reproduced with addresses for ease of reference in my Appendix 4 [APP/P5.3], that there are adverse effects predicted at a minority of locations, and significant effects predicted at four locations during Task 1 (road surface works) and Task 4 (Material excavation for track formation. The durations of these tasks in the locations affected will be much shorter than the overall construction program periods of 335 days and 460 days respectively. However, for assessment purposes they are assumed to be for a duration of one month or more as explained in 10.2.90 of the ES [BEE/A13/1]. In cases where SOAEL is exceeded, in order to avoid SOAEL as required by policy the buildings concerned may be eligible for noise insulation in accordance with the Code of Construction Practice paragraph 4.4 [Appendix D2 to the ES BEE/A13/2]. For non-residential receptors, mitigation may involve timing of noisy works to avoid periods when sensitive uses are occurring.

7.2.2 Vibration levels are predicted to exceed SOAEL at 6 locations (10.6.15 and Table 10.4) and to exceed LOAEL at 12 locations. The source in these cases is vibratory rollers, and to avoid SOAEL it will be necessary to use alternative methods of working in the vicinity of the relevant 6 receptors. For the 12 locations likely to experience vibration above LOAEL but below SOAEL, mitigation by the application of Best Practicable Means will be required.

7.2.3 Construction traffic will be managed via the CoCP (10.6.1), and a specific route provided in order to minimise any impacts at existing sensitive receptors. The timing and access points to the site should be formulated with the intention of minimising noise impacts, through the use of screening, minimising the need to use reverse alarms and by avoiding vehicle body noise during passage over rough ground. The effect is dependent purely upon the number of HGV deliveries, it is considered in the ES (10.6.12) that any noise effects can be controlled through the use of correct traffic management procedures.

7.3 Findings of assessment of operational phase

- 7.3.1 The ES findings are superseded by the Update to the ES, and table 3.8 (as amended) shows that in the short term there are 407 residential receptors with predicted adverse effects but no predicted significant adverse effects in the daytime period and 406 residential receptors with predicted adverse effects but no predicted significant adverse effects in the night-time period. In the long term there are is one adverse effect in the daytime only and no significant adverse effect.
- 7.3.2 With regard to groundborne noise, the ES results are superseded by the Update to the ES. There are no predicted exceedances of LOAEL or SOAEL for residential receptors (although four come within 5 dB of the residential criterion), but there is a high risk of non-compliance with the ground-borne noise policy criteria for three non-residential receptors: The Birmingham Civil Justice Centre (R4) which has a policy criterion of 35dB and a predicted L_{Amax} of 38dB; Digbeth Hall that has a policy criterion of 25dB and a predicted L_{Amax} of 38dB; and 6 Coventry Street that has a policy criterion of 25dB and a predicted L_{Amax} of 28dB. A detailed assessment leading, if necessary, to consideration of mitigation through enhanced vibration isolation in the trackform and formation will be required with respect to these locations. Available methods will ensure that adequate results are obtained.
- 7.3.3 With regard to vibration, the ES finds that (10.7.14) neither SOAEL nor LOAEL are likely to be exceeded.

8. ISSUES RAISED BY OBJECTORS

8.1.1 I have read and considered the objections, representations and Statements of Case associated with BEE. Of the objectors who have put in Statements of Case, one mentions noise, namely Hotel La Tour.

8.2 Hotel La Tour (HLT) [OBJ/12]

Grounds of objection

8.2.1 Hotel La Tour's objection [OBJ/12/1/SOC] raises the concerns that

- i. The order would have a significant impact on HLT and
- i. the nature of the mitigation strategies relied upon by the authority to minimise any impact on HLT are unspecified and unclear.

Response to objection

8.2.2 HLT is include in table 10.4 of the ES [BEE/A13/1] as a receptor location, Hotel La Tour/Albert Street R9, at 15m from the alignment. This is now updated in table 3.3 of the Update to the ES as a distance of 12m for the reasons explained in 3.3.6 (ibid).

8.2.3 The baseline noise level, and the predicted noise during the construction phase are provided in table 10.15 of the ES for R9 in the unmitigated case and in table 10.22 of the ES for the mitigated case. These are updated as tables 3.4 and 3.5 in the Updated to the ES. Noise is not predicted to be above SOAEL but is shown as above LOAEL for tasks 1, 2, 4, 5 and 6.

8.2.4 More detailed noise survey data are provided in Environmental Statement Volume 2 Technical Appendix M1: Noise and Vibration Technical Information [BEE/A13/2] in paragraph 1,5,16 where Position LT1 is a long-term unattended measurement location and positions ST3 and ST4 are short term attended measurement locations outside the south west and south east facades respectively. These locations are shown in Figure 1.3 of Appendix M1 and the results are given in tables 1.7 and 1.8 with photographs in Figure 1.4. The Hotel is within the area covered by figure 1.5 to 1.20 in terms of modelled future noise level. A groundborne noise assessment is provided in Table 10.21, updated in table 3.10 of the Update to the ES. Table 10.19 in the ES shows the significance of impacts during the operational phase for Albert Street, which shows a short and long term significant adverse impact. The Update to the ES (as amended) shows in tables 3.6 and 3.7 that there are no sensitive receptors with an increase of 5 dB L_{Aeq} or more. (As explained in 5.1.2 above, the reference to 1 receptor with an increase of 10+ is to the location which will become

the HS2 Station). The updated table 10.19 (Appendix 4 APP/P5.3) shows no adverse effects in Albert Street.

9. CONCLUSIONS

- 9.1.1 My evidence to this inquiry addresses the issues raised in the statement of matters.
- 9.1.2 My conclusions are that there are no predicted significant adverse effects caused by the operation of the scheme. In the short term only there are predicted adverse effects but no significant adverse effects. The mitigation measure that is indicated as necessary in the Update to the ES is the provision of measures including friction modifiers to avoid the occurrence of wheel squeal and any significant effect therefrom.
- 9.1.3 As regards those significant effects that are currently predicted to occur during the construction phase, controls under the CoCP will ensure that the best practicable means will be used to control noise and vibration thereby minimising these effects. Avoidance of significant adverse effects can where necessary be achieved through the provision of noise insulation.

10. STATEMENT OF TRUTH

10.1.1 I hereby declare as follows:

- i. This proof of evidence includes all facts which I regard as being relevant to the opinions that I have expressed and that the inquiry's attention has been drawn to any matter which would affect the validity of that opinion;
- ii. I believe the facts that I have stated in this proof of evidence are true and that the opinions I have expressed are correct; and
- iii. I understand my duty to the inquiry to help it with matters within my expertise and I have complied with that duty.

Rupert Thornely-Taylor

13 October 2017