TRANSPORT AND WORKS ACT 1992

TRANSPORT AND WORKS (INQUIRIES PROCEDURES) RULES 2004

THE NETWORK RAIL (CAMBRIDGE SOUTH INFRASTRUCTURE ENHANCEMENTS) ORDER

SUMMARY PROOF OF EVIDENCE

ON MATTERS OF NOISE & VIBRATION

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ON BEHALF OF THE UNIVERSITY OF CAMBRIDGE

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1 INTRODUCTION

1.1 My qualifications and experience are set out in Section 2 of my main Proof of Evidence.

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 Fellow of the International Institute of Acoustics and Vibration. I have specialised exclusively in the subjects of noise, vibration and acoustics for more than 57 years.

2 SCOPE OF EVIDENCE

2.1 My evidence concerns the effects of airborne noise ("**noise**") and vibration from the construction of the scheme ("**Scheme**") the subject of the proposed Network Rail (Cambridge South Infrastructure Enhancements) Order ("**Order**"), and from the operation of the Scheme, on the Anne McLaren Building ("**AMB**") owned by the University of Cambridge ("**University**").

2.2 I have been instructed by the University to consider, in particular, the effects on occupants and specialist equipment used in the AMB that is sensitive to noise and vibration and effects on rodents and fish housed in the vivarium in the AMB.

2.3 The University also has an interest in the nearby area of land known as "Plot 9" and I briefly consider the potential effects of the Scheme on the development and use of Plot 9.

3 THE WORKS PROPOSED AND THE UNIVERSITY'S CONCERNS

3.1 Scheme works are proposed in the vicinity of the Cambridge Biomedical Campus ("**CBC**"), on which are located a number of buildings sensitive to noise and vibration.

3.2 The Environmental Statement for the Order ("**ES**") reports that there will be significant effects due to noise and vibration on facilities in premises on the CBC owned and operated by the University, namely the AMB.

3.3 The AMB houses research facilities which are sensitive to noise and vibration. These include sensitive scientific instruments, specifically a Magnetic Resonance Imaging instrument ("**MRI**"), and a vivarium in which there are rodents (mainly mice, but also some rats) and fish.

4 POTENTIAL NOISE AND VIBRATION EFFECTS

4.1 There are known limits of acceptability for noise and vibration with regard to the MRI, the rodents and the fish, which are of the species Danio rerio (Zebrafish).

4.2 The AMB was designed and constructed in order that noise and vibration from existing sources, notably the railway line, road vehicles and other external sources in the baseline environment, would not exceed acceptability limits and there are currently no adverse effects of this kind.

4.3 Were acceptable limits for noise and vibration to be exceeded, the following effects would result. In the case of the MRI, image quality would be harmed and therefore research of which it forms part would be disrupted or delayed. In the case of the rodents, the successful breeding of which is essential, the effect of excessive noise or vibration would be behavioural disturbance and interference with reproduction including infertility, abortion, mismothering or cannibalism of pups. In the case of fish the potential effects are behavioural disturbance and hearing damage.

5 THE ENVIRONMENTAL STATEMENT

5.1 The ES did not consider all the potential effects of noise and vibration caused by the construction and operation of the proposed Scheme works on sensitive receptors in the AMB. With regard to noise, only effects on human beings were considered and were found to be significant during the construction phase. With regard to vibration, effects due to some of the likely sources associated with the Scheme were considered. Adequate mitigation to remove significant effects was not proposed in the ES.

5.2 The noise and vibration chapters of the ES lack sufficient information to enable other than a broad assessment to be made, with no clear indication of locations and durations of many construction activities. Some construction activities are specifically excluded from the assessment. With regard to the operational phase the ES explicitly excludes, for example, vibration from freight trains.

6 VIBRATION THRESHOLDS

6.1 While limits of acceptability for the different types of sensitive receptor in the AMB can be expressed using a number of different indices, with regard to vibration the University, in the design of the AMB, reduced these to a set of criteria based on what are known VC curves. For the MRI, the relevant VC curve was what is known as VC-

C. With regard to vibration effects on mice the relevant criterion was a modified version of VC-A.

6.2 In the current baseline conditions, modified VC-A is not exceeded. VC-C is slightly exceeded during the passage of freight trains on the railway, but detailed examination of freight train vibration shows that it is just possible for the specific MRI equipment ultimately installed in the AMB to be used without exceeding its tolerance thresholds, even though the formalisation of those thresholds by the instrument manufacturers in simplified terms results in limits being slightly exceeded.

7 FURTHER INFORMATION FROM NETWORK RAIL

7.1 Following receipt of the University's Statement of Case, and commentary on the ES and its shortcomings, Network Rail have provided some additional information, mainly with regard to vibration.

7.2 The current information provided by Network Rail is that vibration may exceed the AMB's VC thresholds during the construction phase of the Scheme. During the operational phase, provided that key assumptions relating to the proposed new track and its operation can be relied on, modified VC-A will not be exceeded during operation but VC-C will be exceeded during the passage of freight trains to a slightly greater extent than is the case for the existing railway. I comment in my main Proof of Evidence on the need to consider a related but different approach to VC-C when considering vibration impacts on specific sensitive equipment in the AMB.

7.3 With regard to the construction phase of the Scheme, Network Rail intend to monitor and control noise and vibration through the Code of Construction Practice part B, and through monitoring and limitation of received levels. What is not known is whether it is practicably possible to apply mitigation methods in terms of control of methods of working, selection of machinery and use of mitigation measures including noise barriers so as to comply with acceptability criteria. In the event that there would be periods when those criteria could be exceeded, there is insufficient information to be able to predict when and for how long such exceedances may occur. The proposed structure and details of a monitoring, warning and limitation protocol are not known.

8 REQUIRED MITIGATION

8.1 Mitigation may be either in the form of physical works, or measures to reduce or limit noise and vibration, including the adoption of an effective protocol for predicting,

monitoring and managing (including stopping work) the levels of noise and vibration caused.

8.2 However the nature and degree of mitigation required is currently not capable of assessment by the University in the absence of adequate assessment by Network Rail. I have therefore identified key criteria relating to noise and vibration to avoid disturbance to operations within the AMB.

9 CONCLUSIONS

9.1 My conclusions are set out fully in my main Proof of Evidence but, in summary:

9.1.1 there is insufficient information to properly assess the effects of the Scheme on relevant receptors in the AMB;

9.1.2 the University has requested further information from Network Rail, some of which has been received, but some of which is still awaited (as detailed in my main Proof of Evidence);

9.1.3 there are a number of likely significant residual effects of the Scheme on the AMB with regard to human beings, sensitive MRI equipment, rodents and fish, during both construction and operation of the Scheme;

9.2 Consequently, adequate mitigation needs to be secured to ensure that construction and operation of the proposed Scheme is carried out in a manner which permits continuance of the research work in the AMB.

9.3 In the case of construction effects (and in relation to operational vibration effects relating to animals), it will also be necessary to establish protocols and method statements which will identify and avoid potential unacceptable interferences with the use of the MRI or research activity.

9.4 All such mitigation will need to be secured by way of Protective Provisions on the face of the Order and/or in a Land and Works Agreement.

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