CEMEX UK and Grundon Waste Management Limited

Grundon Waste Management Depot Banbury

Supplementary Note on Noise Mitigation

15 September 2017

Consultants in Acoustics Noise and Vibration Control
Saxtead Hall, Saxtead, Woodbridge, Suffolk, IP13 9QT
Telephone: 01728 727424

e-mail: rmtt@ruperttaylor.com
http://www.ruperttaylor.com
h

CONTENTS Page

ISSUE AND REVISION RECORD

Issue	Revision	Date	Revision
1	0	16/08/2017	
1	1	15/09/2017	Takes account of Network Rail consultation response

1. INTRODUCTION

Rupert Taylor Ltd was instructed by JSA Architects and Planners on behalf of CEMEX UK and Grundon Waste Management Limited to carry out a study of the levels of airborne noise and groundborne vibration on an application for outline planning consent for a proposed residential development site at Higham Way, Banbury adjacent to the Chiltern Valley Mainline Railway.

A report describing the work undertaken and the findings of the study was issue in November 2015, referred to below as the noise and vibration assessment.

That report assessed the site in relation to Cherwell District Council's local policy on the basis that no noise mitigation was in place. However, that report did include reference to possible noise mitigation methods.

This Supplementary Note provides further discussion of noise mitigation and relates it to an illustrative housing layout shown in the document 'Site Constraints and Opportunities Analysis – Design Evolution' prepared by JSA Architects in May 2017. It takes into account the consultation response of Network Rail who are, among other things, concerned that there should be mitigation measures and conditions to ensure that any existing noise and vibration, and the potential for any future noise and vibration are mitigated appropriately prior to construction.

2. FUTURE INTENSIFICATION OF THE RAILWAY

Network rail are concerned about the following matters relating to noise and vibration:

The light maintenance depot

Network Rail comment that the development "is in close proximity to the light maintenance depot which has been approved by Cherwell council, the developer should undertake noise and mitigation measures in conjunction with the local planning authority"

The noise and vibration assessment notes that although predicted depot levels are below the average railway noise levels on the application site the noise level between trains would be lower and so there is the potential for disturbance at the part of the site nearest to the depot, particularly at night. However, the report notes that the noise mitigation that would be incorporated into the design with respect to operational railway noise would also mitigate noise from the depot.

Future intensification

Network Rail advise that:

"The current level of railway usage may be subject to change at any time without prior notification including increased frequency of trains, night time train running, heavy freight trains, trains run at weekends /bank holidays."

"The proposal should not prevent Network Rail from its statutory undertaking. Network Rail is a track authority. It may authorise the use of the track by train operating companies or independent railway operators, and may be compelled to give such authorisation. Its ability to respond to any enquiries regarding intended future use is therefore limited."

"The scope and duration of any Noise and Vibration Assessments may only reflect the levels of railway usage at the time of the survey."

"Design and layout of proposals should take into consideration and mitigate against existing usage of the operational railway and any future increase in usage of the said existing operational railway."

The noise and vibration assessment deals with intensification in its treatment of uncertainty, where the effect of increases of 25%, 50% and 100% in the number of trains and/or all train speeds are considered. There is no change in the categorization of the site using the criteria of Cherwell Policy ENH8 at night, and only in the case of 100% increase in train numbers, of a train speed increase of 25% or more does the category change from (iii) to (ii), and speed would have to increase by 50% to reach category (i). These levels of intensification are not realistically likely to occur. While the number of freight trains could increase, their axle weight is unlikely to increase substantially and while the duration of vibration from freight trains may increase, and was considered in the noise and vibration assessment, the magnitude is unlikely to increase substantially.

The only future change which might occur that would materially increase vibration would be degradation of the track or its supporting formation, which it would be necessary for Network Rail to rectify at this site as at all other sites.

Night maintenance noise

Network Rail advise that

"Maintenance works to trains could be undertaken at night and may mean leaving the trains' motors running which can lead to increased levels of noise and vibration."
"Light maintenance depots can operate around the clock including at night, during weekends and bank holidays"
"Network Rail also often carry out works at night on the operational railway when normal rail traffic is suspended and often these works can be noisy and cause vibration."
"Network Rail may need to conduct emergency works on the existing operational railway line and equipment which may not be notified to residents in advance due to their safety critical nature, and may occur at any time of the day or night, during bank holidays and at weekends.
Works to the existing operational railway may include the presence of plant and machinery as well as vehicles and personnel for project or emergency works."

Night maintenance work would not be frequent or repetitive enough to be capable of assessment in terms of noise and vibration impact using established criteria and is normally scoped out of environmental assessments. There are many locations along Network Rail lines where there is residential development as close to the railway as at this site, and Network Rail have therefore to adopt methods of working and noise management to minimise disturbance as a matter of routine. Only were they to act negligently would they be at risk of successful legal action.

3. POTENTIAL NOISE MITIGATION METHODS

Noise mitigation can be applied at the source of the noise, to the noise transmission path, or at the receiver location (or a combination of these positions).

In this case, mitigation of noise at the source (*ie*, the trains and railway infrastructure) is outside the control of the applicant and so has not been considered further in this note.

Noise mitigation of the noise transmission path can be provided a by barrier that intersects the line of sight between the source and the receiver and an example of that is discussed below.

Noise mitigation at the receiver, which is often inside a building, can be provided by a façade that exhibits a high resistance to sound transmission and that approach is also discussed in this report.

Finally, there are mitigation techniques which could be categorised as mitigation to the transmission path or the receiver; examples are the

orientation of the building and the internal layout. This category is also considered in this note.

4. MITIGATION USING A NOISE BARRIER

This method relies on the barrier interrupting the direct noise transmission path between the noise source and the receiving location, *ie*, the 'line of sight'. The two most important factors that determine its effectiveness are its height in relation to the heights of the source and receiver and its location along the noise transmission path. Thus if the source and receiver are each at a height of 1.5m above the ground, for example, then the principal noise transmission path is parallel to the ground at a height of 1.5m and so a barrier must have a height of at least 1.5m if it is to provide significant noise reduction. However, if the source is at a height of, say, 1.5m, but the receiver is at a height of, say, 4m, then the principal noise transmission path is not parallel to the ground but increases in height between the source and receiver. Consequently, the height required for a noise barrier to be effective will be greater than in the first example and, furthermore, the height required will depend on its location along the noise transmission path. The effectiveness of a noise barrier is primarily determined by the "path difference" which is the difference between the length of the line of sight in the absence of the barrier and the sum of the lines from source to the top of the barrier and from the top of the barrier to the receiver. The greater the path difference the more effetive is the noise reduction afforded by the barrier.

All trains generate noise from the action of the wheels rolling along the rails and the height of that source of noise is taken to be the head of the rail itself[1]. For locations at a low elevation, *ie*¸ the ground floor of dwellings and the amenity areas between the blocks, a noise barrier as indicated in the document 'Site Constraints and Opportunities Analysis – Design Evolution' could provide a useful reduction of the 'wheel-rail noise' from passenger trains operated by diesel multiple units and freight trains where the locomotive is not running on full power.

However, if a locomotive is running on full power then, because the noise source is at a higher position[2], the screen would be less effective and only the part of the site nearest to barrier at ground level might benefit.

The detailed effect of this screen can only be evaluated in relation to a specific scheme where the heights and locations of buildings, façades, and windows are known. Network Rail have indicated constraints that may, subject to the result of their review of the detailed proposals, limit the proximity of the noise

[1] Calculation of Railway Noise 1995. Department for Transport. ISBN 011551754 5
[2] 4m above the nearside railhead, see footnote 1.

barrier to the boundary of the Network Rail land, and its height, such that the path difference achievable will be affected.

5. MITIGATION USING FAÇADE NOISE INSULATION

The noise level inside a building is clearly determined by the combination of the external noise level and the noise reduction provided by the façade[3]. In most conventional buildings the noise reduction of the façade is determined by the design of the windows, including whether they are single-glazed or double-glazed. Of course, if the window is open, for ventilation for example, then the façade's noise insulation will be much reduced. In order to provide a high degree of façade noise reduction the windows need to be closed which necessitates having an alternative means of ventilation.

The November 2015 report found that based on the open site (*ie*, with no buildings or noise barrier on it) noise levels on parts of the site were such that Cherwell DC's noise policy would require the development to incorporate suitable sound insulation and mechanical ventilation as part of the design.

The illustrative scheme proposed does exactly that by using mechanical ventilation in the design so that windows can remain closed where necessary and can be suitably specified to provide the required level of façade noise reduction.

6. MITIGATION PROVIDED BY THE FORM OF THE DEVELOPMENT

The November 2015 report assessed the predicted noise levels on the site in the absence of any development but noted that buildings on the site would affect the noise levels and could lead to lower noise levels, particularly at location further from the railway.

The 2017 report 'Site Constraints and Opportunities Analysis – Design Evolution' illustrates three ways in which buildings might be laid out on the site:

- Option 1: Backing onto the railway (a so-called' barrier bock') - to screen the rest of he site
- Option 2: Enclosed blocks - to form protected courtyards
- Option 3: Angled blocks perpendicular to the railway

The Design Evolution Report considers the benefits and disadvantages of these three options for a range of factors (*ie*, not only for noise). A noise benefit of the layout in Option 3 is that one façade of each block has a reduced exposure

[3] The acoustic absorption of the internal surfaces can also affect the internal noise level. The effect of internal acoustics absorption and façade noise reduction are both frequency dependent.

to the railway in comparison to a layout parallel the railway (the layout shown in Option 1) and the other façade of the block faces in the opposite direction to the railway. The effect of this reduced exposure is greatest towards the rear of the central part of the site where a reduction in the average noise level[4] of more than 5dB has been estimated.

The illustrative design incorporates double–aspect rooms and so residents have windows on a façade that faces away from the railway as well as windows having an oblique view of the railway. This offers residents the option to open a window on the façade facing away from the railway if they wish to have an open window without being as directly exposed to railway noise as they would if they opened windows on the other façade.

Where balconies are provided there is the potential to consider noise mitigation for that outside space in the form of so-called 'winter gardens' to reduce noise levels in comparison with a completely open balcony.

7. SUMMARY AND CONCLUSIONS

The November 2015 Noise and Vibration Report concluded that for some parts of the site windows would need to be closed and alternative means of ventilation provided in order to provide an acceptable internal noise level. The extent of that provision could not be determined because development on the site would itself affect the propagation of noise across it and would therefore reduce noise levels particularly for areas further from the railway compared to an undeveloped site.

The illustrative design in the 2017 'Site Constraints and Opportunities Analysis – Design Evolution' report shows that incorporating mechanical ventilation in the design and thereby allowing windows to remain closed and specified to provide adequate noise reduction could be applied to the whole development if necessary to ensure appropriate internal noise levels. That design approach aligns with Cherwell DC's policy for developing housing on sites affected by noise.

The illustrative design also shows that a noise barrier could be incorporated into the design to provide some noise mitigation for the amenity areas and the ground floor apartments.

All of Network Rail's concerns regarding noise and vibration are, or are capable of, being satisfactorily addressed.

[4] $L_{Aeq,T}$