

Agenda Item 3

WEST AREA PLANNING COMMITTEE

9th June 2015

Application Numbers: 13/03202/CND and 14/00232/CND

Decision Due by: (respectively): 21/02/2014 and 22/04/2014

Proposals: Details submitted in compliance with condition 19 (Operational Noise and Vibration) of TWA ref: TWA/10/APP/01 (The Chiltern Railways (Bicester to Oxford Improvements) Order - deemed planning permission granted under section 90(2A) of the Town and Country Planning Act 1990).

13/03202/CND – vibration: plain line, section H

14/00232/CND – vibration: switches + crossings, section H

Site Address: Chiltern Railway From Oxford To Bicester **Appendix 1**

Ward: Wolvercote Ward

Agent: Andrew Deacon (ERM)

Applicant: Network Rail

Recommendation:

CONDITION 19 BE PARTIALLY DISCHARGED IN RELATION TO THE VIBRATION SCHEMES OF ASSESSMENT FOR SECTION H.

For the following reasons:

- 1 The two Vibration Schemes of Assessment are considered to be robust and have demonstrated that the required standards set out in the Noise and Vibration Mitigation Policy will be achieved.
- 2 The Council considers that the proposal accords with the policies of the development plan as summarised below. It has taken into consideration all other material matters, including matters raised in response to consultation and publicity. Any material harm that the development would otherwise give rise to can be offset by the conditions imposed.

Subject to the following condition, which has been imposed for the reasons stated:-

1. The development is to be carried out strictly in accordance with the documents titled “East-West Rail; Phase 1 Chiltern Railways Company Limited Plain Line Vibration Assessment and Mitigation” (ref 5114534-ATK-VIB-RPT-80001 rev P07) dated 16 January 2014; “East-West Rail; Phase 1 Chiltern Railways Company Limited Vibration from Switches & Crossings – Assessment and Mitigation” (ref 5114534-ATK-VIB-RPT-80003 rev A01) dated 21 January 2014; the ERM letter to the Council dated 29 April 2015

(including the Atkins Technical Note titled “East West Rail Phase 1: Vibration Assessment for Proposed Relocation of Switches and Crossings in Section H” dated 28 April 2015); and drawing numbers 0221083_SecH_Sheet24_Ver1, 0221083_SecH_Sheet25_Ver1, 0221083_SecH_Sheet26_Ver1 and 0221083_SecH_Sheet27_Ver1 all dated May 2015. In the event of conflict between these drawings and other documents the four May 2015 drawings shall prevail and as between the other documents the later produced document shall prevail

Reason – the vibration scheme of assessment has been prepared upon the basis of these drawings and the potential for deviation from them would not result in the achievement of the standards of vibration mitigation required by the Noise and Vibration Mitigation Policy (January 2011)

With the addition of the following informative:

1. The Applicant is advised that its offer to monitor vibration effects of the development is regarded as highly desirable and the results should be provided to the local planning authority and publicised generally.

Main Local Plan Policies:

Oxford Local Plan 2001-2016

CP6 - Efficient Use of Land & Density

CP10 - Siting Development to Meet Functional Needs

Core Strategy

CS6 - Northern Gateway

CS13 - Supporting access to new development

CS27 - Sustainable economy

Other Main Material Considerations:

- National Planning Policy Framework
- National Planning Policy Guidance
- Emerging Northern Gateway AAP (currently awaiting Inspector’s Report)
- Environmental Information
- Other comments representations and submissions made in connection with the applications
- The deemed planning permission of 23 October 2012 and documents related to it including the Noise and Vibration Mitigation Policy (January 2011)

Purpose of the Report

1. The Committee is being asked to consider and determine the acceptability of two Schemes of Assessment which have been submitted in order to discharge the vibration elements of Condition 19 to the deemed planning permission for East West Rail Phase 1.

Description of East West Rail Phase 1

2. East West Rail Phase 1 uses the exiting route of the Bicester/Oxford rail line, **Appendix 1**. This crosses from the north into the City administrative area just north of the Lakeside development, passes under the Wolvercote roundabout and continues south through Wolvercote village, over the Oxford Canal, past the west side of the Waterways developments (including Stone Meadow), the Waterside developments (including Plater Drive, Rutherford Way and William Lucy Way) and the Rewley Road developments, and then into Oxford Station.
3. The original permission was described in terms of Phase 1, 2A and 2B – these are all now encompassed in the term East West Rail Phase 1 and involve:
 - i. replacing the existing Bicester/Oxford track for its length within the city up to a point opposite Stone Meadow where it deviates west of the existing line and joins the main line near the existing Aristotle Lane crossing; and,
 - ii. constructing a new line to the west of the existing line which joins the main line opposite Stone Meadow.
4. Some proposals which were in the original permission are not now being implemented, namely:
 - a new track from opposite Stone Meadow into the Oxford Station close to the eastern side of the exiting extent of railway land;
 - a new short spur from that track into the station (together with a new platform) which commenced just north of the Rewley Road Swing Bridge; and,
 - a shorter link which was to have joined the new line (ii above) to the main line in the vicinity of Stone Meadow.
5. The details relevant to these applications are shown on the documents titled “East-West Rail; Phase 1 Chiltern Railways Company Limited Plain Line Vibration Assessment and Mitigation” (ref 5114534-ATK-VIB-RPT-80001 rev P07) dated 16 January 2014; “East-West Rail; Phase 1 Chiltern Railways Company Limited Vibration from Switches & Crossings – Assessment and Mitigation” (ref 5114534-ATK-VIB-RPT-80003 rev A01) dated 21 January 2014; the ERM letter to the Council dated 29 April 2015 (including the Atkins Technical Note titled “East West Rail Phase 1: Vibration Assessment for Proposed Relocation of Switches and Crossings in Section H” dated 28 April 2015); and drawing numbers 0221083_SecH_Sheet24_Ver1, 0221083_SecH_Sheet25_Ver1, 0221083_SecH_Sheet26_Ver1 and 0221083_SecH_Sheet27_Ver1 all dated May 2015 the applications being in respect of Section H.

Background and Relevant Planning History

6. The Transport and Works Act application for the project, which was known at the time as 'Chiltern Evergreen 3', was submitted by Chiltern Railways to the Department for Transport on 6th January 2010.
7. A Public Inquiry into the scheme was held between 2nd November 2010 and 28th January 2011. The outcome was that the Secretary of State was minded not to make the Order (by letter dated 15th November 2011) because the likely lack of a licence for works affecting the habitat of bats (in the Wolvercote Tunnel) would be an impediment to the implementation of the scheme.
8. Progress was made on this issue and the Secretary of State informed the respective parties (by letter dated 24th January 2012) that she was now minded to approve the scheme. Responses to that letter however were such that the Inquiry was re-opened between 29th May and 15th June 2012 to cover the proposed mitigation measures for bats, the planning conditions relating to operational noise and vibration, and the air quality impacts of the scheme.
9. By letter dated 17th October 2012 the Secretary of State approved the scheme and granted deemed planning permission subject to conditions. The deemed planning permission was issued in a letter dated 23 October 2012.
10. *Sustainability*: in granting deemed planning permission for the scheme, the Secretary of State concluded that there is a compelling case to increase rail capacity between Oxford and London, and that the scheme would bring substantial transport benefits in terms of reduced travel times, better public transport connectivity, and better rail network capability. In the decision, the Secretary of State weighed these sustainability benefits against the potential adverse impacts that the scheme might cause. Those considerations gave rise to several of the planning conditions dealing with the natural environment and to residential amenity, including Condition 19 (reproduced in full in **Appendix 2**) which focusses on mitigating adverse impacts of noise and vibration on residential amenity. The assessment and mitigation of the predicted vibration impacts of East West Rail in accordance with Condition 19 are the subject of this report.
11. The City Council's jurisdiction in this matter relates only to the works within its administrative boundary. Cherwell DC has jurisdiction for the scheme within its area.
12. The other applications, mainly for approval of conditions, which have been made following the grant of deemed planning permission are as follows:
 - 13/00907/CND** - condition 19 - appointment of Independent Experts - PARTIALLY DISCHARGED 2nd May 2013.
 - 13/00917/CND** - condition 18 - Code of Construction Practice - DISCHARGED 17th September 2013.

13/00918/CND - condition 3: Development Sections - DISCHARGED 7th May 2013.

13/01276/CND - condition 9: Archaeology - PARTIALLY DISCHARGED 6th June 2013.

13/01342/CND - condition 11: Contaminated Land - PARTIALLY DISCHARGED 20th August 2013.

13/01965/CND - condition 6: implementation and maintenance of railway fencing between chainages 124995 (beginning of section H) and 127980 (approximately halfway through section I) - PARTIALLY DISCHARGED 28th January 2013.

13/03209/CND – 11: Contaminated Land - PARTIALLY DISCHARGED 19th June 2014.

14/00007/CND - condition 31: Measures for the protection of the Oxford Meadows Special Area of Conservation and condition 32: Hook Meadow and Trap Ground Site of Specific Scientific Interest - PARTIALLY DISCHARGED 16th June 2014.

14/02962/CND - condition 19: appointment of replacement Independent Expert for Noise - PARTIALLY DISCHARGED 6th November 2014.

14/03453/CND - condition 11: Contaminated Land - Scheme of Investigation - PARTIALLY DISCHARGED 16th March 2015.

15/00429/PDC - PERMITTED DEVELOPMENT CHECK - Proposed temporary compounds. PERMISSION NOT REQUIRED 20th February 2015.

15/00442/CND - condition 16: Method Statement: SSSIs - PARTIALLY DISCHARGED 7th April 2015.

15/00956/CND - condition 19: Operational Noise, section H – PENDING CONSIDERATION.

The Requirements of Condition 19 - noise and vibration

13. Condition 19 is entitled “Operational noise and vibration monitoring and mitigation” and is a relatively complex condition with a number of components. Its core requirements are that:

- operational noise and vibration monitoring and mitigation are to be carried out in accordance with the Noise and Vibration Mitigation Policy, **Appendix 3**, which was approved by the Secretary of State; and
- development within each section of the scheme (Section H shown on the site plan in **Appendix 1**) is not to commence until noise and vibration schemes of assessment have been approved by the Council.

14. Schemes of Assessment are to be submitted to show how the standards set out in the Noise and Vibration Mitigation Policy will be achieved. The Schemes of Assessment are to be accompanied by a report prepared by an Independent Expert (who has been approved in advance by the Council) commenting on their robustness. The appointment of the Independent Experts: one for noise (Brian Hemsworth) and one for vibration (Dr. Chris Jones), were agreed by Oxford City Council on 2nd May 2013 under planning application reference 13/00907/CND.
15. Residents have expressed the view that the Independent Expert for vibration is unable to provide independent advice because his appointment was flawed in that he commenced work prior to formal discharge of that part of Condition 19. Further, that his appointment does not conform to the Civil Procedure Rules. In response, officers advise that an expert's involvement prior to being approved by the Council is entirely consistent with the condition 19 process; and The Civil Procedure Rules do not apply to this process.

Noise and vibration being considered separately

16. Condition 19 requirements apply both to operational noise and vibration aspects of the scheme. There are similarities and links between these two aspects, since both are generated by the same rolling stock; and a person's perception of railway noise might be affected by structure-borne vibration and vice versa¹.
17. However, the way in which sound and ground-borne vibration are generated, transmitted and perceived are different, as are the resulting methodologies for their measurement and prediction. These differences are reflected in the way that noise and vibration has been treated in the environmental impact assessment, application, public inquiry and resulting deemed permission. In effect condition 19 requires noise and vibration to be treated separately, though in the same context and using similar processes. For that reason this report deals with vibration and the subsequent report deals with noise.

The Noise and Vibration Mitigation Policy – in relation to vibration

18. The Noise and Vibration Mitigation Policy was approved by the Secretary of State in granting deemed planning permission: it sets out the parameters for the analysis contained in the Vibration Schemes of Assessment. Its purpose is to ensure that:

“Vibration from trains will not cause damage to structures, and even without mitigation, will be likely only to give rise to ‘adverse comments from occupiers being possible’ at a few properties that are located very close to the railway. At these locations, appropriate mitigation measures will be provided”.

¹ British Standard BS6472-1:2008 “guide to evaluation of human exposure to vibration in buildings” includes advice on this interaction.

19. The Noise and Vibration Mitigation Policy uses principles contained in British Standard BS647-1:2008 “guide to evaluation of human exposure to vibration in buildings”. This sets numerical ranges, expressed as Vibration Dose Values to predict the “likelihood of adverse comment” as a result of “feelable” vibration. The Noise and Vibration Mitigation Policy sets down thresholds for Vibration Dose Values which this scheme must not exceed: these thresholds are located between the lower and middle of three Vibration Dose Values ranges, below which the British Standard predicts a “low probability of adverse comment”.
20. Thus the threshold Vibration Dose Values which must not be exceeded in this scheme are:
- Day (0700 – 2300 hours): 0.4 m/s^{1.75}
 - Night (2300 – 0700 hours): 0.2 m/s^{1.75}
21. The Noise and Vibration Mitigation Policy requires that trackforms be designed and installed adjacent to occupied vibration sensitive buildings using best practicable means to keep within the thresholds. Where mitigation measures that the Noise and Vibration Mitigation Policy would otherwise require are “not reasonably practicable” the condition allows for an equally effective substitute (previously approved in writing by the Council) unless the Council has agreed in writing that the mitigation measure is not reasonably practicable and that there is no suitable substitute. In the event that the thresholds could not be met, the condition would allow for alternative mitigation or potentially insufficient mitigation to meet those thresholds.
22. The Noise and Vibration Mitigation Policy sets out the assumptions that are to be used in the Schemes of Assessment for the numbers and timing of train movements which are as follows (set out in full for ease of reference):

“1.8 The assessment of noise and vibration has been based on two operational patterns of new train services:

- After the implementation of the works in Phases 1 and 2A, operational services will consist of up to two Chiltern Railways passenger trains per hour each way. The passenger trains will replace the existing passenger service operated by First Great Western between Bicester Town and Oxford stations.*
- After the implementation of the East West Rail (EWR) link including works in Phase 2B, there are likely to be an additional two passenger trains per hour each way.*

Neither Chiltern Railways or EWR will be running passenger trains throughout the night, and services in late evening and early morning will be at a reduced frequency. A small number of passenger trains may arrive in Oxford after midnight or depart from Oxford before 0600.

1.9 In the operation of Phase 1 and 2A, there are likely to be no more freight trains than operate at present, as there will be no new freight destinations that can be served. When the East-West Rail (EWR) link

is in operation, there may be more freight trains. For this reason, additional freight services were included in the noise assessment in the Environmental Statement, so that this reflects a reasonable planning scenario. The actual number of freight services will reflect national freight demand, but will be limited to the maximum number of available freight 'paths' (1 per hour in each direction). Experience shows that about half of the available freight train paths are likely to be used on a given day, which would suggest a reasonable planning scenario of 8 freight train movements between 11pm and 7am. Freight trains will not use the 'new' railway line between Oxford North Junction (where the Bicester to Oxford Line meets the Oxford-Banbury main line) and Oxford, but instead will use the existing main line, as at present.

1.10 The noise and vibration mitigation will be designed based on the assumptions in paragraph 1.8 and 1.9 regarding the numbers and timing of train movements." [Underlining added]

What is a Vibration Scheme of Assessment and how is it judged?

23. The purpose of a Vibration Scheme of Assessment is to predict the impact of vibration on properties and, if pre-agreed thresholds are exceeded, set out mitigation measures and monitoring arrangements. A Scheme of Assessment would therefore be expected to comprise measurements, methodology, modelled predictions and resulting proposals (which might include mitigation and monitoring).
24. Considering this and the requirements of condition 19, the key tests for the submitted Vibration Scheme of Assessment therefore are as follows:
- Is the Vibration Scheme of Assessment sufficient – being a detailed scheme of assessment of vibration effects, with details of proposed monitoring and mitigation measures?
 - Does the Vibration Scheme of Assessment contain measurements, methodology, modelled predictions and resulting proposals (which include mitigation and monitoring if applicable)?
 - Does the Vibration Scheme of Assessment show how the standards of vibration mitigation set out in the Noise and Vibration Mitigation Policy will be achieved?
 - Does the Vibration Scheme of Assessment contain supporting calculations or empirical data, or a combination of the two?
25. In each of these tests there is an implication that as well as the Vibration Scheme of Assessment containing the relevant elements, these have been treated correctly. This leads to the overall test:
- Are the vibration-related elements of the Vibration Scheme of Assessment considered to be sufficiently robust?
26. If any of these tests were not met, the Vibration Scheme of Assessment would need to be rejected. It is the role of the Independent Expert to comment on the robustness of the Scheme of Assessment.

27. However, it is the Local Planning Authority and not the Independent Expert which must decide upon the acceptability of the Vibration Scheme of Assessment. Provided that the submitted Vibration Scheme of Assessment is considered to be robust then its predictions may be relied upon, as may the mitigation and monitoring measures contained within it.

Monitoring

28. The Noise and Vibration Mitigation Policy does not require the monitoring of operational noise and vibration as a continuous exercise: it requires only the monitoring of any mitigation measures that are installed as a result of the findings of the Noise and Vibration Scheme of Assessment (see paragraph 2.11 of the Policy, **Appendix 3**). The Applicant has however voluntarily agreed to monitor and an informative is recommended.

The Submitted Vibration Schemes of Assessment

29. Two Vibration Schemes of Assessment have been submitted: one for plain line dated 16th January 2014 (13/03202/CND) and the other for switches and crossings dated 21st January 2014 (14/00232/CND). These meet the 'content' tests set out in paragraph 24 above. The associated report of the Independent Expert is dated 15th May 2014, **Appendix 4**.

30. As originally submitted the Vibration Schemes of Assessment asserted that the vibration thresholds stipulated in the Noise and Vibration Mitigation Policy would not be exceeded by the East West Rail Phase 1 and consequently no vibration mitigation was proposed. The Vibration Schemes of Assessment were regarded by the Independent Expert as being robust (the test in paragraph 22 above) even taking into account the many technical comments and questions already raised by local people, and the considerable body of local anecdotal evidence about train vibration in the area.

31. Further detailed and well-researched scrutiny by well-informed local residents ensued, raising significant doubts about the robustness of the Vibration Schemes of Assessment and the advice given by the Independent Expert, and requesting that additional independent advice be sought. Interactions representative of that debate are set out in some detail below so that the Committee is able to appreciate the breadth and depth of local concern. Expert rail consultants, ARUP, were appointed to assist the Council in assessing the Vibration Schemes of Assessment. As a result of repeated re-evaluation over the last few months, of the vibration calculations and the associated data and assumptions that underpinned them, Vibration Dose Values were identified above the threshold limits stipulated in the Noise and Vibration Mitigation Policy for properties adjacent to the switches and crossings at Bladon Close. On 29th April 2015 Network Rail agreed to relocate those switches and crossings to a position near Lakeside.

32. The final position of Network Rail is that with the switches and crossings in their revised position adjacent to Lakeside, the Noise and Vibration Mitigation

Policy thresholds will not be exceeded by East West Rail Phase 1 on either the plain line or at switches and crossings, and consequently no vibration mitigation is proposed. Some local people remain concerned however that the possibility of excessive vibration has not been properly evaluated despite the assurances given by ARUP.

Public consultation on vibration

33. There is no requirement for public consultation in relation to the discharge of planning conditions. Extensive public consultation has however occurred in relation to these submissions, namely:

- at the request of Members following a Member briefing in March 2014 two public meetings were arranged in Wolvercote Village Hall in April 2014 (the first convened by officers, the second by convened by Cllr Fooks) to inform local people about the process and progress towards discharge of the conditions, particularly focused on Condition 19, and to invite comments. Some 50 people attended each meeting;
- Network Rail organised a 'technical' meeting to discuss the vibration submissions with the public on 10th June 2014 at The Oxford Hotel;
- Nicola Blackwood MP organized a further very well attended public meeting on 5th March 2015 covering noise and vibration at which the Rail Minister Claire Perry MP was present along with representatives from Network Rail, Chiltern Railways, consultants ERM, and city officers;
- A Webpage on the City Council's website has been set up to help disseminate information between the Council and local people; and,
- Throughout, officers have maintained an 'open door' for the receipt of comments and the circulation of responses.

Public comments and the independent advice received

34. The initial range of public comments received from some 30 local households, Nicola Blackwood MP (also a near-track resident), and the Wolvercote Primary School, are summarized below:

- City Council should not consider taking any decision until they have justified their position unambiguously and ensured that their decision making process is fully evidence-based
- These submissions should be scrutinised robustly: compliance should be put 'beyond all reasonable doubt'
- People feel excluded from the process
- Differences and omissions between what was promised at the public enquiry and what is now proposed
- Atkins report hides behind complicated figures, equations, guidelines and assumptions

- The Council must be under pressure from the rail companies to discharge condition 19
- Costs issues have trumped the needs of residents
- Noise and vibration from passing trains wakes us up and disrupts sleep
- Vibration is felt like an earthquake
- Pictures fall off walls when trains pass
- Plaster cracking and structural cracks because of train vibration
- Heavy goods trains cause vibration which is very disruptive and very unpleasant
- We want to ensure that the enjoyment and structural integrity of our homes are not overlooked in favour of cost savings in the construction of this line
- Doubts about the independence and technical competence of the Independent Expert because he is paid for by Chiltern/NR and selected from a list provided by them. This does not conform to the Civil Procedure Rules.
- The independent Expert should not have summarily dismissed the concerns of local residents
- Need a truly independent review
- There are too many assumptions – need to make assumptions and calculations much more certain. Degree of error – the outcomes could be 3x greater than predicted, not <25% less than the policy allows.
- Measurements were made where vibration is least. Plain Line measurement site is 30' lower and on different ground than properties. Deeply flawed, unreliable, out by factors. To be correct would need to include section between Blenheim Drive and – Bladon Close.
- No geological survey has been performed at or near the sensitive receptors in Wolvercote.
- Track should have a ballasted base, vibration dampeners, or floating slab track.
- Vibration needs to be considered when the ground is saturated
- The line speed at Wolvercote is to be increased to 100 mph for passenger trains and between 60 mph and 70 mph for freight but this is overlooked in the report
- There should be a reduction in the proposed speed of trains: faster trains mean greater impact
- Need to take account of axle load. Could be over 30 tonnes axle weight. Does Network Rail really control the axle-loading on every contract?
- Properties within 20m will suffer increased vibration; Quadrangle House will experience higher VDVs but no mitigation is proposed
- What if the train traffic assumptions used in the prediction model were an underestimate?
- Freight is not under Chiltern Rail's control so can't be predicted, yet part of the upgrade is for freight.
- The EW project is now part of the national strategic rail freight network – is this allowed in the terms of the permission and accounted for in the vibration assessments?

- How do the vibration submissions relate to the Network Rail Freight Market Study, published in October 2013, and to the extant Network Rail Strategic Business Plan?
- The vibration submissions are inconsistent with the Network Rail Freight Market Study, published in October 2013, and to the extant Network Rail Strategic Business Plan.
- Didcot fly ash trains in 2012 had major impacts: these could recur but are not accounted for in the Vibration Schemes of Assessment.
- Does the planning permission allow “open access” freight? Need mitigation for “open access” freight. Concerned that ‘open access’ operators such as Devon and Cornwall Railways will in future operate more frequent, though temporary, services along this line.
- Previously assured that 3m ballast would be used; now 1m proposed.
- The new tracks should be designed and fitted with vibration dampeners from the outset, it is extremely disruptive and expensive to retro-fit them.
- What are the proposals for operational monitoring of noise and vibration?
- Is it true there is no monitoring if no mitigation?
- 2B Bladon Close is less than 20m from the track but not shown – correct map should be used.
- No contour information on the map.
- Condition 19 (Vibration) refers to mitigation to avoid the excessive and structurally damaging vibration which has previously been experienced.
- What is the impact of vibrations on different types of house foundations and has this been accounted for in the report?
- Wolvercote has experienced 3000 tonne freight trains, which have already caused significant, very expensive, structural damage to trackside buildings.
- Adverse impact on school and unacceptability of building new classroom extension close to the line not recorded in Atkins report.
- Pupils learning will be adversely affected by nearby train noise and vibration
- Will the IE visit the site? If not how can he understand local concerns?
- Will the speed of trains be slowed down to attenuate noise and vibration?
- Mitigation should not wait until after construction
- What are the plans for Health Impact Assessment?
- Will diesel particulate filters be used in the trains?
- Can trees and landscaping be used to mitigate noise and vibration and pollution?
- Where can I find out about compensation for any effects of this scheme?

35. In addition, numerous and lengthy technical questions were submitted around the methodology of the Vibration Schemes of Assessment, the data and assumptions used in the calculations, and the outcomes predicted. These were consolidated into a single paper entitled “The Failures of the Atkins Report” (dated 11th July 2014, **Appendix 5**) submitted by local residents Professor Buckley and Dr Dancey on behalf of some residents of Upper Wolvercote and Lakeside (at the time this was a nascent residents’ action group which now extends through all the track-side residential areas and includes some 200 email addresses on its circulation list). This report formed

the basis of most of the subsequent discussions of technical issues, and raised the following concerns:

- the relevance, integrity and objectivity of the data are open to question;
- the methodology causes an underestimate of vibration predictions and there are no safety factors to compensate for uncertainties;
- there are major sources of potential error in the predictions – additional information is needed to quantify them, where it is possible to estimate them the outcome is a breach of the vibration threshold by a large margin;
- the vibration limits must not be exceeded on any day for the foreseeable future. The only valid test of compliance, therefore, is whether the *worst case* day and night VDV_s to be experienced in the future will satisfy the limits;
- the sites chosen for open ground baseline vibration measurement were not geologically or topographically comparable sites to the main vibration receptor buildings and this is contrary to the recommendation of the inquiry Inspector;
- disagree that there is a zero multiplication for external to internal vibration transfer;
- there are errors in the recorded speed of passing trains;
- population of trains passing are more varied than allowed for;
- unclear whether there was bias in the selection of days and time to record passing trains;
- uncertainty around the effect of track-bed and train speed factors;
- no safety factors to compensate for perceived uncertainties;
- cumulative effect of all the errors and uncertainties is significant underestimation of VDV_s;
- no validation against actual measurements.

36. At an early stage Council officers brought these representations to the attention of the Independent Expert for vibration, Dr Chris Jones for two reasons. Firstly, in case any matter raised by residents might cause him to challenge the Vibration Schemes of Assessment further and/or change the opinion he expressed in his report of 15th May 2014; and secondly, to assist Council officers in taking account of local concerns. His responses on the issues raised by local people were summarised in his “IE vibration technical notes for Correspondents” of July 2014 (**Appendix 29**). These notes were circulated to correspondents in September 2014.

37. In July 2014, to assist the Council in assessing the vibration submissions and the related public comments and objections, a further rail vibration expert (ARUP) was appointed, at the Council’s expense, to carry out a specialist review of:

- the submitted Vibration Schemes of Assessment (in relation to the three receptors in the City’s area: The Quadrangle and 3-4 Bladon Close);
- the Independent Expert’s report; and,
- the public comments that were of a technical nature.

38. ARUP's initial report (H01-OB, 29th August 2014) is attached at **Appendix 6**. For both "plain line", and 'switches and crossings', ARUP examined:
- whether the vibration predictions had been calculated in a reasonable manner;
 - whether cautious assumptions had been used in the prediction of operational vibration; and,
 - whether any residual uncertainty in the predictions would make a material difference to the acceptability of the scheme in terms of operational vibration.
39. ARUP concluded that while the general approach of the vibration Schemes of Assessment was reasonable, and many aspects had employed cautious assumptions, in their view two aspects had not employed cautious assumptions:
- i. that the vibration experienced inside a building would be the same as that experienced outside a building; and,
 - ii. that there would be the same variability of freight train using the line after implementation of the scheme as before.
40. ARUP also noted discrepancies between vibration measurements presented in the Environmental Impact Assessment and the Vibration Schemes of Assessment.
41. The incautious assumptions, together with the discrepancies between vibration measurements presented in the Environmental Impact Assessment and the Vibration Schemes of Assessment led ARUP to recommend that before the condition could be discharged further information was required to quantify the residual uncertainties, namely:
- i. estimates of the realistic operational speed of trains as they pass The Quadrangle and Bladon Close;
 - ii. an estimate of the reduction in vibration that will be achieved through track improvement works; and,
 - iii. explanation of the discrepancies between vibration measurements presented in the Environmental Impact Assessment and the vibration Schemes of Assessment.
42. ARUP also concluded that in relation to local technical concerns, the Independent Expert's advice was for the most part sound. ARUP differed from the Independent Expert however in relation to the experience of vibration inside and outside of buildings: in ARUP's view an amplification factor of 4 would represent a cautious approach to vibration prediction in this regard.
43. Between August 2014 and May 2015 there were several rounds of detailed representations from residents, and responses and comments from Network Rail (or their advisors, consultants ERM), ARUP and Council officers. The

documents and outcomes which are representative of those interactions are summarised below:

- i. meeting note of 12th September 2014 in which the Council requested examination by Network Rail of a number of issues arising from the ARUP report of 29th August 2014, Appendix 7;

Summary - Network Rail was asked to clarify: the purpose of the vibration measurements in the Environmental Impact Assessment; why the multiplier factor used for the transfer of vibration from outside to inside a building was 0; to comment on inter-train variability; to comment on the effect of renewed track; to comment on actual train speeds predicted; and to advise when de-vegetation is to occur.

- ii. Network Rail Technical Note published in response in January 2015 Appendix 8;

Summary - Network Rail confirmed that: the vibration data collected for the Environmental Impact Assessment was not intended to be used in the Vibration Scheme of Assessment, it had been collected for a different purpose; the data on the pattern and types of trains using the line which was input to the Vibration Scheme of Assessment was based on the existing train timetable, the predicted timetable and the increase in freight trains as set out in the Noise and Vibration Mitigation Policy; that the use of '0' as the vibration multiplier was based on guidance provided by the Association of Noise Consultants; and that their prediction of inter-train variability was based on track-side monitoring over three days which they regard as representative of the current use of the line.

- iii. 10th February 2015, paper by Professor Paul Buckley (also writing on behalf of the local resident's group) Appendix 9;

Summary – on the appropriate vibration multiplier, the practical problem is to make reasonable, and unambiguously cautious predictions in a situation where there are multiple building types while avoiding the need to model or measure each individual building: writer prefers use of a multiplier of up to 4 used by ARUP on other projects; criticizes use of unreasonably low open ground VDV for 2B and 3 Bladon Close; criticizes omission of a calculation of VDV for the crossing adjacent to Bladon Close, and omission of 4 Bladon Close from any calculations; table included with revised calculations showing exceedence of Noise and Vibration Mitigation Policy acceptable VDV levels. Considers that baseline recording of train movements was 'under-recorded' and leads to serious underestimation of likely scheme VDV.

- iv. 18th February 2015, Revised Technical Note in response from Network Rail, Appendix 10;

Summary – enlarges on previous Technical Note by elaborating on its use of multipliers from the Association of Noise Consultants guidance and considers that assessment is robust; calculations of VDV for crossing adjacent to

Bladon Close shows marginal exceedence using worst-case transfer functions which in their opinion produces overly “conservative” estimates considering that the assessment already includes conservative assumptions for other inputs.

- v. 6th March 2015, a further email and paper from Prof Buckley commenting on Network Rail’s revised Technical Note (iv above) and setting out the residents’ major outstanding concerns, **Appendix 11**;

Summary – errors in the calculations and assumptions in the revised Technical Note lead to calculations for the crossing at Bladon Close being under-estimated; the predictions are not overly cautious using normal statistical analysis; the revised Technical Note repeats the underestimation of train variability. Residents also remain concerned about:

- the effects of geological and topographical differences on the prediction of VDV’s;
- there is evidence that the ground in Upper Wolvercote responds to vibration in a unusual way – it can’t be modelled using data from Port Meadow;
- the continuation of errors in the calculations and the possibility of additional hidden bugs which would corrupt the calculations;
- there is still no serious attempt at validation – residents need greater confidence in the prediction methodology.

- vi. 11th March 2015, ARUP’s final report (H01-OB) including response to Network Rail’s revised Technical Note (iv above) **Appendix 12**;

Summary – the Vibration Scheme of Assessment clarified by the revised Technical Note is robust based on the assumption that the fleet mix, timing and condition of trains will not differ significantly from those assumed in the Noise and Vibration Mitigation Policy; the conclusions reached by the Independent Expert may be relied upon in respect of the plain line but not the switches and crossings where there will be an exceedence at 4 Bladon Close; conformity with the Noise and Vibration Mitigation Policy at the Bladon Close switches and crossings would be likely if lower train speeds than those modelled in the Vibration Scheme of Assessment are considered.

- vii. 27th March 2015, email and paper from Prof Buckley (own comments but supported by other local people) responding to ARUP’s response to Network Rail’s revised Technical Note (vi above) **Appendix 13**;

Summary – disappointing that cannot validate the Vibration Scheme of Assessment by reference to measured vibration; puzzled that ARUP accepts revised multiplier value because this seems an incautious approach and does not take account of the unusual structure of Quadrangle House; puzzled why the effect of switches and crossings on 3 Bladon Close is not accounted for by ARUP; concerned that ARUP has concluded that condition 19 is met in view of: the remaining doubts about the data (the baseline data is not geologically or topographically relevant, contrary to the Inspector’s specification, and does not take account of cuttings or the topography of the tunnel), the lack of

assurance that the train mix may not alter and produce worse vibration than predicted, and remaining concerns about the multiplier factor and the differing responses of different buildings; not convinced by the assurances in the Technical Note that there is unlikely to be more intensive use of the stone train and agree with ARUP that there could be cases in the future where trains could run which produce higher levels of vibration than allowed for; agree that track quality assumption is cautious but this is not a significant safety margin; also train speeds will not reach design speed so this too cautious an assumption; states that only if misgivings about input data are ignored can it be said that VDV will be within the Noise and Vibration Mitigation Policy limit but even then only if train speeds limited to 40mph. Need for a greater safety factor, puzzled that in view of these uncertainties ARUP does not call for a train speed limit. Considers that compliance with condition 19 should be 'beyond reasonable doubt' not just 'likely': suggests 30mph limit needed to achieve that level of certainty. The paper questions why no 'vibration-reducing' track forms are being proposed as suggested in the Noise and Vibration Mitigation Policy. The paper offers a critique of building responses to vibration; and analyses the effect of reduced train speed on VDV in Wolvercote proposing that a limit of 30mph will meet condition 19 with an acceptable safety margin and will give the necessary assurance to track-side residents.

- viii. 2nd April 2015, letter from Network Rail responding to the ARUP report (vi above) and continuing local concerns Appendix 14

Summary – requests that the Vibration Scheme of Assessment be considered only in relation to section H – assessments for section I to be submitted in due course; sets out the pattern of train movements extracted from the Noise and Vibration Mitigation Policy; describes why the train speed assumptions in the Noise Scheme of Assessment differ from those in the Vibration Scheme of Assessment (because of revised, updated, track layout designs); establishes the position that the reasonable worst case is 70mph for both passenger and freight trains with the exception of the much slower stone trains. Network Rail considers the predicted nighttime exceedence at 4 Bladon Close to be at worst marginal, and in any case based on conservative assumptions. Acknowledging the predicted exceedence, the letter contains a brief summary of the means to mitigate the exceedence and concludes that there are no measures that are reasonably practicable. Comments that 'silent track' (a noise mitigation measure) is not type approved for this line but is to be installed on a trial basis.

- ix. 15th April 2015, ARUP's response (H02-OB) to Prof Buckley's 27th March comments Appendix 15;

Summary – the multipliers used in the Vibration Schemes of Assessment allow for timber framed buildings such as 2B Bladon Close, for the variety of building types that can occur, and for differences between Canadian (the study area) and UK structures; coupling losses are accounted for using a cautious approach (the upper limit of the single family residence); the approach taken in the Vibration Schemes of Assessment is reasonably cautious and the inherent uncertainties in predicting vibration responses have

been accounted for by the use of coupling loss and floor resonance curves. ARUP does not consider that there is anything inherently unusual about Quadrangle House in respect of its susceptibility to vibration, and the Vibration Schemes of Assessment use a cautious approach. Agree it may be necessary to consider the impacts of the switches and crossings on 3 Bladon Close. ARUP does not share Prof. Buckley's doubts about the baseline data (see vii above); and considers that Network Rail's statements about the future operation of the stone train are the authoritative response of the network operator. It is beyond ARUP's remit to speculate about possible changes in fleet mix and train operations once the scheme is in operation. ARUP's check on the exceedence for 4 Bladon Close was only intended to be an approximation as a check on the prediction. ARUP has confidence in the data and methodology and concludes that in respect of plain line there is an adequate safety margin in the predictions. The area south of Wolvercote is to be considered in a later submission.

- x. 21st April 2015, ARUP's response (H03-OB) to Prof Buckley's 6th March comments **Appendix 16**;

Summary – agrees with the Independent Expert that use of data measured at Port Meadow is likely to provide a cautious estimate of vibration throughout Wolvercote; ARUP's UK and international experience shows that there is a small variation in susceptibility within generic geological classifications; also agrees with the Independent Expert that vibration close to cuttings, embankments and cut and cover tunnels can be reliably predicted with source data measured at grade; while acknowledging that structural damage is a cause for anxiety for track-side residents, the presence of perceptible levels of vibration is not evidence that any building damage has been caused by train vibration; buildings in Wolvercote will be subjected to levels of vibration which, according to the relevant British Standard, are unlikely to produce structural damage; humans perceive vibration which is significantly below the levels that are likely to cause damage to a building. ARUP has undertaken checks of the calculations and methodologies in the Vibration Schemes of Assessment and has not identified any errors over and above those already identified by Prof. Buckley and taken into account in the revised Technical Note (iv above). The data used, the prediction method, and the ways in which uncertainty have been dealt with mean that further validation against an independent dataset is unnecessary.

- xi. 28th April 2015, further comments from Prof. Buckley, **Appendix 17**;

Summary – presents calculations for vibration effects using the revised train operating assumptions set out in Network Rail's letter of 2nd April (viii above) and asserts that although predicted vibration levels are reduced they will not comply with condition 19 and thus significantly reduced train speeds will be required. Requests a publicly verifiable, independent check on vibration prediction.

- xii. 6th May 2015 email response from ARUP to Prof. Buckley's 28th April comments (xii above) **Appendix 18**;

Summary – ARUP’s checks on the calculations for 3 and 4 Bladon Close result in predictions in line with the Vibration Scheme of Assessment. Differences between Prof Buckley’s calculations and those verified by ARUP could result from ARUP’s use of base data and decay curves that were not available to Prof. Buckley.

- xiii. 29th April 2015, letter from ERM on behalf of Network Rail, **Appendix 19**;

Summary – explains that the imposition of speed limits was explored at the Inquiry and rejected because it would adversely affect journey times and timetabling, would result in a breach of the franchise agreement, and that noise and vibration could be dealt with through conditions. Proposes that the switches and crossings be moved from adjacent to Bladon Close to a point near Lakeside in order to overcome the problem of the vibration exceedence at Bladon Close. Includes a Technical Note calculating the predicted vibration at the new location. This was followed by a Technical Note dated 5th May 2015 which set out the noise implications for the new location **Appendix 19**;

- xiv. Between 1st and 13th May, further correspondence from some 20 households, many accepting the relocation of the switches and crossings to Lakeside but continuing to question the conformity of the scheme to the requirements of condition 19. These include two papers from Dr Caroline Robertson (relating in part to vibration) (**Appendices 20 and 21**); a further paper from Prof. Buckley (**Appendix 22**); and representations as a group from residents of Bladon Close (**Appendix 23**)

Summary (of points relating to vibration) – the predictions do not take into account the likely future freight services on this line, especially use of fast, heavy, nighttime freight trains, despite awareness of the role of East West Rail in the Strategic Freight Network, the Freight Market Study, and the proposed use of EWR as a servicing route for HS2. The approved scheme for EWR has changed in so many ways that condition 19 can no longer protect residents from vibration. Call for a new Environmental Impact Assessment to account for the new situation. Prof. Buckley provides 4 scenarios: the first showing that using the operational service assumptions in the Noise and Vibration Mitigation Policy, the vibration limits will not be exceeded, together with 3 scenarios for the consideration of future more intensive freight movement on the line which show that using those assumptions, the vibration thresholds will be exceeded. Bladon Close residents welcome the repositioned points but are of the view there is no margin of error on the resulting plain line; Council must satisfy itself that Network Rail’s future service planning scenarios are credible and take account of any foreseen increases; given all the changes to the possible service levels since the TWA a new EIA is needed; assert that EWR consortium has every intention of using the line to capacity; will be used for service line to HS2 so to say no heavy or night-time freight implausible; need post construction vibration monitoring.

- xv. 14th May 2015 ERM response to vibration issues in xiv above
Appendix 24;

Summary – the train service levels specified in the Environmental Statement and the Noise and Vibration Mitigation Policy take into account future growth in passenger and freight use of the line after East West Rail Phase 2 opens: this was accepted by the Inspector and confirmed by the Secretary of State as a reasonable assumption of likely future service frequencies. Neither East West Rail Phase 2 nor HS2 are approved schemes. The Environmental Statement is not out of date and adequate environmental information has been provided in relation to these schemes.

- xvi. 18th May 2015 email from ARUP responding to repeated concerns about geology, topography and the external to internal transfer function
Appendix 25

Summary – satisfied that local differences in geology and topography, and transfer function properly accounted for; nothing in repeated concerns would lead to a change in ARUP's previous advice.

- xvii. 21st May 2015 further comments from Dr Robertson, **Appendix 26**

Summary – maintains assertion that new EIA and SEA required, that erroneous data and wrong planning scenario being used: future freight not accounted for, and monitoring not fit for purpose.

- xviii. 22nd May 2015 summary of Prof. Buckley's remaining concerns relating to vibration **Appendix 27**

Summary – the train operating assumptions are too low: the assumed numbers of trains, particularly heavy freight are too unrealistic to represent a reasonable worst case after completion of East West Rail Phase 2; these assumptions lead to vibration being under-predicted; the reliability and relevance of the data used is still doubted, errors remain, and measured data is not consistent with the Inspector's specification.

- xix. 26th May 2015, ERM response response to Dr Robertson's 21st May concerns

Summary – following correspondence, in the view of ERM, the Council is happy with the environmental information supplied and the EIA requirements are satisfied; Strategic Environmental Assessment does not apply retrospectively; there is a distinction between the requirements of the planning and noise insulation regulations; no assessment of the impacts of HS2 on this line has been made, but the Secretary of State has accounted for future freight patterns; the very detailed assumptions about the stone trains are conservative; the assumptions about the relationship between the speed of trains and gradients are robust conservative when averaged; monitoring proposals met the requirements of the condition.

44. Considerable efforts by all involved have been made to secure agreement

between the parties but that has not proved possible and, despite the assurances of ARUP, local residents remain concerned that vibration is not being properly predicted and that their lives and properties will be adversely affected by the absence of vibration mitigation proposed for this scheme.

Issues:

- The reasonable planning scenario and the Environmental Impact Assessment
- Multiplier for external to internal vibration
- Geology and Topography
- Structural damage from rail vibration
- Northern Gateway
- Health Impact Assessment
- Speed of trains
- Robustness - methodology, data, calculations and validation

Officers Assessment:

The reasonable planning scenario and the Environmental Impact Assessment

45. The Noise and Vibration Mitigation Policy, approved by the Secretary of State, lays down the 'reasonable planning scenario' that is to be used in the assessment of noise and vibration (paragraph 22 above). On the operational pattern of train services it sets out the following (for ease of reference, summarized from para 22 above):

Passenger services

- Phase 1 - up to two passenger trains per hour each way;
- with Phase 2 from Bicester to Bletchley, an additional two passenger trains per hour each way;
- no passenger trains throughout the night; and,
- services in late evening and early morning at a reduced frequency.

Freight services (underlining added)

- Phase 1 - there are likely to be no more freight trains than operate at present, as there will be no new freight destinations that can be served
- with Phase 2 - there may be more freight trains. For this reason, additional freight services were included in the noise assessment in the Environmental Statement, so that this reflects a reasonable planning scenario.
- The actual number of freight services will reflect national freight demand, but will be limited to the maximum number of available freight 'paths' (1 per hour in each direction). Experience shows that about half of the available freight train paths are likely to be used on a given day, which would suggest a reasonable planning scenario of 8 freight train movements between 11pm and 7am.

46. In considering the predicted noise and vibration impacts of the 'reasonable planning scenario,' the 'reasonable worst case scenario' has been used: the worst case that is reasonably likely to occur has been tested. The robustness of the approach is specifically provided for by the requirement that a report as to robustness be provided.
47. Local representations have pointed to the possibility that freight services on this line will be much more intensive (more frequent/numerous; heavier, longer faster freight trains) because of the role of East West Rail in the strategic freight network (following implementation of Phase 2 from Bicester to Bletchley), and the likelihood that it will be used to service the construction and operation of HS2. Thus, residents assert that the reasonable worst case has not been described or tested through this current application process. As a result, in the view of local residents, the Noise and Vibration Mitigation Policy thresholds will be exceeded in the future, and the Vibration Schemes of Assessment should be reviewed to take these future freight scenarios into account. For that reason also, residents consider that the Environmental Impact Assessment is out of date and a new EIA is called for.
48. In response to these concerns, on 14th May ERM on behalf of Network Rail wrote (**Appendix 24**):

"In response to the assertions that Network Rail intend to increase capacity beyond that assessed in the ES, we reiterate that the service levels specified in the NVMP take into account future growth in passenger and freight use of the line once EWR Phase 2 has opened and are the same as those assumed at the TWA Inquiry and in the ES, except for the Cross Country service already discussed above. The NVMP states, in paragraph 1.9, that 'when the East-West Rail (EWR) link is in operation, there may be more freight trains. For this reason, additional freight services were included in the noise assessment in the Environmental Statement, so that this reflects a reasonable planning scenario'.

These future service levels were discussed and accepted by the Inspector at the TWA Inquiry (and confirmed by the Secretary of State's decision to grant the Order) to be *'reasonable assumptions of likely future service frequencies following the opening of East West Rail Phase 2 between Bicester and Bletchley'*.

These reflect the anticipated train movements after the opening of East West Rail Phase 2 and it remains Network Rail's position that this forms the appropriate basis for determining mitigation in both the Noise and Vibration Schemes of Assessments (SoAs) in line with the Secretary of State's decision."

49. In response to ERM's comments, on 21st May, Dr Robertson wrote (**Appendix 27**):

“For Oxford City Council to decide if sufficient environmental information has been provided to discharge planning Condition 19, it must be fully satisfied that the proposed mitigation is based on **meaningful** levels of train services over the next 15 years. At the moment, predictions of future train services are based on **obsolete** assumptions as the scope of the scheme has **expanded** beyond that covered by Chiltern Railways’ Environmental Statement”.

50. Also in response to ERM’s comments, Prof. Buckley wrote, on 22nd May (Appendix 27):

“ERM asserts ... that the *‘the [train] service levels specified in the NVMP take into account future growth in passenger and freight use of the line once EWR Phase 2 has opened..’*. This is no longer plausible in the light of information now available. The NVMP claims that only 50% of all available freight paths will be used, even on the busiest day or night in the future (to a 15 year horizon ...). But, as was made clear by Arup in their report for Oxford City Council, there is no limit to the fraction of available freight paths that will be used in future. The figure of 50% now seems reckless, since plans for HS2 are much further advanced than was the case at the time of the public inquiries. It is now known that HS2 will be serviced with delivery of supplies and removal of spoil by EWR, via the Infrastructure Maintenance Depot (IMD) at Calvert. It is true that the hybrid HS2 bill is still under parliamentary scrutiny, but it is unreasonable to imply that HS2 may not go ahead, and it is irrelevant to point out that HS2 Ltd is a separate company from Network Rail, HS2 has already been approved in principle, when the bill passed its second reading by a very large majority in April 2014. Current debate is only about matters of detail. Royal assent is currently expected in December 2016. There is widespread agreement that the most likely outcome, by far, is that HS2 will go ahead. Trains servicing HS2 will be competing with all the other anticipated freight demands on EWR. The likely effect will be to exert pressure on the number of available EWR freight paths. In the light of this, a much more sensible, cautious, assumption for EWR noise and vibration predictions is that *all* freight paths will be used – i.e. the number of assumed freight trains should be doubled. This would more fairly represent the intention of Condition 19.

Network Rail’s revised train operating assumptions envisage *no* loaded stone trains at night (11pm-7am), and only two such trains per day (7am-11pm) in the down direction only. Also, their speed in future is envisaged to be no more than 20mph through Wolvercote. These assumptions are hopelessly unrealistic. *Currently*, residents routinely experience noise and vibration from heavy stone trains travelling towards Water Eaton after 11pm at night. *Currently*, heavy stone trains pass through Wolvercote towards Water Eaton at speeds of more than 20mph. For example, the VSoA records vibration measurements from only two loaded stone trains on the OXD (Oxford –Bicester) line: one was travelling at 35mph, the other at 28mph. One of the main supplies to the HS2 IMD will be ballast for the new tracks – i.e. there will in future be many stone trains supplying HS2. These will not be stopping at Water Eaton, so will be travelling at the full speed

envisaged in the VSoA (60mph). Pressure on availability of freight paths will mean they are most likely to be at night. In the light of all this evidence, ERM's claim ... that 'normal' stone trains in future will run only between 6am and 7pm (weekdays) or 6am and 1pm (Saturdays) is wholly implausible".

51. The advice of officers however, as a point of law, is that the Council is required (in the discharge of Condition 19) to consider whether the submitted schemes of assessment show how the standards of the Noise and Vibration Mitigation Policy will be met. The Noise and Vibration Mitigation Policy itself (at paragraph 1.10) provides that the noise and vibration mitigation will be based upon the assumptions set out in the Policy itself. To apply different assumptions would involve the consideration of matters beyond the scope of the Noise and Vibration Mitigation Policy, Condition 19 and the determinations currently before the Council.
52. On the receipt of applications for approval in circumstances such as these the Council is required to consider whether it has sufficient environmental information as to the likely significant effects of the development. This has been done and officers are content that the Council does have sufficient information. The Council cannot use the requirement to obtain approval under a planning condition to reconsider issues that were determined by the Secretary of State in the context of deeming the planning permission to be granted.
53. While residents' analysis of future service possibilities is thorough and their concerns are real, the fact is that East West Rail Phase 2 (which would give access to the strategic freight network) has not been approved under the Transport and Works Act nor does it have the benefit of planning permission; and HS2 is not approved. The impacts of those schemes on residential areas in Oxford cannot yet be discerned and have not been the subject of scrutiny through the Transport and Works Act and associated public examination procedures. Their impacts, including cumulative impacts, will be assessed within those processes.
54. In the view of officers therefore, the Vibration Schemes of Assessment and the Environmental Impact Assessment (together with further environmental information subsequently submitted), are acceptable insofar as they are based on the approved reasonable planning scenario.
55. To respond to residents' concerns however, it is suggested that the City Council, and indeed residents' should they choose, should participate in those processes making representations at the appropriate time to the relevant bodies when they consider future schemes which may put additional pressure on this line, as to the impact of noise and vibration on local residents which must be carefully considered.

Multiplier for external to internal vibration transfer

56. Earlier sections of this report chart the correspondence and resulting iterations

between Network Rail and its advisors, and the Council and its advisors relating to the use of amplification factors to predict how ground borne vibration behaves once inside properties.

57. ARUP's initial statements about the use of a "cautious" factor of 4 (see Appendix 6) were subsequently modified in light of clarification provided in Atkins' Revised Technical Note of 18th February 2015 (Appendix 10). ARUPs' considered opinion on this matter is contained in their Report of 11th March (Appendix 12).
58. Further, residents have claimed that the structure of Quadrangle House is significantly different from the typical structures used to predict the vibration effects of the scheme – that Quadrangle House needs to be understood individually before a conclusion can be reached. ARUP focused on this concern in their subsequent paper of 15th April (Appendix 15). They have also taken subsequent related comments into account in confirming their advice by email on 18th May (Appendix 25).
59. Officers are aware of the considerable efforts needed to reach a consensus between the experts advising the applicant and the Council on this matter. Extensive discussion and reference both to published authoritative references and ARUP's experience elsewhere have informed this consensus. Officers are satisfied that the result of these efforts may be relied upon.

Geology and Topography

60. It has been asserted in representations that the Vibration Schemes of Assessment cannot correctly predict the vibration impacts of East West Rail because:
- i. the baseline open ground measurements were not taken at locations comparable in geological terms to the receptor sites;
 - ii. due to its geology, Upper Wolvercote is susceptible to vibration differently from the open ground where the baseline vibration data was collected;
 - iii. because of topographical differences: vibration is propagated differently for properties adjacent to cuttings and embankments; and,
 - iv. this is contrary to the recommendations of the inquiry Inspector when he wrote:

"A planning condition should secure an arrangement whereby it would be established, in advance and to the satisfaction of the local planning authority, either through field tests at geologically and topographically comparable sites with comparable trains and track (and mitigation measures, if present at the comparator site) to those proposed, or by numerical analysis, or by a combination of both, that the vibration associated with use of the Scheme would be no more than allowed in the Noise and Vibration Mitigation Policy."

61. The Independent Expert and ARUP considered these issues and their advice

can be seen in **Appendix 29** and **Appendix 25**, respectively.

62. On geological differences, both experts advise that whilst there might be small variations between the upper geological layers at Upper and Lower Wolvercote these are not significant since for low frequency ground-borne vibration, transmission depends on the deeper situated material (Oxford Clay) which is common to both locations. The Independent Expert's Notes at **Appendix 29** demonstrate how vibration frequency components propagate differently and are perceived differently. The difference between the vibration frequency spectrum of passenger versus freight trains is also noted, the latter causing more low frequency vibration which travels further, thereby having greater impact in properties more distant from the track.

63. In an email of 18th May ARUP has advised on geological matters as follows:

"We responded to concerns about the differences between geology at the VSoA source term measurement site and the rest of the scheme in Section 2.1 of H03-OB. our opinion [is] that it is reasonable that Atkins have used source data obtained in Port Meadow to predict the vibration for the scheme."

64. On topographical differences, both experts advise that since vibration waves travel along the ground and thereby follow its contours the effect on their propagation in cuttings or on embankments is less than might at first sight be expected. ARUP have recently reaffirmed their earlier advice when commenting upon some research papers quoted by one of the residents (**Appendix 25**):

"[the resident] cites two papers which he claims prove that cuttings make a difference to the propagation of vibration including:

- *M.C. Forde, D.P. Connolly Seismic vibration measurements near high speed railway lines to validate University of Edinburgh developed software. NERC Scientific report. Institute for infrastructure and environment, University of Edinburgh; and*
- *Nguyen, K-V. and Catmiri, B. (2007). Evaluation of seismic ground motion induced by topographic irregularity. Soil Dynamics and Earthquake Engineering, 27, 183–188*

The former reference is a paper providing preliminary findings of an on-going research project. It does state that "cuttings produced elevated vibration levels in comparison to the at-grade and embankment cases". However the statements made are qualitative and no quantitative information is presented which could be used to verify the result or determine if it would be significant for the VSoA assessment.

The second reference states that "local topographic conditions play an important role in the modification of seismic ground motion at the irregular feature itself and its neighbourhood". These conclusions are informed by the results of numerical modelling. The paper is written for

the purpose of studying the effects of strong ground motion during earthquakes. These studies are therefore not considered to be relevant to the VSoA.

It is important to add that at no point have we claimed that the presence of embankments and cuttings “makes no difference to the propagation of vibration”, as suggested by [the resident]. In HO3-OB we stated that “ground vibration levels measured close to cuttings, embankments and cut and cover tunnels can reliably be predicted with train vibration source data measured from trains operating at grade with no special consideration of the topography close to the track”. This was demonstrated in the measurement work used to develop the ground vibration prediction methods for High Speed 1.”

65. The rail vibration experts are clear that the Vibration Schemes of Assessment are robust in terms of their treatment of local geological and topographical differences and officers see no reason to doubt that advice.

The possibility of structural damage to buildings from rail vibration

66. Residents along the trackside have provided anecdotal evidence that their properties are suffering structural cracks which they claim result from rail vibration. Several link this claim with their experience of the vibration levels that they feel when some trains pass near their property. One resident has collated information about a significant number of near-track properties which have been affected by structural damage. The resident suggests that there is a correlation between proximity to the track and structural damage, and draws the conclusion that the structural damage evident in these properties is attributable to railway vibration. The claim is also made that Council-owned properties are affected.
67. In the view of officers the anecdotal evidence presented does not prove a correlation between structural damage and proximity to the railway, for instance: the evidence is not supported by building surveyors' reports, and the sample area does not extend beyond track-side areas. Officers have consulted the Council's property records: there are approximately 140 properties near the railway in Wolvercote (Ulfgar Road, St Peters Road and Sheriff Drive) but there are no records of reported or surveyed structural damage in those properties.
68. Both the IE and ARUP have advised on this matter (see **Appendix 29** and **25** respectively). They point out that feelable vibration is commonly perceived at vibration levels much lower than those which could cause structural damage. They have referred to national guidance which lists many possible causes of such damage not related to vibration. Neither of the independent experts are aware of cases of railway-induced structural damage to conventional properties.
69. In an email of 18th May (**Appendix 25**) ARUP advises on structural damage as follows:

“We advise that [the resident’s] conclusions on structural damage are at odds with the professional consensus on the likelihood of structural damage caused by railway vibration. It is unscientific to assume that correlation between perception of vibration, distance from the railway and structural damage means that the damage is necessarily caused by train vibration. Further evidence in the form of measured vibration levels would be required to conclude that railway vibration is the cause of building damage. We have responded in detail to concerns about structural damage in Section 2.2 of HO3-OB [Appendix 16]. Here we provided detailed advice on other causes of building damage including “internal or external disturbances such as the effects of temperature, moisture, differential settlement, trees, occupational loads, overloading, pre-stressing forces, material creep and chemical changes”. Further evidence would also be required to dismiss these factors before it could be concluded that vibration was the cause of damage”.

70. Officers are of the view therefore that concerns about the possibility that structural damage will be caused to track-side properties by rail vibration, should not be a reason to doubt that the Vibration Schemes of Assessment are acceptable.

Northern Gateway

71. On 13th May the Northern Gateway Consortium lodged a holding objection to the site for the relocation of the switches and crossings at Lakeside. In their view the proposals had the potential, in terms of noise and vibration, to materially impact on the strategic site at Northern Gateway for which detailed Masterplan proposals were currently being prepared.

72. ERM on behalf of Network Rail:

- a. confirmed that other locations had been considered for the relocated switches and crossings but that none was suitable against detailed locational criteria;
- b. that they had been aware of the Northern Gateway proposals when they chose the Lakeside location; and
- c. they supplied detailed noise and vibration assessments which demonstrated that:
 - i. a small local buffer between proposed dwellings and the track would be needed to meet the Noise and Vibration Mitigation Policy thresholds for vibration; and
 - ii. that the increased noise over the previously proposed plain line in this location would be less than 3dB (which is generally accepted as the smallest change that is noticeable in ordinary conditions).

73. In those circumstances the view of officers is that the impact of East West Rail on the Northern Gateway strategic site in terms of the noise and vibration associated with the location of switches and crossings at Lakeside should not

be a reason to doubt that the Vibration Schemes of Assessment are acceptable.

Health Impact Assessment

74. Condition 19 aims to protect residential amenities in relation to operational rail noise and vibration. Both in writing and at meetings, local residents have described the ways in which they consider that rail vibration affects their lives – being woken up at night and the fear and upset caused; windows doors and furniture rattling; objects rattling on shelves; structural damage. In some instances rail vibration is reported as feeling “like an earthquake”. It has been requested that a Health Impact Assessment be carried out prior to determining this application.
75. These impacts on health and wellbeing are understood and are not underestimated by officers. The Secretary of State’s decision to grant planning permission for East West Rail Phase 1 was, however, reached after the possibility of such impacts had been considered through an Environmental Impact Assessment subsequently tested at a Public Inquiry. In this case the Secretary of State decided that an acceptable balance would be struck between the need for this rail development and the protection of residential amenity if the vibration thresholds in the Noise and Vibration Mitigation Policy are met, and that was to be secured by Condition 19. There is no requirement for a Health Impact Assessment to be carried out as part of condition 19 and in the view of officers further health-related assessments are not an appropriate part of this condition discharge process, since the scheme already has the benefit of planning permission.

Restricting the speed of trains

76. As it has been demonstrated that the required standards set out in the Noise and Vibration Mitigation Policy will be achieved, the possibility that train speed might be reduced to mitigate vibration impact does not arise. Had that not been the case, the issue might have arisen in the context of substitute mitigation.
77. ERM on behalf of Network Rail commented upon the practicality of such mitigation in their letter of 29 April 2015 (**Appendix 19**). Furthermore, the Inspector at the reconvened Public Inquiry in January 2011 stated as follows:

“Representations were made that, in order to reduce the noise and/or vibration they might otherwise cause, the speed of trains using the Scheme should in places be limited (by planning condition) to, variously, 30 mph, 40 mph or 50 mph [6.9.1, 6.12.2, 6.11.8]. I do not adopt such a course, for the following reasons:

a) No expert evidence was brought to support the views that any of the suggested speed limits would have the desired effect in the context of the Scheme, or that any one of them was necessary.

b) Such evidence as was brought about the relationship of train speed and resulting vibration was that the ground vibration spectra produced by passing railway trains depend strongly on factors other than train speed [6.19.10].

c) The planning conditions I propose would provide the surety I have described in respect of noise and in respect of vibration, without recourse to speed limits.

d) The suggested condition would therefore not be necessary.”

78. Officers note this position and advise that speed restrictions cannot be required as part of this application.

Robustness - methodology, data, calculations and validation

79. Residents have subjected the methodology, data and calculations used in the Vibration Schemes of Assessment to very detailed and highly competent scrutiny. They identified what they asserted to be errors and uncertainties in methodology, data and calculations, and an absence of validation which would usually be required as part of normal engineering practice.

80. Network Rail has responded to these issues by re-appraising and clarifying their approach through Technical Notes, and by re-working the submission including the proposal to move the switches and crossings from Bladon Close to Lakeside (the vibration limits at that location having been shown to be exceeded).

81. ARUP has examined these claims, the responses of Network Rail to them, and the further replies of residents. After several iterations of scrutiny and response, ARUP has concluded that:

- the methodology and data are robust (para 43, document vi above); and that,
- the vibration predictions (including for the resulting plain line at Bladon Close following the relocation of the switches and crossings to Lakeside) are within the limits set by the Noise and Vibration Mitigation Policy.

82. On the overall issue of methodology, data and calculations, ARUP states in H03-OB (**Appendix 16**):

“... as part of this review we have undertaken checks of the calculations presented in the VSoA. We have also compared key aspects of the methodologies employed in the VSoAs to methods employed by the industry and by Arup in our own validated prediction methods. Arup can provide assurance that we have not identified any errors in Atkins’ work in addition to those identified by Prof. Buckley which were subsequently responded to by Atkins in the Technical Note issued on the 18th February 2015.”

83. On validation, ARUP states in H03-OB (**Appendix 16**):

“The prediction method presented in the VSoA was designed specifically to predict vibration from trains operating on the proposed Scheme in that:

- source data was taken in the locality of Wolvercote;
- trains currently operating on the current scheme were used as source data; and
- source data were measured at speeds as close as practicable to the line speed of the Proposed Scheme.

These steps were taken to limit the prediction uncertainty associated with extrapolating these measurements to other locations in Wolvercote. In addition, following consideration of how the assessments have dealt with uncertainty throughout the prediction chain, Arup consider the assessments presented in the VSoA, as clarified in the Technical Note of 18th February 2015, to be sufficient. Because of this we consider it reasonable for Atkins to apply the VSoA prediction method to properties in Wolvercote without further validation against an independent dataset.”

84. Despite this, residents maintain significant concerns on these matters as summarised by Prof. Buckley on 22nd May (**Appendix 28**):

“Worries about [the use of out of date train operating assumptions] are made worse by the many failings in execution of the VSoA, now notorious among the track-side residents of Wolvercote. Thus there are widespread doubts about the reliability and relevance of Atkins’ data used in the predictions - e.g. there are numerical errors in the VSoA, and Atkins failure to use a measurement methodology consistent with the public inquiry Inspector’s specification. Hence there is understandable anxiety that vibration exceedances in practice could easily be much greater than predicted.”

85. As is evident from the all the foregoing, Condition 19 deals with highly technical issues around predicting and mitigating operational vibration. Such technical issues are within not within the normal scope of a Planning Committee’s work. Indeed, highly technical matters such as these are more usually fully resolved at public inquiries following detailed exchanges between technical experts, with cross-examination of the evidence presented, and with the inquiry Inspector and/or the Secretary of State ultimately adjudicating. In this case however, it is for the City Council as Local Planning Authority to determine whether the Vibration Schemes of Assessment are acceptable in the terms of Condition 19.

86. In this case, based on the evidence presented at the Inquiry, the Secretary of State was satisfied that noise and vibration issues did not justify the refusal of planning permission. The scheme was given planning permission, the Noise and Vibration Mitigation Policy was approved, including the reasonable planning scenario to be used in the Schemes of Assessment, and the vibration limits to be achieved, Condition 19 was formulated to implement the Noise and Vibration Mitigation Policy.

87. The limited technical expertise available 'in-house' to the Council in these disciplines was however acknowledged by the Secretary of State, and this resulted in the requirement that Independent Experts should be appointed to comment on the robustness of the Schemes of Assessment. Under the terms of his appointment approved by the Council in 2nd May 2013 under planning application reference 13/00907/CND the Independent Expert for vibration has also been involved in an advisory capacity, assisting Council officers with technical matters raised by the applications and public correspondence.
88. Given the intense local scrutiny of the vibration submissions by local residents, the Council chose to seek additional input from rail vibration experts, ARUP.
89. Officers have also explored with the Department for Transport the experience of other local authorities in this regard to see if lessons can be learned from the way in which the discharge of such applications has been handled elsewhere. There are however, so far as officers are aware, no similar circumstances in the UK where railway noise and vibration mitigation has been dealt with by such a condition, and therefore no comparable experience upon which to draw.
90. Officers have not been indifferent to the considerable weight of local anecdotal evidence about how operational rail vibration is experienced locally, nor to the considerable body of well-researched and well-articulated technical objection. Throughout this process officers have ensured that the stream of public comment has been subjected to scrutiny initially by the Independent Expert and latterly by ARUP. After several iterations of report and comment ARUP now advises that the Schemes of Assessment are robust, and that nothing remains in the concerns of residents that would cause them to alter those views.
91. In those circumstances, having worked closely with rail vibration experts and having considered their written advice, officers are aware of no basis upon which it can be properly concluded that the Schemes of Assessment are anything other than robust.

Conclusion on Vibration:

92. The two Vibration Schemes of Assessment have been shown to meet the tests set out in paragraphs 24 and 25 of this report, including the overall test of whether they are sufficiently robust. Both have demonstrated that the required standards set out in the Noise and Vibration Mitigation Policy will be achieved. On that basis it is recommended that approval be given to both, subject to the condition set out above.

Human Rights Act 1998

Officers have considered the Human Rights Act 1998 in reaching a recommendation to grant planning permission, subject to conditions. Officers have considered the

potential interference with the rights of the owners/occupiers of surrounding properties under Article 8 and/or Article 1 of the First Protocol of the Act and consider that it is proportionate.

Officers have also considered the interference with the human rights of the applicant under Article 8 and/or Article 1 of the First Protocol caused by imposing conditions. Officers consider that the conditions are necessary to protect the rights and freedoms of others and to control the use of property in accordance with the general interest. The interference is therefore justifiable and proportionate.

Section 17 of the Crime and Disorder Act 1998

Officers have considered, with due regard, the likely effect of the proposal on the need to reduce crime and disorder as part of the determination of this application, in accordance with section 17 of the Crime and Disorder Act 1998. In reaching a recommendation that the condition be partially discharged, officers consider that the proposal will not undermine crime prevention or the promotion of community safety.

Background Papers: 13/03202/CND, 14/00232/CND and 15/00956/CND

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Date: 28th May 2015

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