

High Speed 2 - 1MC06 - Stage One C2 - MWCC –
North Portal of Chiltern Tunnels to Brackley

**South West Aylesbury
Noise Demonstration Report**

1MC06-CEK-TP-REP-CS04_CL18-000001

Rev	Date	Author	Checked by	Approved by	Revision De- tails	EK Reviewer
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Stakeholder review required (SRR)	Purpose of SRR
☐ County / District / London Borough Council	☐ Acceptance
☐ LOV	☐ Approval
☐ LUL	☐ No Objection
☐ NRL	☐ Consent
☐ TFL	
☐ Utilities Company	
☐ Other (please specify)	

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Overall Operational Noise for Design compared to HS2 Phase 1 ES for South West Aylesbury West side (Downside)

Glossary of Terms

Term	Description
AFARP	As far as is reasonably practicable
AP	Additional Provisions
ARFC	All reasonably foreseeable circumstances
CDC	Cherwell District Council
BS	British Standard
CBA	Cost Benefit Analysis
CoCP	Code of Construction Practice
CRTN	Calculation of Road Traffic Noise
dB	Decibel
dB(A)	'A' Weighted Decibel.
EIA	Environmental Impact Assessment
EMRs	Environmental Minimum Requirements
ES	Environmental Statement
IMD	Infrastructure Maintenance Depot
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authority
LpAeq	'A' Weighted Equivalent Continuous Sound Level
LpAmax	Maximum 'A' Weighted Sound Pressure Level
NDR	Noise Demonstration Report
Nominated undertaker	The body or bodies appointed to implement the powers of the hybrid Bill to construct and maintain the railway
SES	Supplementary Environmental Statement
SOAEL	Significant Observed Adverse Effect Level
the Act	The High-Speed Rail (London – West Midlands) Act 2017

TNPM	Train Noise Prediction Model
TSI	Technical Specifications for Interoperability
ToR	Top of Rail
U&As	Undertakings and Assurances
WNC	West Northamptonshire Council

EXECUTIVE SUMMARY

The purpose of this report is to provide Buckinghamshire Council (BC) Unitary Authority (formerly Aylesbury Vale District Council) with supporting information to assist with the determination of the Plans and Specifications submission made under Schedule 17 of the High-Speed Rail (London – West Midlands) Act 2017 (“The Act”) AVDC Package 6 South West Aylesbury Part B.

This report provides update on the design as consented for AVDC Package 6 West Aylesbury Part A (Application no. 22/01576/HS2). The Design for AVDC Package 6B as presented in this report is modelled as a composite design considering the design as consented for AVDC Package 6A. Reference in this report to the consented design refers to the design as consented for Package 6A.

This Noise Demonstration Report is compiled in accordance with the High Speed Two (HS2) Phase 1 Planning Memorandum and Planning Forum Note 14: Operational Noise from the Railway and Altered Roads (PFN 14). This report demonstrates how all reasonable steps have been taken for the combined airborne sound from altered roads and operational railways, predicted in all reasonably foreseeable circumstances, not to exceed the lowest observed adverse effect levels.

The Application Site is shown on the South West Aylesbury Part B Site Location Plan (Drawing No. 1MC06-CEK-TP-DLO-CS04_CL18-000002) as presented in Appendix A.

At **Aylesbury - East side (Upside)**, two different combinations of lineside barriers based on the consented design have been assessed. The Proposed Design (Option 1) with a combination of a 5m lineside barrier, 2m barrier in Green Banks, 5m lineside barrier and a 1m lineside barrier to tie in with the Thame Valley Viaduct has been selected as the proposed mitigation design. Compared to the HS2 Phase 1 ES (as amended) Option 1 presents one more major impact during night-time and one more moderate during daytime, as well as 1 more minor impact during daytime but 36 less minor during night-time.

Design Option 1 (including earthworks design) shows the same number of major impacts above LOAEL (1) as the ES for daytime (1) and 1 additional major impact for night-time over the ES (zero). The moderate impacts for night-time for Option 4 (46) are the same as the ES (46), while there is one additional moderate impact for daytime (101) compared to the ES (100).

The L_{max} impacts above LOAEL for Noise Barrier Design Option 1 are less than those reported in the ES (2018 impacts above LOAEL compared to 2976 in the ES case). This indicates that a noise barrier in the Green Banks is effective at reducing L_{max} exceedances of LOAEL. From a visual perspective, it is noted that the Preferred Option barriers for this area has already been consented under the original various S17 application. The consent also includes the vertical change in the track level because of VE 030. The consented option also includes barrier heights which have been increased since the ES as amended.

At **Aylesbury - West side (Downside)**, two different combinations of lineside barriers based on the consented design have been assessed. Option 1 (5m noise barrier with 4m noise barrier in the Green Banks Scheme and to the north of Green Banks) shows the same minor, moderate and major impacts above LOAEL as the ES Design.

Option 1 provides a taller barrier at the Aylesbury South cutting, Aylesbury Embankment and Aylesbury North cutting civils assets. These assets fall within the Hadden vale LCA. Although there are landscape mitigation earthworks with planting at these locations (both sides) the increased height barrier will protrude above these earthworks at year one of operation. It is also noted that there has been a lowering of the upside barrier over a 720m length between Ch 60+050 to 60+770, which will increase the expose of the barrier.

The Proposed Design (Option 1) with a combination of a 5m lineside barrier, 4m barrier in Green Banks and 4m lineside barrier on the west side (downside) has been selected as the proposed mitigation design because it provides an acoustic benefit which outweighs the perceptible negative visual change.

1 Introduction

1.1 Background and Aim

The purpose of this report is to provide Buckinghamshire Council (BC) Unitary Authority (formerly Aylesbury Vale District Council) with supporting noise assessment information to assist with the determination of the Plans and Specifications submission made under Schedule 17 of the Act, for the AVDC Package 6 South West Aylesbury Part B.

This report provides update on the design as consented for AVDC Package 6 West Aylesbury Part A (Application no. 22/01576/HS2).

This Noise Demonstration Report is compiled in accordance with the High Speed Two (HS2) *Phase 1 Planning Memorandum and Planning Forum Note 14: Operational Noise from the Railway and Altered Roads (PFN 14)*.

The information in this NDR shows, as far as is reasonably practicable at the current stage in the design process, how the proposed noise mitigation performs and the expected conditions. This information will provide reassurance in advance of the request for approval under paragraph 9 that the mitigation is appropriate. To determine optimal mitigation measures a number of options have been assessed. The options appraisal was then used to select the preferred noise mitigation scheme.

Although this report relates to the applications made under Schedule 17 of the Act, it is necessary to consider operational noise over a larger area outside each application site to properly understand the overall effect of noise. Therefore, a broader geographical area is considered for the purposes of the noise assessment, referred from hereon as the study area.

1.2 Structure of Report

This report comprises the following sections:

- Policy, Requirements and Standards
- Description of the Works
- Options appraisal
- Methodology
- Assumptions
- Results of the assessment of the proposed noise mitigation
- Conclusions

1.3 Site Location

The application area is shown on the South West Aylesbury Part B Site Location Plan (Drawing No. 1MC06-CEK-TP-DLO-CS04_CL18-000001) as presented in Image 1 below and Appendix A. The Site Location Plan shows the extent of the Schedule 17 application site boundary in blue and the site in relation to the surrounding area.

The site is located south of Aylesbury (Upside) and north east of Lower and Upper Hartwell (Downside) as the closest nearby settlements as shown on the Site Location excerpt below (1MC06-CEK-TP-DGA-CS04_CL18-000006 (Image 1 below) and Sheet 2 (1MC06-CEK-TP-DLO-CS04_CL18-000002).

Receptor locations for the assessment are presented on Image 2 and Image 3 below.

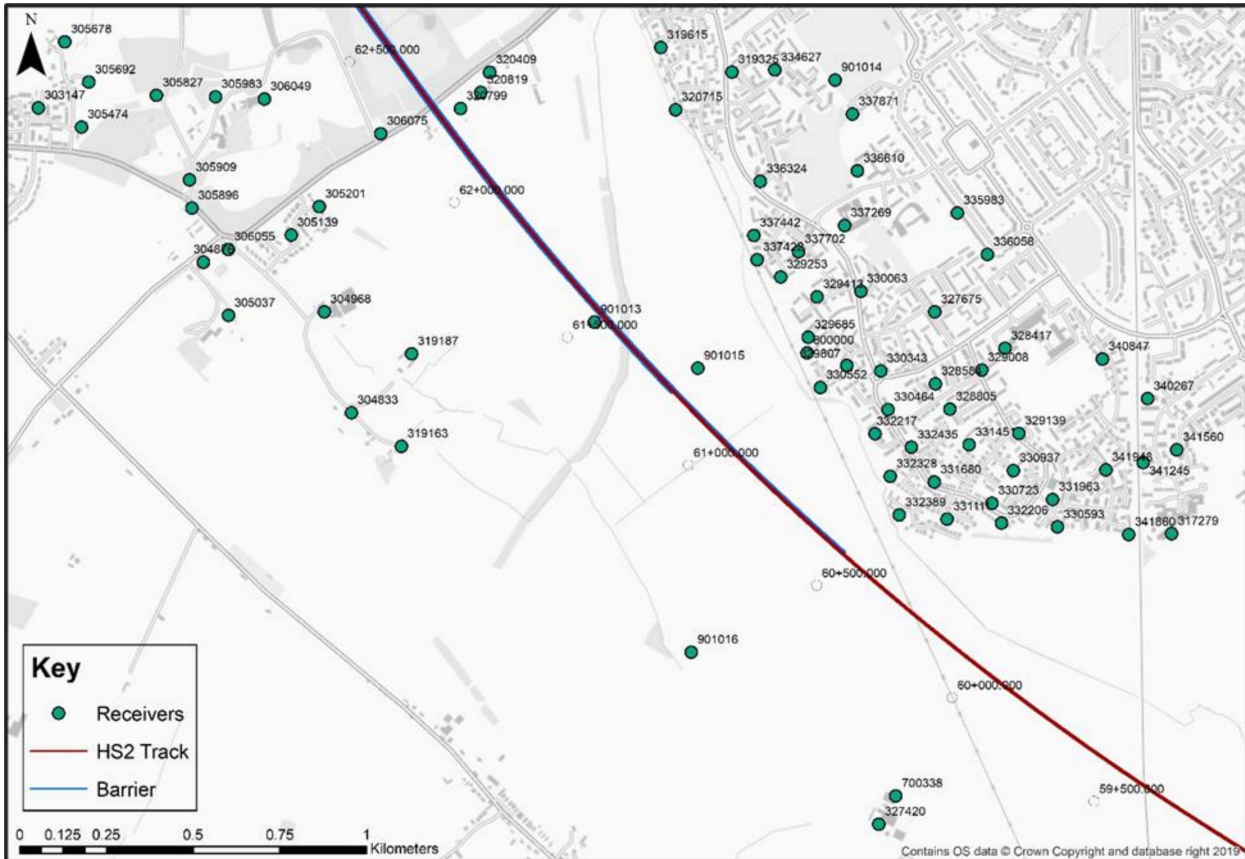


Image 2 - Receptor locations for SES 3 AP4 Assessment Area Aylesbury Package 6B

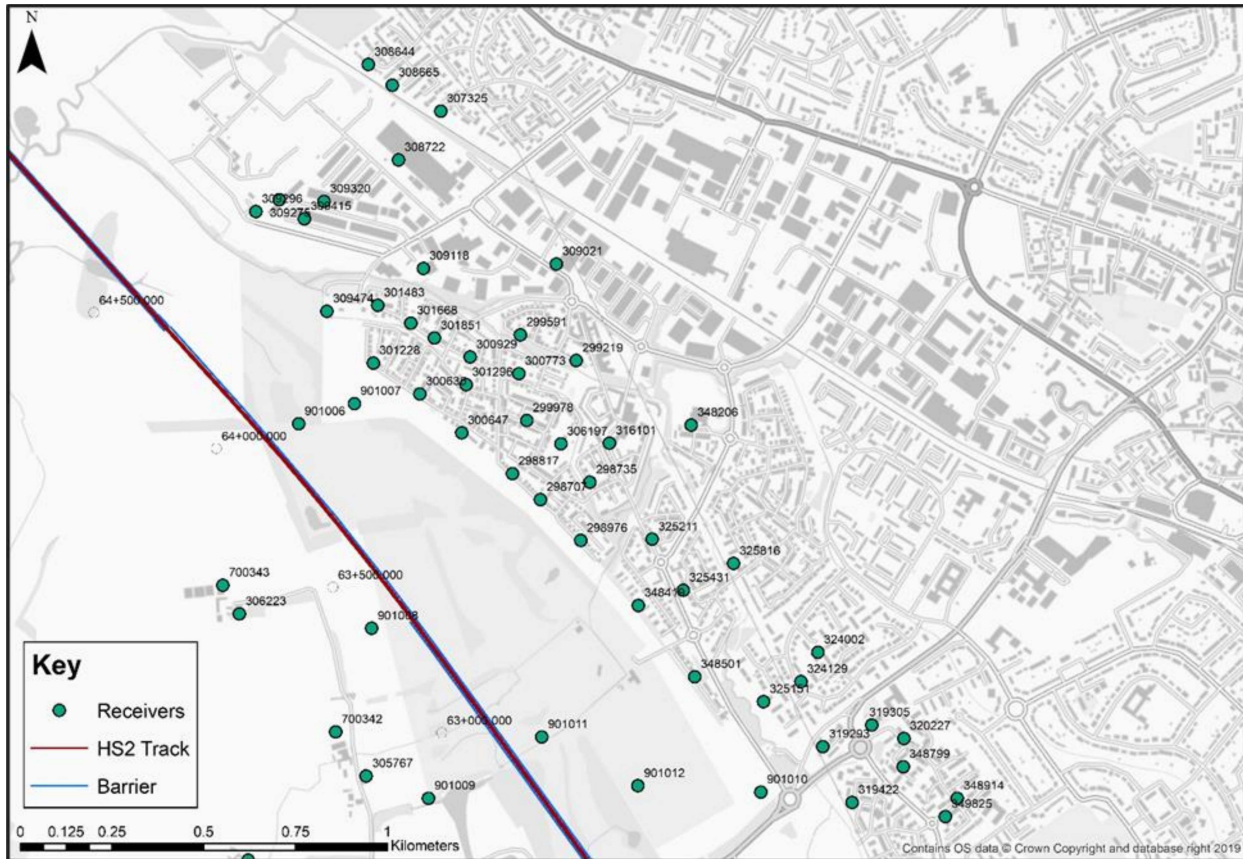


Image 3 - Receptor locations for SES 3 AP4 Assessment Area AVDC Package 6B

2 Policy, Requirements and Standards

High Speed Two (HS2) is the Government's proposal for a new high-speed north-south railway. The proposal is being taken forward in two phases: Phase One will connect London with Birmingham and the West Midlands and Phase Two will extend the route to Manchester, Leeds and beyond.

The High-Speed Rail (London – West Midlands) Act 2017, referred to from this point forward as “*the Act*”, provides powers for the construction and operation of Phase 1 of High Speed Two, for which HS2 Ltd is the nominated undertaker. The Secretary of State has also published Environmental Minimum Requirements (EMRs), which set out the environmental and sustainability commitments that will be observed in the construction of the Proposed Scheme.

Section 20 to *the Act* grants deemed planning permission for the works authorised by it, subject to the conditions set out in Schedule 17. Schedule 17 includes conditions requiring various matters to be approved by the relevant Local Planning Authority(ies) (LPA).

Schedule 17 of the Act sets out the specific grounds on which the LPA may impose conditions on approvals or refuse requests for approval. With respect to noise one of the specific grounds the LPA may refuse to approve plans or specifications is if “*the design or external appearance of the building works ought to be modified to preserve the local environment or local amenity and is reasonably capable of being so modified*”.

Paragraph 7.5.2 of the Planning Memorandum states that when submitting designs for approval under Schedule 17 the nominated undertaker:

“shall, where reasonably necessary for the proper consideration of the design proposed, provide an indication or outline of the appropriate mitigation measures (if any) which it intends to submit subsequently under paragraphs 9 or 12 of the Planning Conditions Schedule. Where works for approval will have a mitigating effect in relation to the operational noise from the railway or new roads, the nominated undertaker will provide information to show, so far as is reasonably practicable at that stage in the design process, how the noise mitigation performs and the expected conditions. While not material to approvals under paragraph 2 or 3 this information will provide re-assurance in advance of the request for approval under paragraph 9 that the mitigation is appropriate and will present an opportunity to raise concerns.”

This report provides information how the noise mitigation, proposed at this stage of the design development, performs and the expected conditions.

When seeking ‘Bringing Into Use’ approvals in relation to the relevant scheduled works under Schedule 17(9), an update to this report will be provided to the Local Planning Authority in order to assist it in determining whether there are any reasonably practicable measures which need to be taken for the purposes of mitigating the effect of the work or its operation on the local environment or local amenity.

The following section provides a summary of the EMRs and relevant information papers that have been produced to explain the commitments made in *the Act* and the Undertakings and Assurances (U&As) given by the Secretary of State, and how they will be applied to the design and construction of HS2 Phase 1.

2.1 Environmental Minimum Requirements (EMRs)

The EMRs set out environmental and sustainability commitments that will be observed during the construction and operation of the Proposed Scheme. The EMRs include the Code of Construction Practice (CoCP) and a series of other supporting documents.

The EMR general principles state:

The controls contained in the EMRs, along with powers contained in the Act and the Undertakings given by the Secretary of State, will ensure that impacts which have been assessed in the ES will not be exceeded, unless any new impact or impacts in excess of those assessed in the ES:

- *results from a change in circumstances which was not likely at the time of the ES¹; or*
- *would not be likely to be environmentally significant²; or*
- *results from a change or extension to the project, where that change or extension does not itself require environmental impact assessment (EIA) under either (i) article 4(1) of and paragraph 24 of Annex 1 to the EIA Directive 3; or (ii) article 4(2) of and paragraph 13 of Annex 2 to the EIA Directive⁴; or*
- *would be considered as part of a separate consent process (and therefore further EIA if required).*

In the circumstances described in the first bullet point above, if the significant adverse impacts identified in the ES are likely to be exceeded, HS2 and their contractors will take all reasonable steps to minimise or eliminate those additional impacts. If despite these reasonable steps, significant adverse impacts remain HS2 and their contractors will report them.

2.2 Information Paper E20: Control of Airborne Noise from Altered Roads and the Operational Railway

HS2 Information Paper E20 outlines the measures that are required to be put in place to control operational airborne noise. It sets out various objectives to minimise operational noise effects as summarised below.

- HS2 and their contractors will take all reasonable steps to design and construct the scheme so that the combined airborne noise predicted, in all reasonably foreseeable circumstances (ARFC), does not exceed LOAEL as set out in Appendix C. Where it is not reasonably practicable to achieve this objective, HS2 and their contractors will reduce airborne noise 'As Far As Reasonably Practicable' (AFARP).
- Noise insulation will be offered with the aim that operational airborne noise from the scheme does not give rise to significant adverse effects on health and quality of life that would otherwise be expected when airborne noise exceeds the significant observed adverse effect levels (SOAEL) (Appendix C).

¹ In addition, Supplementary Environmental Statements and Additional Provision Environmental Statements were published and tabled by the Promoter in July 2015, September 2015, October 2015 and December 2015.

² i.e. a situation that could not reasonably have been anticipated at the time of the Environmental Statement. This covers all effects (both positive and adverse) where those effects are simply of no environmental significance.

³ 2011 consolidated EIA Directive (2011/92/EU).

⁴ Broadly, this would not allow those changes or extensions to the project (once it has received Royal Assent) which would give rise to adverse environmental effects within the EIA.

3 Description of the works

3.1 Application Design

The site is located to the west of Aylesbury and extends from the Princes Risborough to Aylesbury Railway (PRA) Line to Public Right of Way SBH/34/1, Buckinghamshire. The works for approval comprise of the over-bridges and associated earthworks that fall within this package. These comprise Aylesbury South Cutting (part of), Aylesbury Embankment and Aylesbury North Cutting (part of).

Part of Aylesbury South Cutting falls within AVDC Package 05 Stoke Mandeville. Part of Aylesbury North Cutting falls within AVDC Package 6B South West Aylesbury and AVDC Package 07 Hartwell. AVDC Package 06 Aylesbury Part 6A - AVDC Package 07 Hartwell are the subject of separate Schedule 17 submissions to Buckinghamshire Council (BC).

Aylesbury South Cutting (Part of)

Aylesbury South Cutting will be 610m in length. The total length of the Cutting extends beyond the site to chainage 58+320 and will be approximately 2km in length.

Within the site, the Cutting will be between 2m to 4m in depth depending on existing ground levels.

The earthwork design for Aylesbury South Cutting is shown on the South West Aylesbury Part B Earthwork Cross Section Sheets 1 and 2 (Drawing Nos. 1MC06-CEK-TP-DSE-CS04_CL18-000029 and 1MC06-CEK-TP-DSE-CS04_CL18-000030).

Aylesbury Embankment

Aylesbury Embankment will extend from chainage 60+400 to 61+700 and will be 1300m in length.

The Embankment will be up to 12m above existing ground level. The existing ground level ranges from 78m to 85m AOD. The slope of the Embankment will be 1 in 2.

The earthwork design for Aylesbury North Cutting is shown on the South West Aylesbury Part B Earthwork Cross Section Sheets 3 and 4 (Drawing Nos. 1MC06-CEK-TP-DSE-CS04_CL18-000031 and 1MC06-CEK-TP-DSE-CS04_CL18-000032).

Aylesbury North Cutting (Part of)

Aylesbury North Cutting within the site will extend from chainage 61+700 to 61+900 and will be 200m in length. The total length of the Cutting extends beyond the site to chainage 62+450 and will be approximately 750m in length.

Within the site, the Aylesbury North Cutting will be between 2m to 4m in depth depending on existing ground levels and between 40m to 70m wide. The existing ground level through the Cutting ranges from 85m to 87m AOD.

The earthwork design for Aylesbury North Cutting is shown on the South West Aylesbury Part B Earthwork Cross Section Sheet 4 (Drawing No. 1MC06-CEK-TP-DSE-CS04_CL18-000032).

Noise barrier

'Lineside' noise barriers are proposed alongside HS2 to help reduce sound levels from high-speed trains.

The height of noise barriers is expressed relative to the top of rail (ToR), which means that the actual noise barrier height will vary in height based on local ground conditions. As a guiding statement, the actual noise barrier height can be expected to be in the range of 1.0m taller than the reported ToR height.

The noise barriers have a standardised appearance to give HS2 a recognisable look but have also been designed to be sensitive to its surroundings where they will be visible to the public. This submission includes a Type A (non-visible) and Type B (visible) noise barriers.

A Type A barrier is proposed within the site where it will be screened from the public. The steel posts will be visible, and the barrier will not include a curved top panel.

A Type B barrier is proposed within the site where it will be visible to the public. The steel posts are hidden from view to give the barrier a more seamless and coherent appearance. The steel posts are visible on the inner face only.

Facing the HS2 line, the internal surface of the noise barrier will be lined with acoustically absorptive material.

The appearance of the noise barriers is shown on the on the following drawings:

- South West Aylesbury Part B Noise Barrier Transitions Sheet 01 for Approval - 1MC06-CEK-AR-DDE-CS04_CL18-000005
- South West Aylesbury Part B Noise Barrier Transitions Sheet 02 for Approval - 1MC06-CEK-AR-DDE-CS04_CL18-000006
- South West Aylesbury Part B Noise Barrier Transitions Sheet 03 for Approval - 1MC06-CEK-AR-DDE-CS04_CL18-000007
- South West Aylesbury Part B Noise Barrier Plan for Approval - 1MC06-CEK-AR-DPL-CS04_CL18-000006
- Noise Barriers Typical Details Sheet 01 for Approval - 1MC06-CEK-AR-DDE-C002-000006
- Noise Barriers Typical Details Sheet 02 for Approval - 1MC06-CEK-AR-DDE-C002-000007
- Noise Barriers Typical Details Sheet 03 for Approval - 1MC06-CEK-AR-DDE-C002-000009
- Noise Barriers Typical Details Sheet 04 for Approval - 1MC06-CEK-AR-DDE-C002-000010

The location of the noise barriers is shown on the South West Aylesbury Part B General Arrangement Plan - For Approval Sheets 1 Drawing Nos. 1MC06-CEK-TP-DGA-CS04_CL18-000005 (Image 4) and Sheet 2 1MC06-CEK-TP-DGA-CS04_CL18-000006 (Image 5).

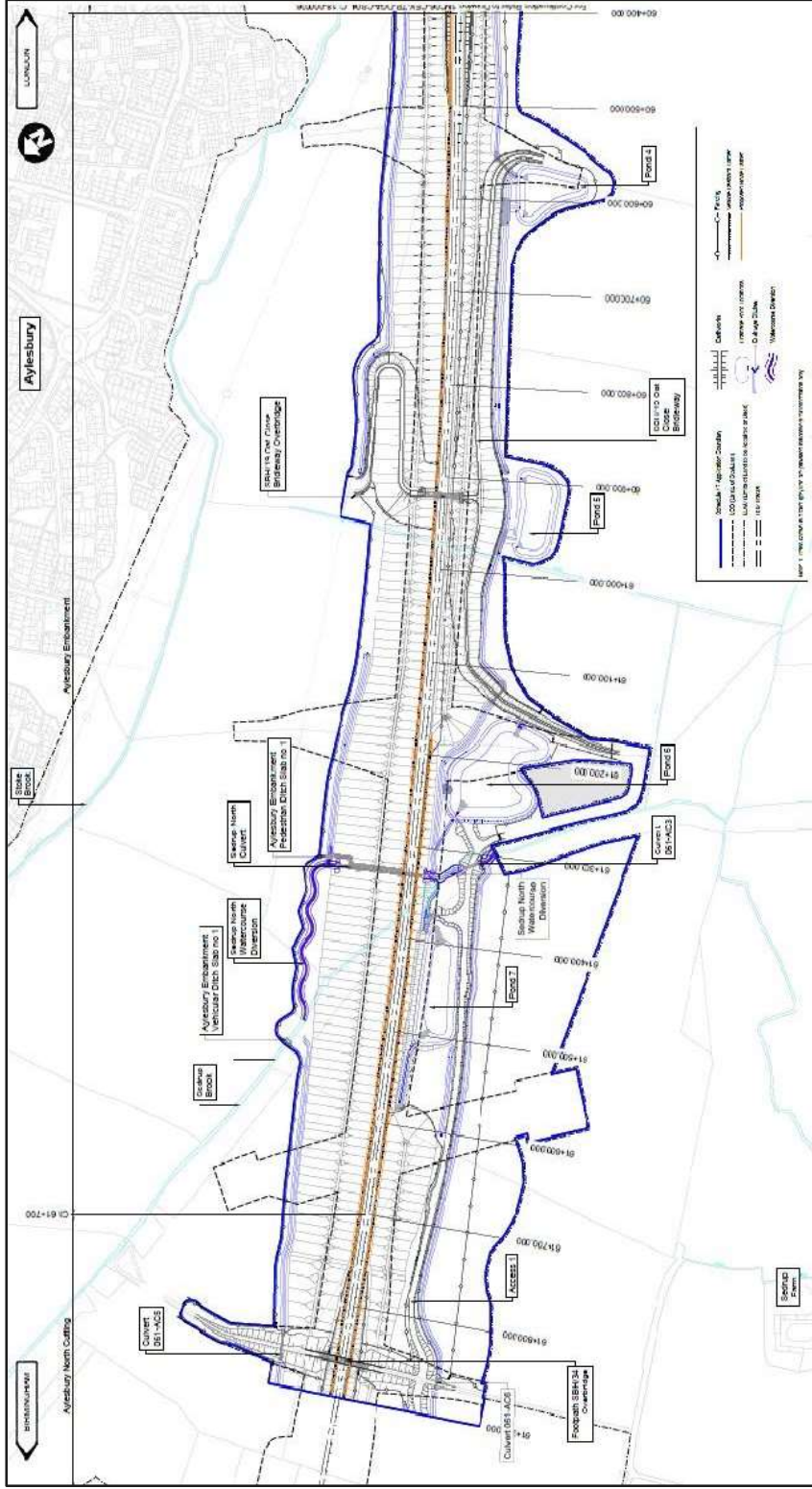


Image 4 – Excerpt from General Arrangement Plan Part 6B Sheet 1 (Drawing No. 1MC06-CEK-TP-DGA-CS04_CL18-000005)

3.2 Design Changes Since Consented Design

Since the original consent the barrier offsets have been amended to accommodate drainage and facilitate a laydown area. The revised barrier offsets and the noise barrier type set out in Table 1 have been considered in the noise modelling on the Up Side (east) of the HS2 alignment.

Asset	Ch	Ch	Drainage Offset (m)	Type
Aylesbury South Cutting	59,800	60,275	7.9	Type A
Aylesbury South Cutting	60,275	60,500	5.7	Type A
Aylesbury Embankment	60,500	60,666	5.7	Type A
Aylesbury Embankment	60,666	60,816	6.0	Type A
Aylesbury Embankment	60,816	60,984	5.6	Type A
Aylesbury Embankment	60,984	61,134	5.6	Type A
Aylesbury Embankment	61,134	61,576	5.7	Type A
Aylesbury Embankment	61,618	61,763	5.6	Type A
Aylesbury North Cutting	61,763	62,084	5.8	Type A
Aylesbury North Cutting	62,084	62,250	5.8	Type A
Aylesbury North Cutting	62,250	62,340	5.7	Type A
Aylesbury North Cutting	62,340	62,380	5.7	Type A
Aylesbury North Cutting	62,380	62,435	5.4	Type A
Oxford Road Embankment	62,435	62,880	5.5	Type A
Oxford Road Embankment	62,880	63,292	5.5	Type A
Whaddon Hill Cutting	63,292	63,874	5.4	Type A
Whaddon Hill Cutting	63,874	64,200	5.5	Type A
Whaddon Hill Cutting	64,200	64,259	5.4	Type B
Whaddon Hill Cutting	64,259	64,300	5.4	Type B
Whaddon Hill Cutting	64,300	64,334	5.4	Type B

Asset	Ch	Ch	Drainage Offset (m)	Type
Thame Valley South Embankment	64,334	64,350	5.4	Type B
Thame Valley South Embankment	64,350	64,371	5.4	Type B
Thame Valley South Embankment	64,371	64,382	5.4	Type B

Table 1 Noise Barrier Offsets Aylesbury Up Side

On the Down Side (west) of the HS2 alignment, the changes to noise barrier offset to accommodate drainage are set out in Table 2.

Asset	Ch	Ch	Offset	Barrier Type
Aylesbury Embankment	61,200	61,620	5.4	Type B
Aylesbury Embankment	61,620	61,763	5.4	Type B
Aylesbury North Cutting	61,763	61,966	5.4	Type B
Aylesbury North Cutting	61,966	62,250	5.5	Type B
Aylesbury North Cutting	62,250	62,435	5.6	Type B
Oxford Road Embankment	62,435	62,700	5.5	Type B
Oxford Road Embankment	62,700	63,292	5.5	Type B
Whaddon Hill Cutting	63,292	63,300	5.4	Type B

Table 2 Noise Barrier Offsets – Aylesbury (Down Side)

4 Methodology

4.1 Calculation Method

Airborne noise from the operational railway has been assessed according to the required HS2 methodology which requires predictions of noise emission from five discrete sources at different heights above the rail to represent the source of noise associated with High-Speed Rail. The total noise emission from the train is calculated from the summation of the contributions of each of these distinct elements of the train, individually corrected for propagation to the assessment location.

The methodology includes corrections to account for future rolling stock being quieter than TSI-compliant trains and the representation of an individual track to better allow for divergence of the up and down tracks.

Appendix D sets out in detail the technical methodology for the prediction of airborne noise from operational trains.

4.2 Airborne noise from altered roads

Airborne noise from altered roads has been assessed in accordance with the methodology in Appendix D.

Airborne noise from altered roads (the A418 Oxford Road) has been assessed in accordance with the methodology set out in the *Calculation of Road Traffic Noise* (CRTN) and the updated procedure in the *Design Manual for Roads and Bridges HD213-11 Rev1* (DMRB)⁵.

The A418 Oxford Road is realignment and follows the realignment proposed in the ES. The A418 Oxford Road is situated inside the application area of AVDC P16 South West Aylesbury Part B.

The contribution from road traffic is presented in Appendix F.

4.3 Assessment Methodology

In accordance with Information Papers E20 and E21 and the HS2 Phase 1 ES methodology, the impact of each Noise Barrier Design Option is considered and assessed against the following criteria:

- The number of residential properties with impacts predicted to exceed LOAEL;
- The number of residential properties with impacts predicted to exceed SOAEL;
- The number of residential properties with predicted noise impacts; and
- The number of properties predicted to be eligible for noise insulation.

⁵ DMRB HD213-11 Rev1 as referenced in the HS2 Guidance has been revised (LA 111 Noise and Vibration) but does not alter the criteria for considering road traffic noise.

5 Assumptions

The study is based upon the available information at this stage of the design. For the operational railway: assumed train service patterns, track form, rolling stock parameters and noise sources, and planned operational train speeds are provided by HS2 and are presented within Appendix E.

5.1 Uncertainties and Limitations

The Train Noise Prediction Method (TNPM) was originally validated against a large number of high speed train noise measurements covering a broad range of scenarios, including propagation over flat ground up to distances of 800m from the railway, effects of screening (including reflective and absorptive barriers) and varying angles of view. The overall regression analyses gave a standard error, for the goodness of fit between predicted and measured levels of approximately 3dB(A) for SEL and L_{pAFmax} . This means that the difference between predicted and measured sound levels is typically within ± 3 dB(A). Consistent with the hybrid Bill Scheme the mean levels predicted with the TNPM are presented in this report.

Any source of noise that could occur, or any mitigation that is installed or constructed to control noise and/or vibration; but is not subject to an acoustic specification / standard requires an assumption. Such assumptions are defined when taking into consideration the likely application of existing technology with reference to the probability of the noise and/or vibration occurring. This includes reference to sensitivity tests and regression analysis between predicted and measured levels such as those presented in Appendix SV-001-000: Annex D2 of the HS2 Phase 1 ES and set out in the methodology section of this report. Assumptions in all reasonably foreseeable circumstances are taken on a reasonable worst case. As such, under the majority of operating conditions, lower noise levels than those predicted in this assessment would be expected.

6 Options Appraisal

The noise barrier solution has been developed to cover all of the relevant receptors in the area that stretches from the Princes Risborough to Aylesbury Rail Overbridge crossing in the south to the Thame Valley Viaduct in the north. It is necessary therefore to assess and report the noise impacts over a wider study area, significantly beyond the area of the application site.

The extent of the study area is shown in images 6, 7 and 8 (Ch. 59+500 to 64+382).

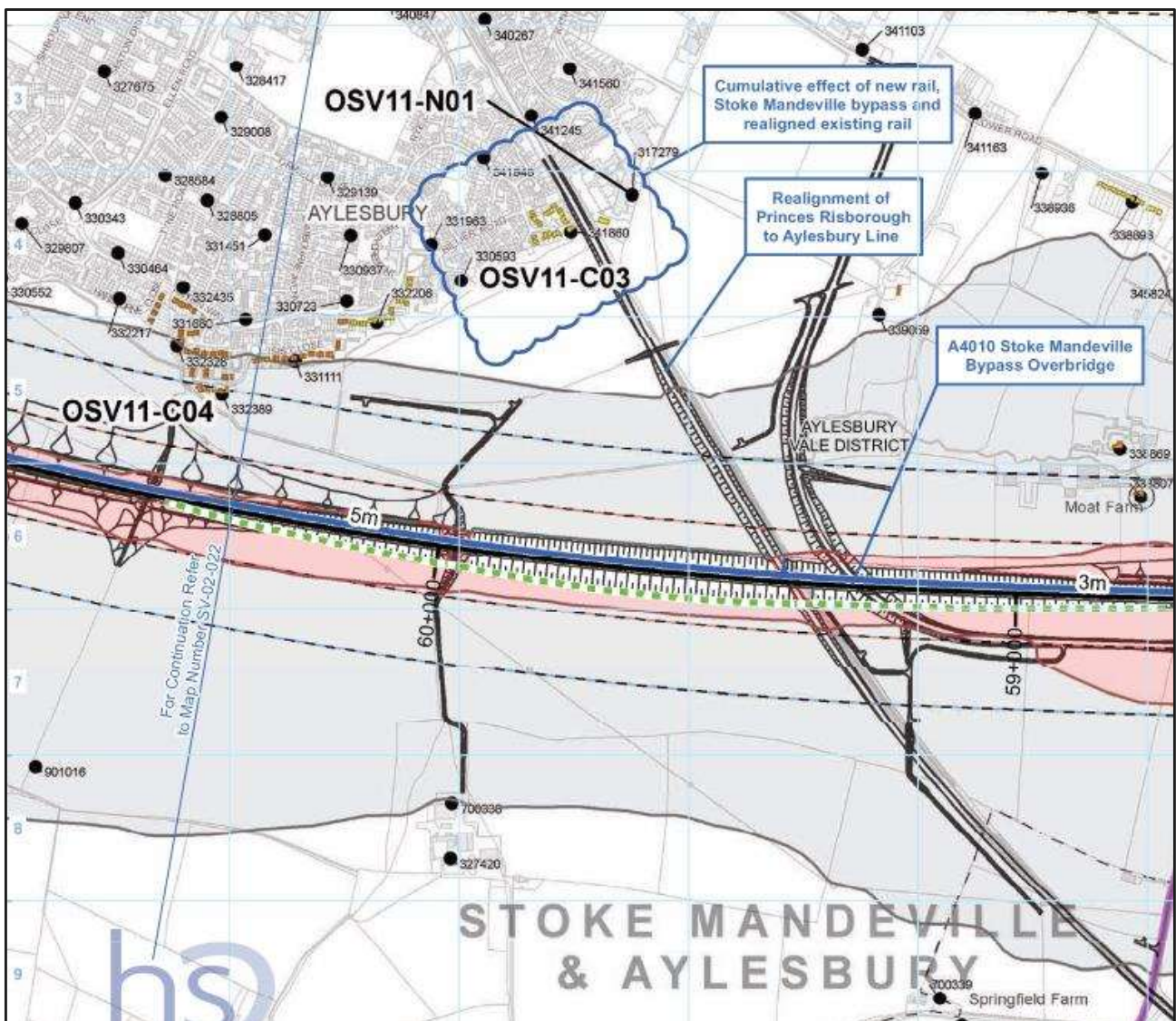


Image 6 - Study area southern part

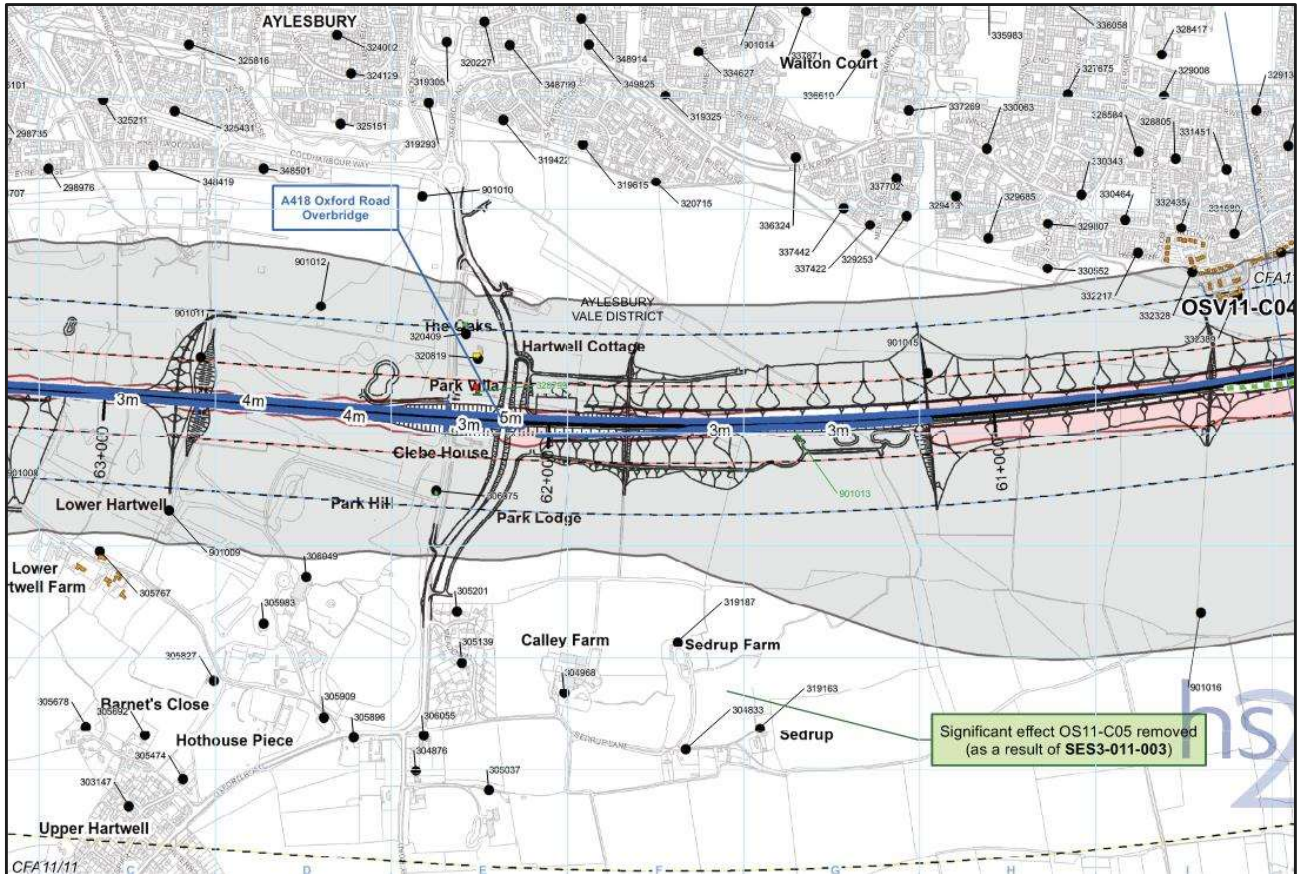


Image 7 - Study area central part

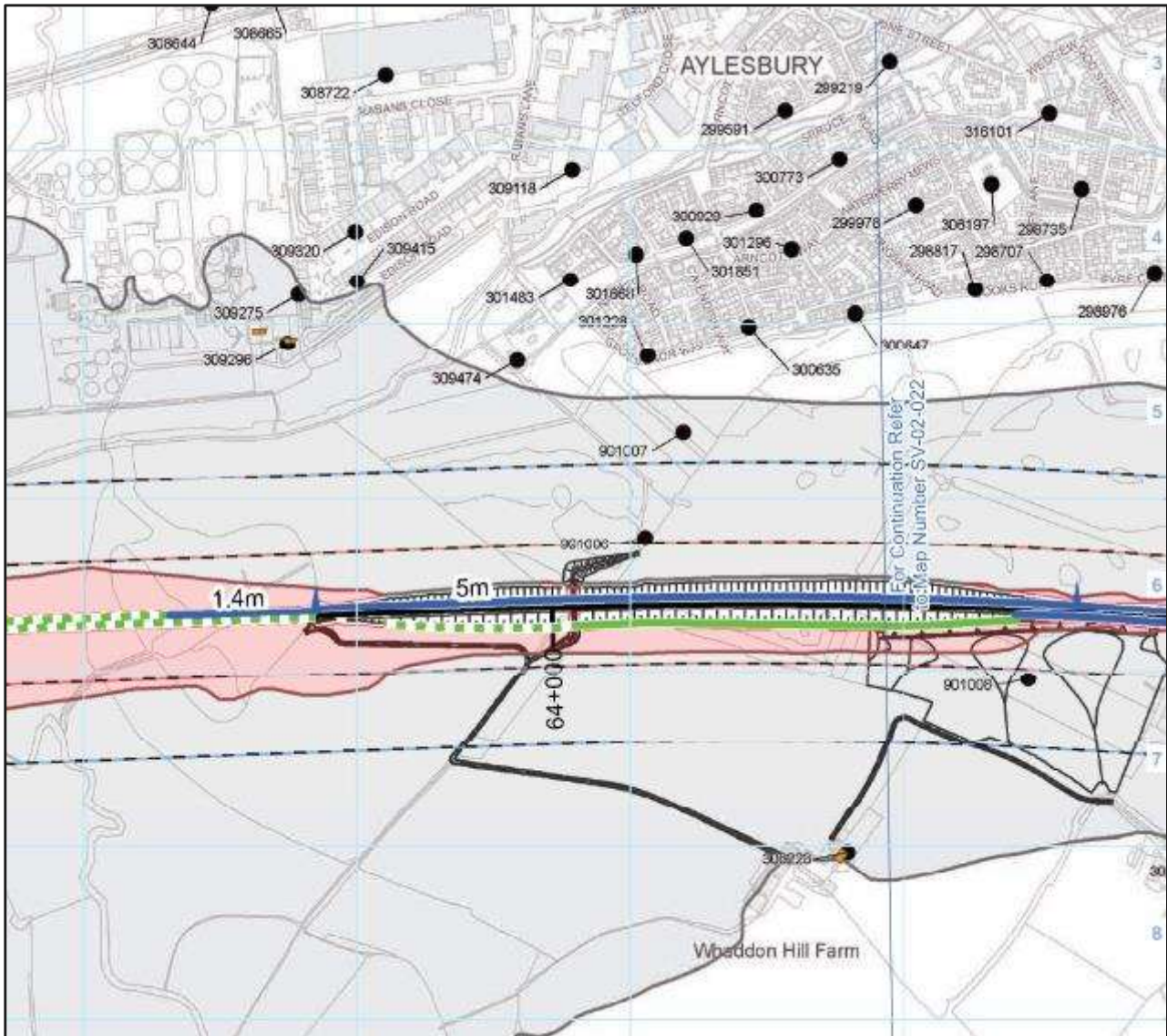


Image 8 - Study area northern part

Design options have been evaluated against a range of criteria including the acoustic effects; landscape and visual effects; engineering practicability and value for money. High level summaries of the options appraisals can be found in Tables 1 (Aylesbury east side - Upside) and 5 (Aylesbury west side - Downside).

Image 9 provides an overview of noise barriers in the study area for options assessed and the proposed design compared to the ES (as amended).

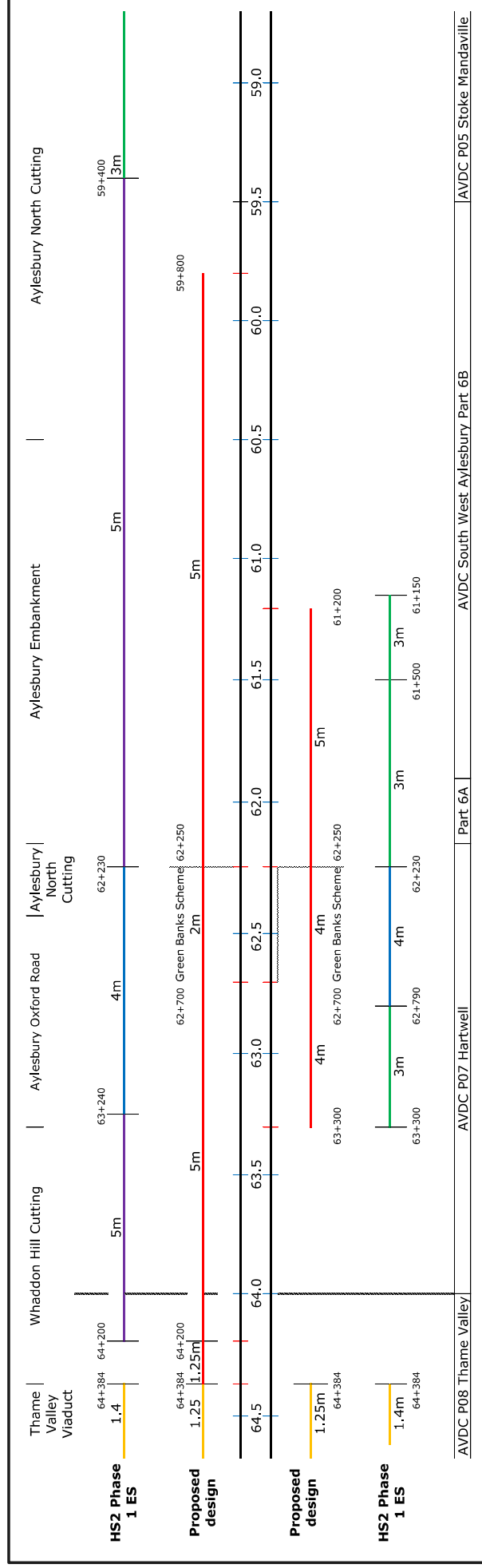


Image 9 – Overview on noise barriers in the Aylesbury area

6.1 Barriers at Aylesbury at the East side (Upside)

The ES (as amended) identified lineside noise barriers on the east side, as follows:

- 5m in height between the Princes Risborough to Aylesbury Rail Overbridge crossing and Oxford Road,
- 4m in height to the north of Oxford Road, and
- 5m in height up to Thames Valley Viaduct.

The noise barrier design, as consented under Schedule 17, is as follows:

- Ch 59+800 to Ch 62+250 absorptive barrier 5m above ToR
- Ch 62+250 to Ch 62+880 absorptive barrier 2m above ToR in the Green Banks Scheme
- Ch 62+880 to Ch 64+200 absorptive barrier 5m above toR
- Ch 62+200 to Ch 64+382 absorptive barrier 1.25m above ToR to tie in with viaduct parapet.

The following design options have been evaluated. The options describe the full extents of the barriers, although the majority falls outside the application area.

- **Earthworks Design** - Mitigation provided by the scheme design earthworks.
- **Option 1 –**
 - Absorptive lineside noise barrier 5m above ToR from Ch 59+800 to 62+250 at varying off-sets from outside rail to accommodate drainage (see Table 1).
 - Green Banks Scheme – noise barrier 2m above ToR (Ch. 62+250 to 62+880).
 - Absorptive lineside noise barrier 5m above ToR Ch 62+880 to Ch 64+ 200 at varying offsets varying offsets from outside rail to accommodate drainage (Table 1).
 - Absorptive lineside noise barrier 1.25m above ToR at varying offsets from outside rail from Ch. 64+200 to tie in with the Thame Valley Viaduct) to accommodate drainage.
- **Option 2 –**
 - Absorptive lineside noise barrier 6m above ToR from Ch 59+800 to 62+250 at varying off-sets from outside rail to accommodate drainage (see Table 1).
 - Green Banks Scheme – noise barrier 3m above ToR (Ch. 62+250 to 62+880).
 - Absorptive lineside noise barrier 6m above ToR Ch 62+880 to Ch 64+ 200 at varying offsets varying offsets from outside rail to accommodate drainage (Table 1).
 - Absorptive lineside noise barrier 2m above ToR at varying offsets from outside rail from Ch. 64+200 to tie in with the Thame Valley Viaduct) to accommodate drainage.

Table 3 below presents a summary of the appraisal. The change in acoustic performance, visual impact and value for money compared to the baseline ES (as amended) design. The proposed design is highlighted in green.

Case	Description	Acoustic	Visual	Value for money	Engineering Con- straints	Consultation
ES Noise Barriers [Comparison Design]	Noise barriers on east side 5m above rail up to existing Oxford Road continuing with a 4m above rail	-	-	-		
Earthworks Design	The Earthworks Design results in the same acoustical impacts as the ES	XX	✓	✓	N	N
Option 1 - lineside noise barriers - this is the Design as consented under Schedule 17	Option 1 Mitigation in the form of lineside noise barriers 5m, 2m (Green banks Scheme), 5m and 1m above ToR	✓	N	N	N	N
Option 2 - lineside noise barriers -	Option 2 Mitigation in the form of lineside noise barriers 6m, 3m (Green banks Scheme), 6m and 2m above ToR	✓	✗	✗	✗	N
XX Materially worse (Using EIA methodologies)						
X Worse						
- Neutral, N/A – no change or not applicable						
✓ Beneficial						
✓✓ Materially beneficial (Using EIA methodologies)						
Value for money compared to the ES: B – Better, W – Worse, N - Neutral						

Table 3 – Summary appraisal table, proposed mitigation scenarios, operational airborne noise at Aylesbury at the east side (upside barrier)

In summary:

- **Earthworks Design** (mitigation in the form of the earthworks design) shows the following impacts:

	Earthworks Design		ES Design		Earthworks Design at time of Consent	
	Day	Night	Day	Night	Day	Night
Major impact	97	5	1	0	101	5
Moderate impact	901	549	100	46	1142	782
Minor impact	576	605	1	91	338	825
No. above LOAEL L_{Aeq}	1859	2039	414	949	1915	2684
No. above SOAEL L_{Aeq}	1	1	0	0	1	1
No. above LOAEL L_{Amax}	5190		2795		3917	
No. above SOAEL L_{Amax}	1		0		1	

Table 4 – Earthwork Design and ES at Aylesbury - East side (Upside): Number of impacts (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Aeq}) and SOAEL (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Amax}) and SOAEL (L_{Amax})

The No Barrier Option shows significantly more moderate and major impacts for daytime and night-time as compared to the ES, presenting an adverse material change. No further consideration is given therefore to this option.

It is worth noting that the higher number of L_{max} impacts for the proposed Earthworks Design compared to the earthworks design at the time of Schedule 17 consent for AVDC Package 6b can be attributed to the lowering of the earthworks by 0.7m as agreed with BC to accommodate the access road for the proposed housing development.

Visual perspective: No barrier compared to the HS2 Phase 1 ES (as amended) assessed mostly 5m barrier with a short section of 4m barrier over 2.75Km would have a locally noticeable positive change. It is noted that there has been a track uplift at this location making the Aylesbury embankment higher and the Aylesbury South cutting and Aylesbury North cuttings shallower. However, this change in the track vertical alignment has been offset by a corresponding increase in the height and length of the landscape earthworks false cutting. The HS2 Phase 1 ES assessed barrier would for the most part be contained by a combination of railway cutting and landscape earthworks false cutting which run along both sides of HS2. Where there is a break in the landscape earthworks on the downside the omission of the barrier will be noticeable, assuming the no barrier on the downside was also the preferred option. The majority of views where the omission of the barrier would be experienced will be limited to short sections of PRoW and Bridleway on the immediate approaches to A418 overbridge and the footbridge to the south which cross HS2 within the study area. Overtime these views will be reduced to glimpses through vegetation as the proposed mitigation planting on the landscape earthworks establish. It is considered that the no barrier option would have a negligible positive effect on the local landscape character of the vale landscape to the south-west of Aylesbury and its visual amenity to that reported in the ES (as amended). The omission of the barrier will have a perceptible positive change, allowing a view to the false cutting and cutting slopes.

The earthworks mitigation removes the need for construction of noise barriers.

Option 1 (combination of earthworks and noise barriers 5m above ToR south of Green Banks Scheme, with a 2m barrier located within the Green Banks Scheme and 5m barrier north of the Green Banks Scheme) shows the following impacts:

	Option 1		ES Design		Consented Design	
	Day	Night	Day	Night	Day	Night
Major impact	0	0	1	0	1	1
Moderate impact	46	46	100	46	101	46
Minor impact	5	30	1	91	2	133
No. above LOAEL L_{Aeq}	592	672	414	949	325	779
No. above SOAEL L_{Aeq}	0	0	0	0	0	0
No. above LOAEL L_{Amax}	2372		2795		2150	
No. above SOAEL L_{Amax}	1		0		1	

Table 5 – Option 1 and ES at Aylesbury - East side (Upside): Number of impacts (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Aeq}) and SOAEL (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Amax}) and SOAEL (L_{Amax})

Compared to the ES (as amended), Option 1 shows one less major impact above LOAEL (0) as the ES for daytime (1), with the noise change at ID 320799 reduced from major to moderate. The 100 daytime moderate impacts reported in the ES are reduced to 46 moderate impacts.

On face value this would appear to be a material benefit over the ES. The benefit however results from changes in the predicted design noise levels at ID 331111 (27 impacts) and ID 332328 (28 impacts) being reduced to marginally below LOAEL (49.7dB for ID 331111 and 49.4dB for ID 332328).

For night-time Mitigation Design Option 1 shows the same number of major impacts as the ES (zero) and the same number of moderate impacts as the ES (46).

At ID 332328 (28 impacts) and ID 320206 (33 impacts) the nighttime exceedances of LOAEL in the ES are reduced to slightly below LOAEL (39.5dB at ID 320206 and 39.9 at ID 332328), removing 61 minor impacts reported in the ES. Again, on face value this appears to be a material benefit but is as a result of very small noise changes compared to the levels reported in the ES.

From a visual perspective, a 2m barrier within the Green Banks and a 5m (1.02Km) barrier above TOR compared to the ES (as amended) will have a negative change. It is noted that there has been a very slight track uplift at this location making the Oxford Road embankment marginally higher.

From a visual perspective, it is noted that the Preferred Option barriers for this area has already been consented under the original S17 applications. The consent also includes the vertical change in the track level because of VE 030. The consented option also includes barrier heights which have been increased since the ES as amended. These changes are.

- New upside barrier (2m above ToR) has been introduced at Aylesbury North Cutting (A418 / Hartwell House Park wall) and Oxford Road embankment (SBH/32 footbridge) between Ch 62+250 and 62+880 (NB Green Banks Project).
- Upside barrier has increased in height by +1m (from 4m above ToR to 5m above ToR) at Oxford Road embankment (SBH/32) to end of embankment between Ch 62+880 and 63+300.

Since the ES (as amended) a 1.284km length of 4m above ToR noise barrier (upside) has been removed from within Aylesbury cutting between Ch 58+516 and 59+800. In addition, at Thame Valley South Embankment the noise barrier has been reduced in height to 1.25m above ToR i.e., the same height as the designed viaduct parapet between Ch 64+350 to 64+382. The ES reported the barrier to be initially 5m ToR reducing to 3m above ToR.

Since the previous S17 application when the barriers were consented there has been a further design change at Aylesbury South cutting / Aylesbury Embankment. The upside landscape mitigation earthworks crest height has been reduced in height over a 720m length (Ch 60+050 to 60+770) up to a maximum of 700mm over a 200m length. This means that the earthworks crest height will be slightly lower than the top of the adjacent noise barrier over this length. However, it is considered that the landscape planting mitigation on the outward facing back slope, allowing for between two- and three-years establishment prior to year one of operation, will screen the barrier.

There are no other notable design changes within the area that will affect the massing or appearance of the noise barrier.

Based on landscape and visual effects, taking account of the proposed landscape mitigation earthworks and the mitigation planting, Mitigation Design Option 1 will not result in new or worsening of the landscape and visual effects as reported in the ES (as amended).

Option 1 does not present any specific engineering constraints and is considered to be neutral.

Option 2 (combination of earthworks and noise barriers 6m above ToR with a 3m barrier located within the Green Banks Scheme and 6m barrier north of the Green Banks Scheme) shows the following impacts:

	Option 2		ES Design		Consented Design	
	Day	Night	Day	Night	Day	Night
Major impact	0	0	1	0	1	1
Moderate impact	46	46	100	46	101	46
Minor impact	3	30	1	91	2	133
No. above LOAEL L_{Aeq}	472	672	414	949	325	779
No. above SOAEL L_{Aeq}	0	0	0	0	0	0
No. above LOAEL L_{Amax}	1913		2795		2150	
No. above SOAEL L_{Amax}	1		0		1	

Table 6 – Option 2 and ES at Aylesbury - East side (Upside): Number of impacts (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Aeq}) and SOAEL (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Amax}) and SOAEL (L_{Amax})

The acoustic performance of this option is similar to that of Option 1 and only reduces the number of minor impacts during the day from 5 to 3. Mitigation Design Option 2 therefore does not show a material benefit over Option 1 and provides a similar if not the same benefit over the ES as mitigation Option 1.

From a visual perspective, Mitigation Option 2 increases the height of most noise barriers through the Aylesbury South area except for the southern 4m ToR noise barriers (upside and downside) at Aylesbury South cutting which remain the same height between Ch 57+418 and 58+516.

The changes to barrier heights introduced by this option are.

- Upside barrier has increased in height by +1m (from 5m ToR to 6m ToR) at Aylesbury South cutting (just south of the proposed A4010 overbridge), Aylesbury embankment and Aylesbury North cutting (A418 / Hartwell House Park wall) between Ch 59+880 and 62+250.
- The new upside barrier has increased by +1m (from 2m ToR to 3m ToR) at Aylesbury North Cutting (A418 / Hartwell House Park wall) and Oxford Road embankment (SBH/32 footbridge) between Ch 62+250 and 62+880 (NB Green Banks Project).

Mitigation Option 2 in comparison with Mitigation Option 1 provides a taller barrier at the Aylesbury South cutting, Aylesbury Embankment and Aylesbury North cutting civils assets. These assets fall within the Hadden Vale LCA.

Although there are landscape mitigation earthworks with planting at these locations (both sides) the increased height barrier will protrude above these earthworks at year one of operation. It is not anticipated that the increased height of the barrier will result in worsening or new significant landscape effects on the Haddenham Vale LCA. However, there is the likelihood of a worsening of the visual effects compared to the Preferred Option as it will not be possible to fully screen the taller barrier at year one of operation without a review and redesign of the proposed landscape planting mitigation and the introduction of taller plant species.

Option 2 at 6m above ToR would require larger piles, which would require additional space, impacting on earthworks design, drainage requirements and noise barrier offsets. Option 2 would also incur additional costs as a result of the additional piles and increased pile diameters.

Option 1 has been selected as the proposed mitigation design as its acoustic performance on balance is similar or better to that reported in the ES (as amended). Option 2 does not provide any appreciable acoustic benefit compared to Option 1 but is worse in terms of visual impact and cost.

It is recognized that the noise barriers presented as Design Option 1 do result in an increase in the barrier heights compared to those assessed in the ES (as amended). However, the proposed landscape earthworks and or the associated mitigation planting will provide the necessary landscape and visual mitigation as assessed in the ES. Design Option 2 proposes further increases in the barrier heights, particularly within the Haddenham Vale LCA to the southwest of Aylesbury. It is considered that the increased massing and appearance of the barriers will not be fully mitigated by the landscape mitigation planting resulting a likely new significant visual effect at year one of operation.

On the basis Design Option 1 will not give rise to a worsening of the visual effect reported in the ES (as amended) and it is considered that this option is better than Design Option 2.

It will henceforth be referred to as **the Proposed Design**.

6.2 Barriers at Aylesbury at the West Side (Downside)

The ES (as amended) identified lineside noise barriers on the west side, 3m in height, from Footpath SBH/27 Overbridge to the existing Oxford Road and then continuing in 4m in height followed by a 3m in height to Whaddon Hill Cutting.

SES 3 AP4 provides for a noise barrier at Sedrup ditch (SES3-011-003). The provision of a 3m high noise fence barrier along the west side of the HS2 route, to the east of Sedrup Lane, for a length of approximately 350m to reduce operational noise effects in Sedrup. As shown on Image 7, the significant effect OS11-C05, that was previously identified, was removed as a result of this additional mitigation.

Image 7 shows that only a few receptors on the west side of HS2 fall within the daytime noise LOAEL contour.

The following design options have been evaluated. As before, the options describe the full lengths of the barriers, although the majority of the barriers extend beyond the application area.

- **Earthworks Design.**
- **Option 1 –**
 - Absorptive lineside noise barrier 5m above ToR on embankment at variable from outside rail (Table 48) from Ch. 61+200 to 61+618) to accommodate drainage and 4.6m from outside rail (Ch. 61+618 to 62+250).
 - Green Banks Scheme – Absorptive lineside noise barrier 4m above ToR (Ch. 62+250 to 62+700).
 - Absorptive lineside 4m noise barrier above ToR on embankment at variable offset from outside rail (Table 48) from Ch. 62+700 to 63+300.
- **Option 2 –**
 - Absorptive lineside noise barrier 6m above ToR on embankment at variable from outside rail (Table 48) from Ch. 61+200 to 61+618) to accommodate drainage and 4.6m from outside rail (Ch. 61+618 to 62+250).
 - Green Banks Scheme – Absorptive lineside noise barrier 5m above ToR (Ch. 62+250 to 62+700).
 - Absorptive lineside 5m noise barrier above ToR on embankment at variable offset from outside rail (Table 48) from Ch. 62+700 to 63+300.

Table 7 below presents a summary of the appraisal. The change in acoustic performance, visual impact and value for money compared to the baseline ES (as amended) design. The proposed design is highlighted in green.

Case	Description	Acoustic	Visual	Value for money	Engineering Con- straints	Consultation
ES Noise Barriers [Comparison Design]	Noise barriers on west side 3m above rail up to existing Oxford Road continuing with a 4m above rail					
Earthworks Design	Earthworks Design	XX	✓	✓	N	N
Option 1 - Lineside Noise Barriers – reflects design as consented	Mitigation in the form of lineside noise barriers 5m, 4m (Green Banks Scheme) and 4m above ToR	✓	✗	N	N	N
Option 2 – Lineside Noise Barrier	Mitigation in the form of lineside noise barriers 6m, 5m (Green Banks Scheme) and 5m above ToR	✓	✗			
XX Materially worse (Using EIA methodologies)						
X Worse						
- Neutral, N/A – no change or not applicable						
Beneficial						
✓✓ Materially beneficial (Using EIA methodologies)						
Value for money compared to the ES: B – Better, W – Worse, N - Neutral						

Table 7 – Summary appraisal table, proposed mitigation scenarios, operational airborne noise at Aylesbury west side (Downside barriers)

In summary:

- **Earthworks Design**, mitigation in the form of the earthworks design shows the following impacts:

	Earthworks Design		ES Design		Earthworks Design at time of Consent	
	Day	Night	Day	Night	Day	Night
Major impact	8	0	0	0	8	8
Moderate impact	1	9	9	1	36	32
Minor impact	0	6	0	8	1	20
No. above LOAEL L_{Aeq}	26	59	49	52	85	88
No. above SOAEL L_{Aeq}	0	0	0	0	0	0
No. above LOAEL L_{Amax}	162		88		88	
No. above SOAEL L_{Amax}	0		0		0	

Table 8 – Earthwork Design option and ES at Aylesbury - West side (downside): Number of impacts (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Aeq}) and SOAEL (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Amax}) and SOAEL (L_{Amax})

The acoustic performance of this option shows 8 more major impacts above LOAEL for daytime and 8 more moderate impacts for night-time as compared to the ES, presenting an adverse material change. Therefore, this Option represents a material worsening from the ES case.

The L_{max} impacts above LOAEL for the earthworks design option are more than those reported in the ES (162 impacts above LOAEL compared to 88 in the ES case).

Visual perspective: No barrier compared to the ES (as amended) assessed mostly 3m barrier with a short section of 4m barrier over 400m would have a locally noticeable positive change. It is noted that there has been a track uplift at this location making the Aylesbury embankment higher and the Aylesbury South cutting and Aylesbury North cuttings shallower. However, this change in the track vertical alignment has been offset by a corresponding increase in the height and length of the landscape earthworks false cutting. The ES assessed barrier would for the most part be contained by a combination of railway cutting and landscape earthworks false cutting which run along both sides of HS2. Where there is a break in the landscape earthworks on the downside the omission of the barrier will be noticeable, and it is assumed that the no barrier option would also apply to the upside barrier, so that it too would not be present in the view. The majority of views where the omission of the barrier would be experienced will be limited to short sections of PRow and Bridleway on the immediate approaches to A418 overbridge and the footbridge to the south which cross HS2 within the study area. Overtime these views will be reduced to glimpses through vegetation as the proposed mitigation planting on the landscape earthworks establish. It is considered that the no barrier option would have a negligible positive effect on the local landscape character of the vale landscape to the South-west of Aylesbury and its visual amenity to that reported in the ES (as amended).

The **Earthworks Design** does not present any specific engineering constraints and is considered to be neutral.

- **Option 1** (mitigation in the form of noise barrier 5m above ToR with a 4m barrier located within the Green Banks Scheme, followed by a 4m above ToR) shows the following impacts:

	Option 1		ES Design		Consented Design	
	Day	Night	Day	Night	Day	Night
Major impact	0	0	0	0	0	0
Moderate impact	9	1	9	1	1	1
Minor impact	0	8	0	8	0	8
No. above LOAEL L_{Aeq}	25	25	49	52	17	25
No. above SOAEL L_{Aeq}	0	0	0	0	0	0
No. above LOAEL L_{Amax}	85		88		62	
No. above SOAEL L_{Amax}	0		0		0	

Table 9 – Option 1 and ES Aylesbury - West side (downside): Number of impacts (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Aeq}) and SOAEL (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Amax}) and SOAEL (L_{Amax})

On balance, the acoustic performance is neutral, matching the moderate and minor impacts reported in the ES. Compared to the ES however there is a decrease in the number of exceedances of the LOAEL.

Visual perspective: A 4m barrier within the Green Banks and mostly a 4m (600m) barrier above TOR (with a very short section of 5m barrier) compared to the ES (as amended) assessed 4m (540m) and 3m (510m) barrier above TOR would have a negative change from the conclusions drawn in the ES. The changes to barrier heights introduced by this option are.

- Downside barrier has increased in height by +2m (from 3m ToR to 5m ToR) at Aylesbury embankment (Sedrup Brook) and Aylesbury North cutting (A418 / Hartwell House Park wall) between Ch 61+200 and 62+250.
- Downside barrier has increased in height by +1m (from 4m ToR to 5m ToR) at Aylesbury North cutting (A418 / Hartwell House Park wall) and Oxford Road embankment (SBH/32) between Ch 62+250 and 62+880.
- Downside barrier has increased in height by +2m (from 3m ToR to 5m ToR) at Oxford Road embankment (SBH/32) to end of embankment between Ch 62+880 and 63+300.

Option 1 provides a taller barrier at the Aylesbury South cutting, Aylesbury Embankment and Aylesbury North cutting civils assets. These assets fall within the Hadden vale LCA. Although there are landscape mitigation earthworks with planting at these locations (both sides) the increased height barrier will protrude above these earthworks at year one of operation. It is also noted that there has been a lowering of the upside barrier over a 720m length between Ch 60+050 to 60+770, which will increase the exposure of the barrier.

It is not anticipated that the increased height of the barrier will result in worsening or new significant landscape effects on the Haddenham Vale LCA.

Option 1 does not present any specific engineering constraints and is considered to be neutral.

- **Option 2** (mitigation in the form of noise barrier 6m above ToR with a 5m barrier located within the Green Banks Scheme, followed by a 5m above ToR) shows the following impacts:

	Option 2		ES Design		Consented Design	
	Day	Night	Day	Night	Day	Night
Major impact	0	0	0	0	0	0
Moderate impact	9	1	9	1	1	1
Minor impact	0	0	0	8	0	8
No. above LOAEL L_{Aeq}	25	25	49	52	17	25
No. above SOAEL L_{Aeq}	0	0	0	0	0	0
No. above LOAEL L_{Amax}	85		88		62	
No. above SOAEL L_{Amax}	0		0		0	

Table 10 – Option 2 and ES Aylesbury - West side (downside): Number of impacts (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Aeq}) and SOAEL (L_{Aeq}), Number of impacts exceeding LOAEL (L_{Amax}) and SOAEL (L_{Amax})

Option 2 shows the same number of moderate and major impacts above LOAEL as the ES Design and Mitigation Design Option 1. Mitigation Option 2 removes the 8 minor impacts at night reported in the ES and also shown in Option 1, but this is as a result of a noise reduction of 0.6dB and is of minimal acoustic benefit.

From a visual perspective, Mitigation Option 2 increases the height of most noise barriers through the Aylesbury South area except for the southern 4m above ToR noise barriers (upside and downside) at Aylesbury South cutting which remain the same height between Ch 57+418 and 58+516.

The changes to barrier heights introduced by this option are.

- Downside barrier has increased in height by +3m (from 3m above ToR to 6m above ToR) at Aylesbury embankment (Sedrup Brook) and Aylesbury North cutting (A418 / Hartwell House Park wall) between Ch 61+200 and 62+250.
- Downside barrier has increased in height by +1m (from 4m ToR to 5m ToR) at Aylesbury North cutting (A418 / Hartwell House Park wall) and Oxford Road embankment (SBH/32) between Ch 62+250 and 62+880.
- Downside barrier has increased in height by +2m (from 3m ToR to 5m ToR) at Oxford Road embankment (SBH/32) to end of embankment between Ch 62+880 and 63+300.

The 6m barrier presented in Option 2 would result in an increase in pile diameter, which in turn will have an impact on the drainage corridor and result in an increased offset of the earthworks.

It is recognized that the noise barriers presented as Design Option 1 result in increased barrier heights compared to those assessed in the ES as amended. However, the proposed landscape earthworks and or the associated mitigation planting will provide the necessary landscape and visual mitigation. Design Option 2 proposes further increases in the barrier heights, particularly within the Haddenham Vale LCA to the south-west of Aylesbury. It is considered that the increased massing and appearance of the barriers will not be fully mitigated by the landscape mitigation planting resulting a likely new significant visual effect at year one of operation.

On the basis Design Option 2 will not give rise to a worsening of the visual effect reported in the ES (as amended). It is considered that Option1 is significantly better than Design Option 2.

Option 2 would require larger piles, which would require additional space, impacting on earthworks design, drainage requirements and noise barrier offsets. Option 2 would also incur additional costs as a result of the additional piles and increased pile diameters.

Option 1 has been selected on the basis that it reduces noise as far as reasonably practicable and represents the optimum balance between the acoustic benefits and other environmental and sustainability impacts, primarily the visual benefit and value for money. It will henceforth be referred to as **the Proposed Design**.

7 Results

In this section of the report the outputs of the acoustic modelling exercise are presented for the Proposed Design.

7.1 Results at Aylesbury - East side (Upside)

The noise predictions for the ES Design and the proposed design (Composite Noise barriers) are presented in Table 11 for Aylesbury - east side (Upside). The tables present a comparison for the predicted rail noise only. Combined future baseline and road traffic noise is included in Appendix E.

Receptor locations are shaded in red where the LOAEL value is exceeded. Where SOAEL is exceeded receptor locations are shaded in darker red.

ID	Area Represented	No of Im-pacts	ES Design Scheme noise only LAeq dB		Option 1 Scheme Noise Only		Consented Scheme	
			Day	Night	Day	Night	Day	Night
298707	Cooks Road, Aylesbury	78	47	38	45	36	45	35
298735	Hickman Street, Aylesbury	85	43	35	42	33	42	33
298817	Cooks Road, Aylesbury	78	47	38	45	36	45	35
298976	Eyre Close, Aylesbury	59	47	39	46	37	45	35
299219	Brimmers Way, Aylesbury	121	41	32	39	31	40	31
299591	Brimmers Way, Aylesbury	75	42	32	41	32	42	32
299978	Great Meadow Way, Aylesbury	65	43	34	42	33	42	33
300635	Napier Road, Aylesbury	61	47	38	46	37	47	37
300647	Warbler Close, Aylesbury	69	47	38	45	36	45	36
300773	Wren Path, Aylesbury	32	42	33	41	32	42	32
300929	Spruce Road, Aylesbury	43	44	35	43	34	44	34
301228	Grosvenor Way, Aylesbury	68	48	39	48	39	48	39
301296	Arncott Way, Aylesbury	36	44	35	43	34	44	34
301483	Chelsea Road, Aylesbury	14	46	37	47	38	48	38
301668	Chelsea Road, Aylesbury	21	45	36	46	37	46	37
301851	Hampstead Close, Aylesbury	35	45	35	45	35	45	36
306197	Swallow Lane, Aylesbury	24	43	34	42	33	42	32
307325	Meredith Drive, Aylesbury	48	41	31	42	33	41	32
308644	Gogh Road, Aylesbury	40	43	34	45	36	44	35
308665	Picasso Place, Aylesbury	40	43	33	44	35	44	34
308722	Rabans Lane, Aylesbury, (General Commercial)	1	43	34	45	35	45	35
309021	Telford Close, Aylesbury	1	39	30	39	30	39	30
309118	Tompion Road, Aylesbury	1	44	35	45	36	46	36
309275	Edison Road, Rabans Lane Industrial Area, (General Commercial)	10	50	41	52	43	52	43
309296	Rabans Lane, Aylesbury	4	52	43	54	45	53	44
309320	Woodley House, Rabans Close Industrial Area (Office)	1	47	38	50	40	50	40

309415	Edison Road, Rabans Lane Industrial Area, (office)	8	50	40	52	42	52	42
309474	Rabans Lane, Aylesbury	2	49	39	50	41	50	41
316101	Hampden Square, Aylesbury	189	41	33	40	31	41	31
317279	Booker Park School, Stoke Leys Close, Aylesbury (School)	1	50	43	52	45	50	42
319293	Pearson Close, Aylesbury	35	49	42	50	42	49	42
319305	Church of Jesus Christ of Latter-day Saints, Aylesbury (Church)	1	44	36	44	36	45	36
319325	Alham Road, Aylesbury	93	43	35	43	35	43	35
319422	Dormer Close, Aylesbury	118	49	44	51	45	47	41
319615	Bonham Close, Aylesbury	178	49	44	51	45	50	42
320227	Briskman Way, Aylesbury	28	40	31	41	33	40	32
320409	Oxford Road, Hartwell	1	55	46	57	48	59	51
320715	Lupin Walk, Aylesbury	127	50	42	51	43	50	42
320799	Oxford Road, Hartwell	1	61	52	61	52	63	54
320819	Oxford Road, Hartwell	1	60	51	60	51	60	51
324002	Slattenham Close, Aylesbury	208	39	31	41	33	42	34
324129	Rowland Way, Aylesbury	112	42	34	43	35	44	36
325151	Upper Abbots Hill, Aylesbury	118	50	42	50	43	52	43
325211	Great Meadow Way, Aylesbury	72	44	35	43	35	44	36
325431	Horton Close, Aylesbury	130	44	36	44	36	46	38
325816	Pitcher Walk, Aylesbury	347	42	34	42	34	43	35
327675	Torridge Road, Aylesbury	176	42	33	41	32	44	35
328417	Ellen Road, Aylesbury	1	41	32	40	32	43	34
328584	Brent Path, Aylesbury	41	44	35	43	34	45	35
328805	Lowmon Way, Aylesbury	53	45	36	44	35	45	37
329008	Orwell Close, Aylesbury	84	42	33	42	33	43	35
329139	Enborne Close, Aylesbury	64	44	35	43	35	45	37
329253	Welland Road, Aylesbury	30	46	37	45	36	46	37
329413	Blackwater Drive, Aylesbury	61	45	36	44	36	46	37
329685	Witham Way, Aylesbury	57	48	39	46	38	47	39
329807	Witham Way, Aylesbury	44	46	37	46	37	46	37
330063	Alwin Close, Aylesbury	84	43	34	42	34	44	36
330343	Ebble Close, Aylesbury	78	46	37	45	36	46	37
330464	Anton Way, Aylesbury	13	47	38	46	37	47	38
330552	Stour Close, Aylesbury	49	49	39	48	39	48	39
330593	Parslow Close, Aylesbury	78	49	41	48	40	49	40
330723	Anton Way, Aylesbury	56	48	39	47	38	48	39
330937	Garron Close, Aylesbury	71	45	36	45	36	46	38
331111	Isis Close, Aylesbury	27	50	41	50	41	51	42
331451	Bowmont Drive, Aylesbury	63	45	37	45	36	46	37
331680	Anton Way, Aylesbury	103	48	39	48	39	49	39
331963	Hillier Road, Aylesbury	99	46	37	46	37	47	38
332206	Anton Way, Aylesbury	33	49	40	48	39	49	40

332217	Harbourne Close, Aylesbury	31	49	39	48	39	48	39
332328	Deverill Road, Aylesbury	28	50	41	49	40	50	41
332389	Oat Close, Aylesbury	41	52	43	52	42	52	43
332435	Anton Way, Aylesbury	64	48	38	47	38	48	39
334627	Hamble Drive, Aylesbury	146	41	33	41	34	44	36
335983	Grenville Road, Aylesbury	42	37	28	37	29	40	32
336058	Grenville Road, Aylesbury	125	38	28	38	29	40	32
336324	Cornbrook Road, Aylesbury	124	46	39	45	37	46	39
336610	Plym Close, Aylesbury	108	42	34	41	33	42	34
337269	Hannon Road, Aylesbury	65	43	35	42	34	44	36
337422	Nene Close, Aylesbury	27	48	40	47	39	47	39
337442	Frome Close, Aylesbury	45	42	33	43	34	44	35
337702	Tees Road, Aylesbury	44	44	36	44	36	45	36
337871	Nursery Close, Aylesbury	21	36	27	36	28	37	29
340267	Hughenden Green, Aylesbury	49	52	33	47	35	51	38
340847	Bowler Road, Aylesbury	77	39	31	39	31	42	33
341245	Lower Road, Aylesbury	17	52	33	49	38	51	39
341560	Mentmore Green, Aylesbury	108	45	35	44	36	47	40
341860	Kynaston Avenue, Aylesbury	2	49	41	51	43	50	42
341948	Rake Way, Aylesbury	127	43	34	44	35	45	36
348206	Keen Close, Aylesbury	75	39	30	38	29	39	31
348419	Prestwold Way, Aylesbury	113	48	40	47	39	48	40
348501	Andrews Way, Aylesbury	18	49	42	49	41	49	41
348799	Jakeman Way, Aylesbury	36	41	33	43	35	44	36
348914	Briskman Way, Aylesbury	88	40	31	41	33	43	34
349825	Wendover Road, Weston Turville	58	42	34	43	36	44	37
Non-Residential								

Table 11 – Operational airborne railway noise at Aylesbury - East side (Upside), Proposed Design compared to HS2 Phase 1 ES Design: L_{Aeq} parameters

The predicted noise impacts above LOAEL (L_{Aeq} daytime and night-time) for the proposed design have been compared against the Phase 1 ES and are presented in Table 12.

	Observed Adverse Effect Level	Total Day	Total Night
The Proposed Design	Number of impacts exceeding lowest observed adverse effects level (LOAEL)	592	672
ES Design		414	950

Table 12 – Number of impacts exceeding LOAEL in the Design and ES (L_{Aeq}) at Aylesbury - East side (Upside)

Table 13 below shows one less major impact above LOAEL (0) as the ES for daytime (1), with the noise change at ID 320799 reduced from major to moderate. For daytime the 100 moderate impacts reported in the ES are reduced to 46 moderate impacts.

On face value this would appear to be a material benefit over the ES. The benefit over the ES is due to predicted design noise levels at ID 331111 (27 impacts) and ID 332328 (28 impacts) being reduced to marginally below LOAEL (49.7dB for ID 331111 and 49.4dB for ID 332328).

For night-time Proposed Design shows the same number of major impacts as the ES (zero) and the same number of moderate impacts as the ES (46).

At ID 332328 (28 impacts) and ID 320206 (33 impacts) the nighttime exceedances of LOAEL in the ES are reduced to slightly below LOAEL (39.5dB at ID 320206 and 39.9 at ID 332328), removing 61 minor impacts reported in the ES. Again, on face value this appears to be a material benefit but is as a result of very small noise changes over the levels reported in the ES.

	Major Impacts		Moderate Impacts		Minor Impacts	
	Day	Night	Day	Night	Day	Night
The Proposed Design	0	0	46	46	5	30
ES Design	1	0	100	46	1	91

Table 13 – Number of receptors identifying impacts in the Design and ES (L_{Aeq}) at Aylesbury - East side (Upside)

The L_{Amax} levels for the proposed design have been compared against the HS2 Phase 1 ES and are presented in Table 14 below.

The L_{Amax} predictions are free-field levels and have therefore been compared against a LOAEL level of 57.5 dB as opposed to a façade level of 60dB, and a SOAEL level of 77.5 dB as opposed to a façade level of 80 dB.

Receptor locations are shaded in red where the LOAEL value is exceeded. Where SOAEL is exceeded, these receptor locations are shaded in darker red.

ID	Area Represented	No of Im-pacts	No Barrier L_{max}	Option 1 L_{max}	ES L_{max}	Consented L_{max}
298707	Cooks Road, Aylesbury	78	67	58	59/63	60
298735	Hickman Street, Aylesbury	85	63	63	55/59	57
298817	Cooks Road, Aylesbury	78	65	58	58/62	59
298976	Eyre Close, Aylesbury	59	66	58	58/63	61
299219	Brimmers Way, Aylesbury	121	60	55	53/56	54
299591	Brimmers Way, Aylesbury	75	58	57	54/57	57
299978	Great Meadow Way, Aylesbury	65	63	56	54/57	55
300635	Napier Road, Aylesbury	61	64	61	59/62	61
300647	Warbler Close, Aylesbury	69	65	58	57/61	58
300773	Wren Path, Aylesbury	32	60	57	54/57	56
300929	Spruce Road, Aylesbury	43	60	59	56/59	59
301228	Grosvenor Way, Aylesbury	68	66	64	62/65	64
301296	Arncott Way, Aylesbury	36	62	59	55/58	58
301483	Chelsea Road, Aylesbury	14	64	64	61/64	64
301668	Chelsea Road, Aylesbury	21	62	62	60/63	62
301851	Hampstead Close, Aylesbury	35	61	60	58/61	60
306197	Swallow Lane, Aylesbury	24	63	56	54/57	56

307325	Meredith Drive, Aylesbury	48	57	57	54/57	56
308644	Gogh Road, Aylesbury	40	60	60	57/60	59
308665	Picasso Place, Aylesbury	40	59	59	57/60	59
308722	Rabans Lane, Aylesbury, (General Commercial)	1	59	59	56/59	60
309021	Telford Close, Aylesbury	1	56	55	51/54	55
309118	Tompion Road, Aylesbury	1	61	61	58/61	61
309275	Edison Road, Rabans Lane Industrial Area, (General Commercial)	10	68	67	64/67	68
309296	Rabans Lane, Aylesbury	4	69	69	66/69	69
309320	Woodley House, Rabans Close Industrial Area (Office)	1	65	64	61/64	65
309415	Edison Road, Rabans Lane Industrial Area, (office)	8	67	67	64/67	67
309474	Rabans Lane, Aylesbury	2	67	67	64/67	67
316101	Hampden Square, Aylesbury	189	60	54	52/55	55
317279	Booker Park School, Stoke Leys Close, Aylesbury (School)	1	60	57	59/62	57
319293	Pearson Close, Aylesbury	35	62	58	55/60	58
319305	Church of Jesus Christ of Latter day Saints, Aylesbury (Church)	1	60	56	51/54	55
319325	Alham Road, Aylesbury	93	59	55	51/54	55
319422	Dormer Close, Aylesbury	118	62	58	55/59	58
319615	Bonham Close, Aylesbury	178	63	58	54/58	58
320227	Briskman Way, Aylesbury	28	58	54	52/56	55
320409	Oxford Road, Hartwell	1	74	72	66/71	71
320715	Lupin Walk, Aylesbury	127	63	57	54/58	57
320799	Oxford Road, Hartwell	1	81	78	74/77	80
320819	Oxford Road, Hartwell	1	75	74	68/72	74
324002	Slattenham Close, Aylesbury	208	57	54	50/53	54
324129	Rowland Way, Aylesbury	112	59	56	52/55	56
325151	Upper Abbots Hill, Aylesbury	118	63	59	56/61	59
325211	Great Meadow Way, Aylesbury	72	63	56	55/60	57
325431	Horton Close, Aylesbury	130	64	57	55/60	58
325816	Pitcher Walk, Aylesbury	347	60	55	52/55	56
327675	Torridge Road, Aylesbury	176	58	55	51/54	52
328417	Ellen Road, Aylesbury	1	56	54	50/53	52
328584	Brent Path, Aylesbury	41	60	57	54/58	55
328805	Lowmon Way, Aylesbury	53	61	57	55/59	56
329008	Orwell Close, Aylesbury	84	58	55	52/55	53
329139	Enborne Close, Aylesbury	64	60	57	53/57	56
329253	Welland Road, Aylesbury	30	62	59	56/60	57
329413	Blackwater Drive, Aylesbury	61	62	59	55/58	56
329685	Witham Way, Aylesbury	57	64	61	57/62	58
329807	Witham Way, Aylesbury	44	64	61	57/61	58
330063	Alwin Close, Aylesbury	84	60	57	53/56	54
330343	Ebble Close, Aylesbury	78	63	60	56/60	57
330464	Anton Way, Aylesbury	13	64	60	57/62	59
330552	Stour Close, Aylesbury	49	66	64	59/64	60
330593	Parslow Close, Aylesbury	78	65	62	58/61	60
330723	Anton Way, Aylesbury	56	64	61	58/62	60
330937	Garron Close, Aylesbury	71	61	59	55/58	57
331111	Isis Close, Aylesbury	27	68	63	61/65	65
331451	Bowmont Drive, Aylesbury	63	62	58	56/60	58
331680	Anton Way, Aylesbury	103	66	61	59/63	61
331963	Hillier Road, Aylesbury	99	62	59	55/59	58

332206	Anton Way, Aylesbury	33	66	63	59/63	62
332217	Harbourne Close, Aylesbury	31	66	63	60/64	60
332328	Deverill Road, Aylesbury	28	67	62	62/66	62
332389	Oat Close, Aylesbury	41	70	65	63/68	65
332435	Anton Way, Aylesbury	64	65	60	58/63	59
334627	Hamble Drive, Aylesbury	146	59	53	49/52	53
335983	Grenville Road, Aylesbury	42	54	51	47/51	48
336058	Grenville Road, Aylesbury	125	54	52	47/51	49
336324	Cornbrook Road, Aylesbury	124	60	54	53/57	54
336610	Plym Close, Aylesbury	108	59	52	49/53	50
337269	Hannon Road, Aylesbury	65	57	55	51/55	52
337422	Nene Close, Aylesbury	27	64	58	56/61	57
337442	Frome Close, Aylesbury	45	60	56	52/55	55
337702	Tees Road, Aylesbury	44	59	57	54/57	55
337871	Nursery Close, Aylesbury	21	50	47	45/48	47
340267	Hughenden Green, Aylesbury	49	57	52	48/51	52
340847	Bowler Road, Aylesbury	77	55	52	48/52	51
341245	Lower Road, Aylesbury	17	59	55	51/54	54
341560	Mentmore Green, Aylesbury	108	58	54	53/56	53
341860	Kynaston Avenue, Aylesbury	2	63	59	59/62	59
341948	Rake Way, Aylesbury	127	61	57	52/55	55
348206	Keen Close, Aylesbury	75	57	51	49/52	53
348419	Prestwold Way, Aylesbury	113	66	59	58/63	61
348501	Andrews Way, Aylesbury	18	65	60	58/62	61
348799	Jakeman Way, Aylesbury	36	59	55	50/53	55
348914	Briskman Way, Aylesbury	88	58	53	48/52	53
349825	Wendover Road, Weston Turville	58	62	54	50/53	54
	Non-Residential					
	Exceedance of SOAEL					

Table 14 – Operational L_{Amax} noise levels compared against ES receptors at Aylesbury - East side (Upside)

One exceedance of SOAEL is seen at receptor 320799 situated approximately 50m from HS2.

The impacts associated with the proposed design are summarised in Table 15.

Barrier Design Option	Observed Adverse Effect Level	Total Night
The Proposed Design	Number of impacts exceeding lowest observed adverse effects level (LOAEL)	2372
ES Design		2975
Consented Design		2150

Table 15 – Number of impacts exceeding LOAEL in the Design and ES for L_{Amax} at Aylesbury - East side (Upside)

The Proposed Design shows fewer L_{Amax} impacts above LOAEL than the ES. L_{max} impacts above LOAEL reported in the ES at ID 320715 (127 impacts), ID325211 (72 impacts), ID 325431 (130 impacts), 328584 (41 impacts). The reductions below LOAEL are due to predicted L_{max} levels being marginally below the LOAEL of 57.5dB and is not considered to be an appreciable benefit.

The L_{max} exceedances of LOAEL as consented at Scheme Design totalled 2150 impacts, plus one exceedance of SOAEL, whereas the Proposed Design totals 2372 exceedances of the LOAEL and zero

exceedances of SOAEL. At Scheme Design stage, the consented design showed an exceedance of SOAEL at ID 320799 (1 impact) which has been removed for Mitigation Design Option 1.

7.2 Results at Aylesbury - West side (Downside)

The noise predictions for the ES Design and the Proposed Design are presented in Table 16 for Aylesbury - west side (Downside). The tables present a comparison for the predicted rail noise only. The table presents a comparison for the predicted rail noise only. A full set of data for the combined future baseline is included in Appendix F. Separate predictions are presented for the road traffic noise. Receptor locations are shaded in red where the LOAEL value is exceeded.

ID	Area Represented	No of Im- pacts Repre- sented	Proposed De- sign L _{Aeq} dB		ES Design L _{Aeq} dB		Consented Deisgn L _{Aeq} dB	
			Day	Night	Day	Night	Day	Night
303147	Cottage Grounds, Stone	25	40	31	40	31	40	32
304833	Sedrup, Hartwell	4	43	35	43	34	43	36
304876	Portway Road, Stone	3	41	33	42	33	41	33
304968	Sedrup, Hartwell	1	44	37	44	33	45	37
305037	Portway Road, Stone	1	41	34	41	31	42	34
305139	Meadoway, Hartwell	24	47	40	50	42	47	40
305201	Meadoway, Hartwell	15	55	47	59	50	55	47
305474	Upper Hartwell, Stone	45	42	34	42	34	42	34
305678	Upper Hartwell, Stone	6	44	35	43	35	44	35
305692	Upper Hartwell, Stone	19	44	35	44	35	44	35
305767	Lower Hartwell, Aylesbury	8	50	41	50	41	50	41
305827	Lower Hartwell, Aylesbury	1	46	38	46	38	46	38
305896	Oxford Road, Stone	2	46	38	48	41	46	38
305909	Lower Hartwell, Aylesbury	1	46	39	48	41	47	39
305983	Church of the Assumption *, Hartwell	1	48	39	49	40	48	39
306049	Hartwell House Hotel, Oxford Hartwell House Hotel *, Oxford	1	50	42	50	41	50	42
306055	Bugle Horn Hotel, Oxford Road, Lower Hartwell *, (Hotel)	1	44	36	44	36	44	36
306075	Oxford Road, Hartwell	1	60	52	61	53	60	52
306223	Lower Hartwell, Aylesbury	1	52	42	51	42	52	42
319163	Sedrup, Hartwell	5	44	36	45	35	44	36
319187	Sedrup, Hartwell	1	46	38	46	37	47	38
*	Non-residential							

Table 16 – Operational airborne noise at Aylesbury - West side (Downside), Proposed Design compared to HS2 Phase 1 ES Design: L_{Aeq} parameters

The predicted noise impacts above LOAEL (L_{Aeq} daytime and night-time) for the proposed design have been compared against the ES (as amended) and are summarised in Table 17 for Aylesbury - West side (Downside).

Table 17 shows a level decrease for several receptors, resulting in an overall decrease in the number of exceedances above the LOAEL.

	Observed Adverse Effect Level	Total Day	Total Night
The Proposed Design	Number of impacts exceeding lowest observed adverse effects level (LOAEL)	25	25
ES Design		49	52

Table 17 – Number of impacts exceeding LOAEL in the Design and ES (L_{Aeq}) at Aylesbury - West side (Downside)

Table 18 shows that the number of impacts resulting from the Proposed Design is the same as that reported in the ES.

	Major Impacts		Moderate Impacts		Minor Impacts	
	Day	Night	Day	Night	Day	Night
The Proposed Design	0	0	9	1	0	8
ES Design	0	0	9	1	0	8

Table 18 – Number of receptors identifying impacts in the Design and ES (L_{Aeq}) at Aylesbury - West side (Downside)

The L_{Amax} levels for the Proposed Design have been compared against the ES and are presented in Table 19 below. The L_{Amax} predictions are free-field levels and have therefore been compared against a LOAEL level of 57.5 dB as opposed to a façade level of 60dB. There is a relatively large reduction in the number of exceedances which is mainly attributable to anticipated improvement in train emissions (see Appendix D) compared to HS2 Phase 1 the ES assumptions.

ID	Area Represented	No of Impacts	Option 1 L_{max}	ES L_{max}	Consented Scheme L_{max}
303147	Cottage Grounds, Stone	25	56	52/55	56
304833	Sedrup, Hartwell	4	63	63/66	63
304876	Portway Road, Stone	3	54	54/57	56
304968	Sedrup, Hartwell	1	57	55/57	57
305037	Portway Road, Stone	1	53	54/57	58
305139	Meadoway, Hartwell	24	58	57/60	60
305201	Meadoway, Hartwell	15	61	60/63	62
305474	Upper Hartwell, Stone	45	57	53/56	57
305678	Upper Hartwell, Stone	6	59	55/58	59
305692	Upper Hartwell, Stone	19	59	55/58	59
305767	Lower Hartwell, Aylesbury	8	66	61/64	66
305827	Lower Hartwell, Aylesbury	1	59	56/60	60
305896	Oxford Road, Stone	2	55	55/59	58

305909	Lower Hartwell, Aylesbury	1	56	55/60	59
305983	Church of the Assumption, Hartwell	1	60	59/64	63
306049	Hartwell House Hotel, Oxford Hartwell House Hotel, Oxford	1	62	62/67	65
306055	Bugle Horn Hotel, Oxford Road, Lower Hartwell, (Hotel)	1	55	55/58	57
306075	Oxford Road, Hartwell	1	70	67/71	73
306223	Lower Hartwell, Aylesbury	1	65	63/66	65
319163	Sedrup, Hartwell	5	65	65/ 68	60
319187	Sedrup, Hartwell	1	66	68/ 71	65
Non-Residential					

Table 19 – Operational L_{Amax} noise levels compared against ES receptors at Aylesbury - West side (Downside)

The impacts associated with the proposed design are summarised in Table 20 .Table 20 shows that the Proposed Design has slightly fewer exceedance of LOAEL than the ES Design.

Barrier Design Option	Observed Adverse Effect Level	Total Night
The Proposed Design	Number of impacts exceeding lowest observed adverse effects level (LOAEL)	85
ES Design		88

Table 20 – Number of impacts exceeding LOAEL in the Design and ES for L_{Amax} at Aylesbury - West side (Downside)

8 Conclusions

The report demonstrates how all reasonable steps have been taken to reduce the combined airborne sound from altered roads and operational railways, predicted in all reasonably foreseeable circumstances, in order not to exceed defined values for LOAEL from the HS2 Phase 1 ES. Where it has not been reasonably practicable to achieve this objective, the report shows how airborne sound has been reduced as far as is reasonably practicable.

The proposed mitigation design has been developed using an iterative optioneering process, where a number Mitigation Options have been evaluated against a range of criteria including the acoustic effects; landscape and visual effects; engineering practicality and stakeholder engagement.

At **Aylesbury - East side (Upside)**, Option 1 (combination of a 5m lineside barrier, 2m barrier in Green Banks, 5m lineside barrier and a 1m lineside barrier to tie in with the Thame Valley Viaduct) has been selected as the Proposed Design. Compared to the HS2 Phase 1 ES (as amended) Option 1 presents: one more major impact during night-time; one more moderate during daytime; 1 more minor impact during daytime; but 36 less minor impacts during night-time.

The L_{max} impacts above LOAEL are lower than those reported in the ES (2018 impacts above LOAEL compared to 2976 in the ES case). This indicates that a noise barrier in the Green Banks is effective at reducing L_{max} exceedances of LOAEL. From a visual perspective, it is noted that the Preferred Option barriers for this area has already been consented under the original various S17 application. The consent also includes the vertical change in the track level because of VE 030. The consented option also includes barrier heights which have been increased since the ES as amended.

At **Aylesbury - West side (Downside)**, Option 1 (5m noise barrier with 4m noise barrier in the Green Banks Scheme and to the north of Green Banks) has been chosen as the Proposed Design. Compared to the ES, the Proposed Design provides the same acoustic performance as the ES Design with the same number of minor, moderate and major impacts.

The Proposed Design represents a taller barrier at the Aylesbury South cutting, Aylesbury Embankment and Aylesbury North cutting civils assets. These assets fall within the Hadden vale LCA.

The Proposed Design (Option 1) with a combination of a 5m lineside barrier, 4m barrier in Green Banks and 4m lineside barrier on the west side (downside) has been selected as the proposed mitigation design because it provides an acoustic benefit which outweighs the perceptible negative visual change.

APPENDIX A

Schedule 17 Application Site Plan for South West Aylesbury Part B

Number of Pages: 1

LOAEL and SOAEL Values from Information Paper E20 and E21

Number of Pages: 2

Time of day	Lowest Observed Adverse Effect Level (dB)	Significant Observed Adverse Effect Level (dB)
Day (0700 – 2300)	50 $L_{pAeq, 16hr}$	65 $L_{pAeq, 16hr}$
Night (2300 – 0700)	40 $L_{pAeq, 8hr}$	55 $L_{pAeq, 8hr}$
Night (2300 – 0700)	60 L_{pAFMax} (at the façade, from any nightly noise event)	80 L_{pAFMax} (at the façade, from more than 20 nightly train passbys), or 85 L_{pAFMax} (at the façade, from 20 or fewer nightly train passbys)

Table B1 - Noise effect levels for permanent residential buildings

Ground-borne noise	Lowest Observed Adverse Effect Level	L_{pASMax} [dB]	35
	Significant Observed Adverse Effect Level	L_{pASMax} [dB]	45
Vibration	Lowest Observed Adverse Effect Level	$VDV_{day}[ms^{-1.75}]$	0.2
		$VDV_{night}[ms^{-1.75}]$	0.1
	Significant Observed Adverse Effect Level	$VDV_{day}[ms^{-1.75}]$	0.8
		$VDV_{night}[ms^{-1.75}]$	0.4

Table B2 - Ground-borne noise and vibration effect levels for permanent residential buildings

Examples	L _p AS _{Max} [dB]
Large auditoria; and concert halls	25
Sound recording & broadcast studios; theatres, and small auditoria	30
Places of meeting for religious worship; courts; cinemas; lecture theatres; museums; and small auditoria or halls	35
Offices; schools; colleges, hospitals; hotels; and libraries	40

Table B3 - Ground-borne noise impact levels for non-residential buildings

Examples	VDV _{day} [ms ^{-1.75}]	VDV _{night} [ms ^{-1.75}]
Hotels; hospital wards; and education dormitories	0.2	0.1
Offices; Schools; and Places of Worship	0.4	n/a
Workshops	0.8	n/a
Vibration sensitive research and manufacturing (e.g. computer chip manufacture); hospitals with vibration sensitive equipment / operations; universities with vibration sensitive research equipment / operations	Risk assessment will be undertaken based on the information currently available for the relevant equipment /process, or where information provided by the building owner or equipment manufacturer.	

Table B4 - Ground-borne vibration impact levels for non-residential buildings

APPENDIX B

Detailed Technical Methodology

Number of Pages: 2

Airborne Rail Noise

Rail noise modelling has been undertaken using the NoiseMap software package. This implements the airborne noise calculation methodology (commonly referred to as the Train Noise Prediction Model (TNPM)). This validated methodology has been used for the HS2 Phase 1 ES and, prior to that, the detailed design of the Channel Tunnel Rail Link (HS1). The method to predict airborne sound from operation has modelled the propagation including the following effects: topography, ground type, reflections, shielding by barriers and buildings, air absorption, and meteorology.

The TNPM methodology allows for sources of varying heights to be put onto the same track segments. Image D1 shows the heights of the five sources defined as distances above rail. The source terms which have been used for each of these source contributions are set out in Appendix D.

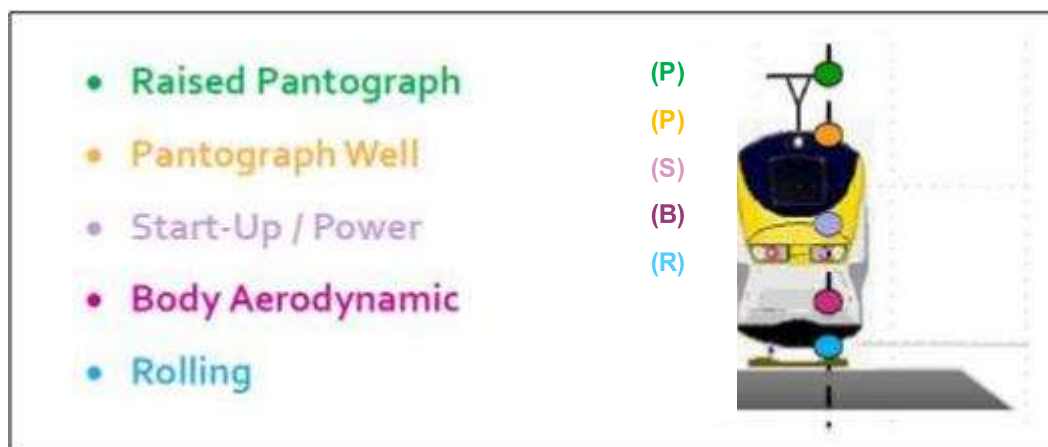


Image D1: Train noise sources

- In the predictions of airborne noise from HS2 trains, the speed dependence relationships for each of these sources, in terms of SEL shall be:
 - $R_{SEL} + 20\log_{10}V$ for rolling sound;
 - $B_{SEL} + 60\log_{10}V$ for body aerodynamic sound;
 - $S_{SEL} - 10\log_{10}V$ for starting sound ($V < 250$ kph); and
 - $P_{SEL} + 60\log_{10}V$ for pantograph and pantograph recess sound.

where R_{SEL} is the source term for rolling sound, B_{SEL} is the source term for body aerodynamic sound, S_{SEL} is the source term for starting sound and P_{SEL} is the source term for pantograph and pantograph recess sound and V is the train speed in kph. S_{SEL} shall not be included for predictions of airborne noise when train speeds are 250 kph or above.

- The corresponding speed dependence relationships for each of these sources, in terms of $L_{pAF,max}$, which shall be assumed in the prediction of airborne noise for each of these sources are:
 - $R_{LpAF,max} + 30\log10V$ for rolling sound;
 - $B_{LpAF,max} + 70\log10V$ for body aerodynamic sound;
 - $S_{LpAF,max}$ for starting sound; and
 - $P_{LpAF,max} + 70\log10V$ for pantograph and pantograph recess sound.
- Where $R_{LpAF,max}$ is the source term for rolling maximum sound, $B_{LpAF,max}$ is the source term for body aerodynamic maximum sound, $S_{LpAF,max}$ is the source term for starting sound and $P_{LpAF,max}$ is the source term for pantograph and pantograph recess maximum sound and V is the train speed in kph.
- The method to predict airborne sound from operation shall model the propagation in order to consider, but not limited to, the following effects: topography, ground type, reflections, shielding by barriers and buildings, air absorption and meteorology.
- The total pass-by $L_{pAF,max}$ is computed using the following equation:

$$L_{pAF,max} = \text{MAX} [(R_{LpAF,max} \oplus B_{LpAF,max} \oplus S_{LpAF,max}) , (R_{LpAF,max} \oplus P_{LpAF,max} \oplus S_{LpAF,max})]$$

- To account for the differing source heights resulting in different distance attenuation, ground absorption and shielding etc. the calculations for propagation from source to receptors will be undertaken for each source individually for both $L_{pAeq,T}$ and $L_{pAF,max}$ calculations. $L_{pAeq,T}$ will be logarithmically summed at the receptor location to provide a single figure value and $L_{pAF,max}$ will be summed in accordance with equation above at the receptor location to provide a single figure value.

Predictions of airborne sound take into account the acoustic performance of civil engineering assets, track-work and trains throughout the life of the operational railway with a maintenance programme agreed with HS2 and thereby account for all reasonably foreseeable circumstances in accordance with HS2 Information Paper E20.

Airborne Noise from Altered Roads

Airborne noise from altered roads has been assessed in accordance with the methodology set out in the Calculation of Road Traffic Noise (CRTN) and the updated procedure in the Design Manual for Roads and Bridges (DMRB) HD213-11 Rev1.

Where there has been no significant changes in the design of surrounding roads since the HS2 Phase 1 ES, results from road noise calculations as presented for the HS2 Phase 1 ES have been utilised.

This data will be updated as further information comes available and where necessary through design changes on the surrounding road network.

APPENDIX C

Assumptions

Number of Pages: 3

Rail Modelling Assumptions

The HS2 rolling stock and service pattern is made up of two train fleets:

- Phase 1 fleet will be made up of Conventional Compatible (CC) trains that can run on both the High Speed and the classic rail network, and,
- Phase 2b fleet will be made up of Captive (CP) trains that are dedicated to the High Speed network.

Train service pattern data is summarised in Table D1, normalised to 200m long trains and the noise source terms are presented in Table C2.

	Route Section	200m trains per section	400m trains per section	Total trains per section	Equivalent 200m trains per section	One-way train flow assumptions (equivalent 200m trains)							Total Night (8hr)	
						05.30 - 06.00	06-07.00	Stand-ard hour	21-22.00	22-23.00	23-00.00	Total (24hr)		
London to Birmingham / The North	3	6.0	12.0	18.0	30.0	5	20	30	25	15	5	490	460	30
L-> Conventional Compatible (Catch-Up)	3A	1.5	0.0	1.5	1.5	0	1	2	1	0	0	23	22	1
L-> Conventional Compatible (330)	3B	4.5	4.0	8.5	12.5	2	8	13	10	6	2	203	191	12
L-> Captive (Catch-Up)	3C	0.0	0.8	0.8	1.5	0	1	2	1	0	0	23	22	1
L-> Captive (330)	3D	0.0	7.3	7.3	14.5	2	9	15	12	7	2	235	222	13

Table C1 – Train flow data (One-way)

Source	SEL dB at 25m		LpAF,max dB at 25m	
	Conventional Com- patible train	Captive train	Conventional Com- patible train	Captive train
Rolling	92	92	89	89
Body Aerodynamic	92	90	89	87
Start-up / Power	74	74	73	73
Pantograph Well	n/a	n/a	n/a	n/a
Raised Pantograph	76	76	78	78

Note: Sound emissions from each train running at 320kph on assumed HS2 infrastructure, expressed in terms of the SEL and L_{pAFmax} 25 m from nearest track and 3.5m above ground

Table C2 – Train source data

APPENDIX D

Overall Operational Noise for Design compared to HS2 Phase 1 ES for South West Aylesbury East side (Upside)

Number of Pages: 3

ES Design, Earthworks Design, Option 1 and 2.

ID	Area Represented	No of Impacts	Do Nothing (Opening Year baseline)		ES Design Scheme noise only LAeq dB		ES Design Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – No Barrier		No Barrier Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – Option 1		Option 1 Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – Option 2		Option 2 Opening Year Baseline +Year 15 Traf- fic LAeq dB		Consented Scheme		Consented + Opening Year Baseline +Year 15 Traf- fic LAeq dB	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
298707	Cooks Road, Aylesbury	78	51	41	47	38	52	42	52	43	55	45	45	36	52	42	45	36	52	42	46	37	52	43
298735	Hickman Street, Aylesbury	85	47	42	43	35	48	42	48	39	51	44	42	33	48	42	42	33	48	42	43	35	49	43
298817	Cooks Road, Aylesbury	78	46	36	47	38	49	39	51	42	52	43	45	36	48	39	45	36	48	39	46	37	49	40
298976	Eyre Close, Aylesbury	59	51	41	47	39	52	42	53	43	55	45	46	37	51	41	45	37	51	41	45	36	52	42
299219	Brimmers Way, Aylesbury	121	49	46	41	32	50	46	45	35	50	46	39	31	49	46	39	30	49	46	41	32	50	46
299591	Brimmers Way, Aylesbury	75	49	46	42	32	50	46	45	36	51	46	41	32	50	46	41	32	50	46	42	33	50	46
299978	Great Meadow Way, Aylesbury	65	47	42	43	34	49	42	48	38	50	44	42	33	48	42	42	33	48	42	43	34	48	43
300635	Napier Road, Aylesbury	61	46	35	47	38	50	40	51	42	52	43	46	37	49	39	46	37	49	39	47	38	50	40
300647	Warbler Close, Aylesbury	69	44	39	47	38	48	41	51	41	51	43	45	36	48	41	45	36	48	41	46	38	48	42
300773	Wren Path, Aylesbury	32	49	46	42	33	50	46	46	37	51	47	41	32	50	46	41	32	50	46	42	33	50	46
300929	Spruce Road, Aylesbury	43	49	46	44	35	50	46	47	38	51	47	43	34	50	46	43	34	50	46	44	35	50	46
301228	Grosvenor Way, Aylesbury	68	48	38	48	39	51	41	52	43	54	44	48	39	51	42	48	39	51	41	49	39	51	42
301296	Amcott Way, Aylesbury	36	49	46	44	35	50	46	48	39	52	47	43	34	50	46	43	34	50	46	44	35	50	46
301483	Chelsea Road, Aylesbury	14	49	46	46	37	51	47	50	41	53	47	47	38	51	47	47	38	51	47	48	38	51	47
301668	Chelsea Road, Aylesbury	21	49	46	45	36	51	46	49	39	52	47	46	37	51	46	46	36	51	46	46	37	51	47
301851	Hampstead Close, Aylesbury	35	49	46	45	35	50	46	48	39	52	47	45	35	50	46	44	35	50	46	45	36	51	46
306197	Swallow Lane, Aylesbury	24	47	42	43	34	48	42	48	39	50	44	42	33	48	42	41	32	48	42	42	33	48	43
307325	Meredith Drive, Aylesbury	48	49	46	41	31	50	46	43	34	50	46	42	33	50	46	42	33	50	46	41	32	50	46
308644	Gogh Road, Aylesbury	40	49	46	43	34	50	46	45	36	51	46	45	36	50	46	45	35	50	46	44	35	50	46
308665	Picasso Place, Aylesbury	40	49	46	43	33	50	46	45	35	50	46	44	35	50	46	44	34	50	46	44	34	50	46
308722	Rabans Lane, Aylesbury, (Gen- eral Commercial)	1	49	46	43	34	50	46	46	37	51	46	45	35	50	46	45	35	50	46	45	35	50	46
309021	Telford Close, Aylesbury	1	49	46	39	30	50	46	43	33	50	46	39	30	49	46	39	30	49	46	40	32	50	46
309118	Tompion Road, Aylesbury	1	47	42	44	35	49	43	48	38	50	44	45	36	49	43	45	36	49	43	46	37	49	43
309275	Edison Road, Rabans Lane In- dustrial Area, (General Com- mercial)	10	47	36	50	41	52	42	53	43	54	44	52	43	53	44	52	43	53	44	52	43	53	44
309296	Rabans Lane, Aylesbury	4	47	36	52	43	53	43	55	46	56	46	54	45	55	45	54	45	55	45	53	44	54	44
309320	Woodley House, Rabans Close Industrial Area (Office)	1	47	36	47	38	50	40	51	41	52	43	50	40	52	42	49	40	51	41	50	40	52	42
309415	Edison Road, Rabans Lane In- dustrial Area, (office)	8	47	36	50	40	52	42	53	43	54	44	52	42	53	43	51	42	53	43	52	42	53	43
309474	Rabans Lane, Aylesbury	2	50	46	49	39	52	47	53	43	55	48	50	41	53	47	50	41	53	47	50	41	53	47
316101	Hampden Square, Aylesbury	189	47	42	41	33	48	42	46	37	49	43	40	31	48	42	40	31	48	42	41	32	48	42

ID	Area Represented	No of Impacts	Do Nothing (Opening Year baseline)		ES Design Scheme noise only LAeq dB		ES Design Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – No Barrier		No Barrier Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – Option 1		Option 1 Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – Option 2		Option 2 Opening Year Baseline +Year 15 Traf- fic LAeq dB		Consented Scheme		Consented + Opening Year Baseline +Year 15 Traf- fic LAeq dB	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
317279	Booker Park School, Stoke Leys Close, Aylesbury (School)	1	52	43	50	43	55	46	53	45	55	47	52	45	55	47	52	45	55	47	51	44	55	46
319293	Pearson Close, Aylesbury	35	57	48	49	42	56	46	50	43	56	47	50	42	56	46	50	42	56	46	51	44	58	49
319305	Church of Jesus Christ of Latter day Saints, Aylesbury (Church)	1	57	48	44	36	57	48	46	38	57	48	44	36	57	48	44	36	57	48	47	39	57	48
319325	Alham Road, Aylesbury	93	47	41	43	35	48	42	45	37	49	42	43	35	48	42	43	35	48	41	45	37	49	43
319422	Dormer Close, Aylesbury	118	49	44	49	44	49	44	52	45	52	45	51	45	51	45	51	45	51	45	49	42	52	46
319615	Bonham Close, Aylesbury	178	49	44	49	44	49	44	52	45	52	46	51	45	51	45	51	45	51	45	50	42	52	46
320227	Briskman Way, Aylesbury	28	57	48	40	31	57	48	43	34	57	48	41	33	57	48	40	32	57	48	41	33	57	48
320409	Oxford Road, Hartwell	1	59	50	55	46	55	46	60	51	60	51	57	48	57	48	56	47	56	47	57	48	56	47
320715	Lupin Walk, Aylesbury	127	49	44	50	42	50	45	52	44	52	46	51	43	51	45	51	43	51	45	50	42	52	46
320799	Oxford Road, Hartwell	1	52	43	61	52	61	52	66	57	66	57	61	52	61	52	60	51	60	51	64	55	64	55
320819	Oxford Road, Hartwell	1	56	48	60	51	60	51	63	54	63	54	60	51	60	51	59	51	59	51	60	52	62	53
324002	Slattenham Close, Aylesbury	208	47	41	39	31	47	41	43	35	48	42	41	33	48	41	40	32	48	41	43	36	49	42
324129	Rowland Way, Aylesbury	112	47	41	42	34	47	41	45	37	49	42	43	35	48	41	43	34	48	41	46	38	50	43
325151	Upper Abbots Hill, Aylesbury	118	57	48	50	42	57	47	51	43	57	48	50	43	57	48	50	42	57	48	53	45	58	50
325211	Great Meadow Way, Aylesbury	72	57	48	44	35	57	48	48	39	57	48	43	35	57	48	43	35	57	48	46	38	57	48
325431	Horton Close, Aylesbury	130	57	48	44	36	57	48	48	39	57	48	44	36	57	48	43	35	57	48	47	39	57	48
325816	Pitcher Walk, Aylesbury	347	47	42	42	34	48	42	46	37	49	43	42	34	48	42	41	33	47	42	45	37	49	43
327675	Torrige Road, Aylesbury	176	47	41	42	33	48	41	45	36	49	42	41	32	48	42	40	32	48	41	44	36	49	42
328417	Ellen Road, Aylesbury	1	45	41	41	32	46	41	44	35	48	42	40	32	46	41	39	31	46	41	43	35	47	42
328584	Brent Path, Aylesbury	41	45	41	44	35	47	41	48	39	50	43	43	34	47	42	42	33	47	42	45	36	48	42
328805	Lowmon Way, Aylesbury	53	45	41	45	36	48	42	49	39	50	43	44	35	47	42	43	34	47	42	46	38	49	43
329008	Orwell Close, Aylesbury	84	45	41	42	33	47	41	46	37	48	42	42	33	47	42	41	32	46	42	44	36	48	42
329139	Enborne Close, Aylesbury	64	45	41	44	35	47	42	47	38	49	43	43	35	47	42	43	34	47	42	46	38	49	43
329253	Welland Road, Aylesbury	30	45	46	46	37	48	46	49	40	51	47	45	36	48	46	44	36	47	46	47	39	49	47
329413	Blackwater Drive, Aylesbury	61	47	41	45	36	49	42	49	39	51	43	44	36	49	42	43	35	49	42	46	38	50	43
329685	Witham Way, Aylesbury	57	45	41	48	39	49	43	51	42	52	44	46	38	49	43	45	37	48	42	48	40	50	43
329807	Witham Way, Aylesbury	44	45	41	46	37	49	42	51	41	52	44	46	37	48	42	44	36	48	42	47	38	49	43
330063	Alwin Close, Aylesbury	84	47	41	43	34	48	42	47	38	50	43	42	34	48	42	41	33	48	42	45	37	49	42
330343	Ebble Close, Aylesbury	78	45	41	46	37	48	42	50	40	51	44	45	36	48	42	44	35	47	42	47	38	49	43
330464	Anton Way, Aylesbury	13	45	41	47	38	49	42	51	42	52	44	46	37	49	42	45	36	48	42	47	38	49	43
330552	Stour Close, Aylesbury	49	45	41	49	39	50	43	53	44	54	46	48	39	50	43	47	38	49	43	49	40	50	43
330593	Parslow Close, Aylesbury	78	45	42	49	41	50	44	51	42	52	45	48	40	50	44	48	39	49	44	50	41	51	45
330723	Anton Way, Aylesbury	56	48	39	48	39	51	42	52	43	53	44	47	38	51	42	46	38	50	41	48	40	51	42

ID	Area Represented	No of Impacts	Do Nothing (Opening Year baseline)		ES Design Scheme noise only LAeq dB		ES Design Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – No Barrier		No Barrier Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – Option 1		Option 1 Opening Year Baseline +Year 15 Traf- fic LAeq dB		Design Only – Option 2		Option 2 Opening Year Baseline +Year 15 Traf- fic LAeq dB		Consented Scheme		Consented + Opening Year Baseline +Year 15 Traf- fic LAeq dB	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
330937	Garron Close, Aylesbury	71	48	39	45	36	50	41	49	40	52	42	45	36	50	41	44	36	49	41	47	39	51	42
331111	Isis Close, Aylesbury	27	45	39	50	41	51	43	55	46	55	47	50	41	51	43	49	40	50	43	51	42	52	44
331451	Bowmont Drive, Aylesbury	63	45	41	45	37	48	42	50	41	51	44	45	36	48	42	44	35	47	42	47	39	49	43
331680	Anton Way, Aylesbury	103	45	39	48	39	50	42	53	44	54	45	48	39	50	42	47	38	49	41	49	40	50	42
331963	Hillier Road, Aylesbury	99	45	42	46	37	48	43	49	40	51	44	46	37	48	43	45	37	48	43	48	40	50	44
332206	Anton Way, Aylesbury	33	48	39	49	49	40	43	53	44	54	45	48	39	51	42	47	39	51	42	49	40	51	43
332217	Harbourne Close, Aylesbury	31	45	39	49	39	50	42	53	44	54	45	48	39	50	42	47	37	49	41	49	40	50	42
332328	Deverill Road, Aylesbury	28	45	39	50	41	51	43	55	45	55	46	49	40	51	42	48	39	50	42	50	41	51	43
332389	Oat Close, Aylesbury	41	45	39	52	43	53	45	57	48	58	48	52	42	52	44	50	42	51	44	53	44	53	45
332435	Anton Way, Aylesbury	64	45	41	48	38	49	43	52	43	53	45	47	38	49	43	46	36	48	42	48	39	50	43
334627	Hamble Drive, Aylesbury	146	47	41	41	33	47	41	44	35	48	42	41	34	48	41	41	33	48	41	45	38	49	43
335983	Grenville Road, Aylesbury	42	47	41	37	28	47	41	41	32	48	42	37	29	47	41	37	29	47	41	42	34	48	42
336058	Grenville Road, Aylesbury	125	47	41	38	28	47	41	41	32	48	42	38	29	47	41	37	29	47	41	41	34	48	42
336324	Corbrook Road, Aylesbury	124	47	41	46	39	49	42	47	39	50	42	45	37	48	42	44	37	48	42	47	40	50	43
336610	Plym Close, Aylesbury	108	47	41	42	34	48	41	44	35	48	42	41	33	48	41	41	33	48	41	44	37	49	42
337269	Hannon Road, Aylesbury	65	47	41	43	35	48	42	45	36	49	42	42	34	48	42	41	33	48	42	45	38	49	43
337422	Nene Close, Aylesbury	27	45	46	48	40	49	46	50	42	51	47	47	39	48	47	47	39	48	46	47	40	49	47
337442	Frome Close, Aylesbury	45	45	46	42	33	47	46	46	37	49	46	43	34	47	46	42	33	47	46	44	36	48	46
337702	Tees Road, Aylesbury	44	47	41	44	36	48	42	48	39	50	43	44	36	48	42	43	35	48	42	46	38	49	43
337871	Nursery Close, Aylesbury	21	47	41	36	27	47	41	38	30	47	41	36	28	47	41	35	27	47	41	39	31	48	41
340267	Hughenden Green, Aylesbury	49	52	43	52	33	52	41	48	36	53	44	47	35	53	44	47	35	53	44	52	40	53	43
340847	Bowler Road, Aylesbury	77	52	43	39	31	52	43	42	33	52	43	39	31	52	43	39	31	52	43	43	35	52	44
341245	Lower Road, Aylesbury	17	52	43	52	33	52	43	50	38	54	44	49	38	54	44	49	37	54	44	53	40	53	43
341560	Mentmore Green, Aylesbury	108	52	43	45	35	53	43	45	37	53	44	44	36	53	44	43	36	53	44	48	40	53	45
341860	Kynaston Avenue, Aylesbury	2	52	43	49	41	54	46	52	44	55	46	51	43	55	46	51	43	55	46	51	43	54	45
341948	Rake Way, Aylesbury	127	52	43	43	34	52	43	46	37	53	44	44	35	53	44	43	35	53	44	46	38	53	44
348206	Keen Close, Aylesbury	75	47	42	39	30	48	42	43	34	48	43	38	29	47	42	37	29	47	42	40	33	48	42
348419	Prestwold Way, Aylesbury	113	56	46	48	40	56	46	52	43	57	47	47	39	56	46	47	39	56	46	48	41	57	47
348501	Andrews Way, Aylesbury	18	56	46	49	42	56	46	51	43	56	46	49	41	56	45	49	41	56	45	50	42	57	47
348799	Jakeman Way, Aylesbury	36	47	41	41	33	48	41	45	37	49	42	43	35	48	42	42	35	48	42	45	38	49	43
348914	Briskman Way, Aylesbury	88	47	41	40	31	47	41	43	35	48	42	41	33	48	41	40	33	48	41	44	36	49	42
349825	Wendover Road, Weston Turville	58	47	41	42	34	48	41	45	37	49	42	43	36	48	42	43	35	48	42	46	39	50	43

APPENDIX E

Overall Operational Noise for Design compared to HS2 Phase 1 ES for South West Aylesbury West side (Downside)

Number of Pages: 1

ID	Area Re- sented	No of Im- pacts	Do Nothing (Opening Year baseline)		ES Design Scheme noise only LAeq dB		ES Design Opening Year baseline +Year 15 Traffic LAeq dB		Scheme Noise Only - No Bar- rier		Design Option No Barrier + Opening Year baseline + Year 15 Traffic LAeq dB		Scheme Noise Only - Design Option 1		Design Option 1+ Opening Year Baseline +Year 15 Traf- fic LAeq dB		Scheme Noise Only - Design Option 2		Design Option 2 + Opening Year Baseline +Year 15 Traf- fic LAeq dB		Consented Scheme Only		Consented Scheme + Opening Year Baseline + Year 15 Traffic LAeq dB	
			Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
303147	Cottage Grounds, Stone	25	53	45	40	31	53	45	45	36	54	45	40	31	53	45	40	31	53	45	41	32	53	45
304833	Sedrup, Hart- well	4	47	40	43	34	49	41	47	39	50	42	43	35	48	41	43	35	48	41	44	36	49	42
304876	Portway Road, Stone	3	58	49	42	33	58	49	45	36	58	49	41	33	58	49	40	32	58	49	42	34	58	49
304968	Sedrup, Hart- well	1	49	43	44	33	50	43	47	39	51	44	44	37	49	43	44	36	49	43	45	37	51	44
305037	Portway Road, Stone	1	49	43	41	31	50	43	45	36	50	44	41	34	50	43	41	34	49	43	43	35	50	44
305139	Meadoway, Hartwell	24	54	45	50	42	54	45	50	41	54	44	47	40	53	43	47	39	53	43	48	40	55	46
305201	Meadoway, Hartwell	15	60	51	59	50	59	50	56	48	56	48	55	47	55	47	55	47	55	47	55	47	61	53
305474	Upper Hartwell, Stone	45	46	37	42	34	47	38	46	37	49	39	42	34	47	37	41	33	47	37	42	34	48	39
305678	Upper Hartwell, Stone	6	46	37	43	35	47	38	48	39	50	41	44	35	48	39	43	35	47	38	44	36	48	39
305692	Upper Hartwell, Stone	19	46	37	44	35	47	38	49	40	50	41	44	35	47	38	43	35	47	38	44	36	48	39
305767	Lower Hartwell, Aylesbury	8	44	38	50	41	50	41	57	47	57	47	50	41	50	41	49	40	49	40	50	41	51	43
305827	Lower Hartwell, Aylesbury	1	53	45	46	38	53	45	51	42	55	46	46	38	53	45	45	37	53	45	46	38	54	46
305896	Oxford Road, Stone	2	70	62	48	41	70	62	48	40	70	62	46	38	70	62	45	38	70	62	46	38	70	62
305909	Lower Hartwell, Aylesbury	1	61	52	48	41	61	52	49	41	61	52	46	39	61	52	46	39	61	52	47	39	61	52
305983	Church of the Assumption, Hartwell	1	45	37	49	40	49	40	53	44	53	44	48	39	48	39	47	39	47	39	48	40	50	41
306049	Hartwell House Hotel, Oxford	1	45	37	50	41	50	41	55	46	55	46	50	42	50	42	49	41	49	41	50	42	51	43
306055	Hartwell House Hotel, Oxford	1	45	37	50	41	50	41	55	46	55	46	50	42	50	42	49	41	49	41	50	42	51	43
306055	Bugle Horn Ho- tel, Oxford	1	63	55	44	36	63	55	47	39	63	55	44	36	63	55	43	36	63	55	44	37	63	55
306075	Oxford Road, Hartwell	1	71	63	61	53	67	58	63	54	67	60	60	52	67	59	59	51	67	59	60	52	66	59
306223	Lower Hartwell, Aylesbury	1	46	36	51	42	52	43	53	43	53	44	52	42	53	43	52	42	53	43	52	43	53	43
319163	Sedrup, Hart- well	5	46	39	45	35	49	40	49	40	50	42	44	36	48	40	44	36	48	40	46	37	49	41
319187	Sedrup, Hart- well	1	47	40	46	37	50	42	52	42	52	44	46	38	49	41	46	38	49	41	48	39	50	43
Non-Residential																								

