Gatwick Airport Northern Runway Project

Appendix G: Response to the JLAs' Comments at Deadline 4 on the Noise and Vibration Technical Notes

Book 10

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1 Applicant's Response to JLAs Comment on Supporting Noise and Vibration Technical Notes [REP3-071]

ID	Para ref	Technical Note Subject	JLAs Comment	Applicant Response
Appendix A – Construction Vibration				
The JLAs accept the Applicant's construction vibration submission				Noted.
Appendix B – Ground Noise Fleet Assessment				
JLA-NVTN-B1	1.1.1	The assessment of Ground Noise from taxiing aircraft	Ground noise should consider all sources (ground running, auxiliary power units, end around turns and fire training ground) and not just taxiing. Only taxiing is covered in the ground noise assessment and other noise sources are predicted using the LAmax metric, which the Applicant states is only for context and is not used for identifying likely significant effects.	End Around Taxiways (EATs), APU and engine testing are assessed using L_{Amax} due to the relatively short durations over which noise from these sources would be experienced. EAT usage would only be required for a very limited number of category F aircraft as described at paragraph 14.9.219 of the ES [APP-039]. APU usage occurs very rarely, for 'less than 3% of the time based on survey information' as noted at paragraph 14.9.218 of the ES [APP-039]. Engine testing occurs less than once per day for a very limited duration as set out in the technical note **Supporting Noise and Vibration Technical Notes to Statements of Common Ground, Appendix E - Ground Noise Engine Ground Runs** [REP3-071]. None of these noise sources would be experienced as a continuous noise throughout the day or night periods nor would they contribute significantly to the predicted L_{Aeq} levels. All sources have therefore

				been assessed properly.
JLA-NVTN-B2	1.1.3-1.1.4	Incorrect levels reported in ES Appendix 14.9.3	The JLAs request that an updated version is submitted of Appendix 14.9.3 is submitted with tracked changes. Details of the error should be provided as it means that some properties experience significant effects when previously they did not and other properties do not now experience significant effects whereas previously they did. The JLAs also request that numerous errors in the ES Chapter 14: Noise and Vibration **[APP-039]** ground noise assessment are also addressed in an updated tracked version.	The Applicant considers that **Supporting Noise and Vibration Technical Notes to Statements of Common Ground, Appendix B - Ground Noise Fleet Assessment** [REP3-071] provides a clear account of ground noise impacts accounting for the slower transition case and the ES errors (in the ES chapter 14 and appendix 14.9.3) and a full updated ES appendix is not necessary.
JLA-NVTN-B3	1.1.5	Ground noise contours	The ground noise contours provided are not adequate for determining how communities would be affected. The contours should be presented, as per air noise, in 3 dB increments from 51 dB daytime and 45 dB night-time so the JLAs are able to identify noise sources and	The ground noise contours provided within the technical note appendix [REP3-071] demonstrate the limited potential for significant effects beyond the airport boundary. Below the SOAEL thresholds (represented by these contours), the change in ground noise relative to baseline and the existing road traffic noise becomes increasingly important

			how effective mitigation is. They should be provided with a zoomed in view and a better resolution of base-mapping so properties can be identified.	as distance increases from the airport boundary. Furthermore, the accuracy of the prediction methodology becomes less reliable at distances beyond 1 km from noise sources since ISO 9613-2 only provides indications of accuracy for distances up to an 'upper limit' of 1000 m. Therefore, presenting ground noise contours in 3 dB increments above the LOAEL threshold would be misleading since the predictions may not represent what can be heard or measured at locations further from the airport boundary (compared to the contours representing the SOAEL thresholds).
			Ground noise contours for all assessment scenarios should be provided.	This is not necessary as the Slower Transition Fleet contours are considered to represent a worst-case.
JLA-NVTN-B3	2.1.1	Comparison of future operational scenario with future baseline	The assessment only looks at the change in noise between the operational scenario and the respective future baseline. As per the air noise assessment, likely significant effects should be identified for smaller changes in ground noise when the SOAEL is exceeded.	The ground noise assessment considers changes of 1dB or more above SOAEL as potentially significant.
JLA-NVTN-B4	3.1.2	Ambient noise sources	The Applicant states that existing sources of noise, such as road traffic noise, are a	Paragraphs 14.9.220 to 14.9.233 of the ES [APP-039] provide a summary of the ground noise

			factor in the ground noise assessment are not discussed in the ground noise assessment in ES Chapter 14: Noise and Vibration **[APP-039]**. As stated in, JLA-NVTN- B2, the JLAs request that the ES chapter is updated with tracked changes.	assessment only and the detailed assessment can be found within **ES Appendix 14.9.3 Ground Noise Modelling** [APP-173] (as clearly stated at paragraph 14.9.220). As stated at paragraph 14.6.25 of the ES [APP-039], road traffic noise was modelled across the ground noise study area with results presented at Figures 14.6.33 and 14.6.34 of the ES [APP-063] and this has been used to inform the ground noise assessment. The detailed taxiing noise assessment at section 8 of the ground noise appendix [APP-173] refers to levels of road traffic noise within each of the assessment areas. Where predicted ground noise is equal to or less than existing road traffic noise, this is taken into account when considering potential significant effects highlighted by the criteria set out in the ES [APP-039].
JLA-NVTN-B5	3.1.4	Complaints	The Applicant states that the lack of complaints is reason for not identifying ground noise as a major concern. The JLAs are of the opinion that there is no basis for this assumption as complaints only tend to be made about unusual events and typical activities can still cause disturbance even though a complaint is not made.	This paragraph 3.1.4 summarises the locations of properties around the airport noting the noise bund that is effective at mitigating ground noise and suggests this may be why ground noise has not been a major concern to the local community, as follows: '*Ground noise at Gatwick Airport is mitigated through operating procedures and a sizeable noise bund running around the northern perimeter of the airport, up to 12m high in places, and the serpentine wall*

				noise barrier that can be seen around the eastern apron area between the north and south terminals. There are no sections of apron or taxing routes along the south side of the airfield. The main housing area is to the north, well screened by the noise bund and beyond Povey Cross Road. To the immediate east and west under the flight paths there is no housing, presumably for safety reasons. To the south there is mainly airport and commercial property with scattered housing on the far side of the Charlwood Road. To the northwest there is a single property and scattered properties before the village of Charlwood 700m from the nearest taxiway. Consequently, ground noise has not been a major concern reported by the local community in recent years.'
JLA-NVTN-B6	3.1.5	Proposed mitigation	It would be helpful to discuss the proposed mitigation or reference where details of it can be found rather than assuming the reader is knowledgeable about such things.	The existing noise bund is described in the paragraph above and is a distinct feature of the northern side of the airport. The proposed mitigation is described in section 7 of **ES Chapter 14: Noise and Vibration** [APP-039] and this report does not change those proposals.
JLA-NVTN-B7	Section 4	Ground noise assessment	The assessment text is difficult to follow and does not provide enough information. It would be helpful to use tables to summarise information so it is easily digestible. The matter is confused by attempting to correct an error and assessing a slower growth rate scenario at	Section 4 assesses the ground noise impacts for the slower transition fleet and with the ES error corrected to provide a fully updated assessment. The assessment necessarily discusses levels relative to LOAEL and SOAEL, the changes compared to levels of ground noise in the future baseline and how levels compare to ambient noise.

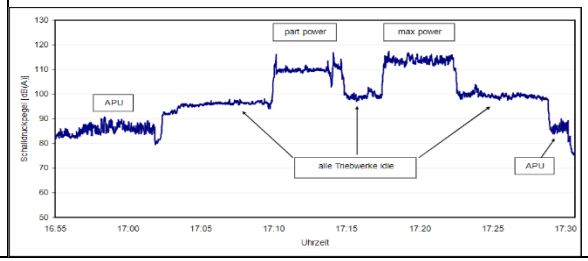
			the same time. As stated in, JLA-NVTN-B2, the JLAs request that the ES chapter is updated with tracked changes with ALL slower growth rate and central case ground noise scenarios assessed.	Each receptor area is discussed separately. This 5 A4 page section provides all the information updating the 7 A3 page Section 8 of **ES Appendix 14.9.3 Ground Noise Modelling** [APP-173].
JLA-NVTN-B8	5.1.1	'protection' provided by bund/ barrier	The JLAs object to the use of 'protected' when describing its influence on ground noise at nearby communities. The word 'protection' means to keep safe from harm. A barrier/ bund mitigates noise but does not protect.	Noted. 'Screened' may be a better word to indicate the fact that the existing noise bund reduces the noise levels that would otherwise be experienced.
JLA-NVTN-B9	5.1.1	Ground noise and road traffic noise comparison	The JLAs object to the Applicant's statement that ground noise and road traffic noise are similar in nature. Road traffic noise and ground noise have different acoustic character so any comparison should be contextualised.	Noted, however, this specific sentence compares air noise to ground noise noting the differences in 'peakiness' and hence the need to consider ambient noise in the ground noise assessment.
JLA-NVTN-B10	5.1.7	Noise insulation scheme	The Applicant has identified that properties that would qualify for ground noise insulation would be determined through monitoring (paragraph 4.1.11 **[APP-180]**) so it comes as a surprise that the Applicant is now willing to rely on modelling to determine whether properties would qualify. It would be helpful if these properties	The additional properties identified to be added to the NIS inner zone have been identified based on modelling specifically undertaken to address the criticism that to rely on monitoring only would be too late to install the insulation beforehand. **ES Appendix 14.9.10 Noise Insultation Scheme [APP-180]** as updated maintains this paragraph to allow monitoring to also identify noise insulation, if

			could be identified.	necessary, to ensure all eligible properties are identified and offered noise insulation.
Appendix C – Traffic Noise Barrier Options Selection Report				
JLA-NVTN-C1	Appendix C	Riverside Park barrier	As detailed in the Appendix C of the Surrey County Council Local Impact Report **[REP1-100]**, a 2m barrier would result in reduction in road traffic noise between 4 and 6 dB for some properties benefiting from screening. The JLAs are of the opinion the A23 Riverside Park barrier would provide substantial benefits for properties experiencing levels of road traffic noise exceeding the SOAEL and should be reinstated. This accords with aim 3 of the Noise Policy Statement for England to improve health and quality of life as referred in Para 12.188 of REP1-097].	The Project as proposed includes two noise barriers on the A23, the realignment of part of the A23 westbound in this area away from the Noise Important Area, and a speed reduction on the A23 past the park that will reduce traffic noise. The Traffic Noise Barrier Options Selection Report pulls together the information used to consider the merits of an additional barrier in Riverside Garden Park. It clarifies how the Project changed after the PEIR so that the third noise barrier within the Riverside Garden Park was no longer required. The Project as proposed will reduce traffic noise in the Noise Important Area compared to what it would be without the Project. This ensures that for the Project as proposed, with the mitigation measures committed, there will be no significant negative traffic noise effects and the Project complies with policy to reduce noise in the Noise Important Area where practicable.

JLA-NVTN-C2	4.1.9	Barrier disbenefits	The Applicant lists a number of barrier disbenefits, but does not go into any detail as to why a barrier results in these disbenefits. Can the Applicant provide more information on: • Why there is a reduction of ability to provide replacement planting. • How the character of the park will change. • Why there is a reduction of ecological connectivity along the length of the park. • Why there will be a greater light spill into the park from the highway.	The Applicant produced an environmental review of the noise barrier options entitled: *A23 Noise Barrier: Environmental Review of Alternative Options*, giving details of these and other environmental impacts of the Riverside Garden Park noise barrier option. This was sent to the local authorities in January 2023 and is annexed to this Appendix as Annex 2.
JLA-NVTN-C3	Table 2	Traffic noise predictions	A review of the traffic noise predictions was undertaken and the JLAs noted that the predicted ES road traffic noise levels in Table 2 did not match the ES predictions from Table 6.3.1 of ES Appendix 14.9.4 **[APP-174]**. They do match the results of the road traffic noise mitigation analysis in Table 5.1.1 of ES Appendix 14.9.4 **[APP-174]**. The JLAs would like to query why the results of Table 5.1.1 and Table 6.3.1 are different for baseline scenarios with specific focus on the 2018 baseline, which should be	Table 2 is incorrectly titled as presenting ES road traffic noise levels. It presents the results of the assessment carried out between the PEIR and the ES, to inform the design process for the ES stage, which was reported in a Noise Barrier Note shared with the local highways and planning authorities in August 2022 (and is also reported in the ES Appendix 14.9.4 **[APP-174]** at Table 5.1.1). Similarly, the heading at paragraph 3.2.5, which refers to 'the ES stage' would be clearer if it instead referred to modelling carried out between the PEIR

			unaffected by traffic forecasts and mitigation.	and the ES. The baseline values reported in ES Appendix 14.9.4 [APP-174] Table 5.1.1 and Table 6.3.1 are slightly different because the Traffic and Transport team revised their strategic modelling outputs between the PEIR and the ES. The final ES noise modeling showed very similar noise levels to those after the PEIR and the justification for not including the Riverside Garden Park noise barrier was the same.
Appendix D – Traffic Noise Important Area Assessment				
JLA-NVTN-D1	4.1.2	2032 is the most stringent assessment	Can the Applicant explain why 2032 is considered as the most stringent assessment for road traffic noise when, for similar projects, the worst-case assessment tends to be when aircraft movements are at their maximum	The ES assesses road traffic noise effects in 2032 (the year of opening) and 15 years later, in 2047, as required by the Design Manual for Roads and Bridges (DMRB). 2032 is considered the most stringent assessment year because the significance of road traffic noise effects is predicted to be higher than in 2047, following the methodology in DMRB which indicates a Minor effect for noise increases of 1dB or more in the short term and 3dB or more in the long term. The results of the DMRB assessment for both 2032 and 2047 are presented in ES Appendix 14.9.4 [APP-174]. The effect of the noise mitigation

				included within the scheme (as summarized above) would be expected to reduce noise levels in any assessment year.
Appendix E – Ground Noise Engine Ground Run				
JLA-NVTN-E1	2.2.2	Boeing 777 engine testing measurements	The Applicant makes reference to engine ground running noise measurements that were used to model engine ground running noise. The Applicant should provide details of these measurements along with the sound power data used in the noise model to calculate LAmax levels.	See response to comments on paragraph 2.6.9 below
JLA-NVTN-E2	2.2.2	Sound power levels for aircraft	The Applicant states some differences in aircraft sound power level, but does not provide the results of measurements nor the calculated sound power levels to contextualise these statements.	See response to comments on paragraph 2.6.9 below
JLA-NVTN-E3	2.5.2	Intention to use replacement locations on taxiway Juliet wherever possible	This should be a commitment rather than an 'intention'; the Applicant should secure this commitment in the DCO.	This is the expected use, i.e., the likely situation assessed in the ES. GAL requires flexibility in areas to operate the airport safely and efficiently.
JLA-NVTN-E4	2.6.8	Justification for not identifying significant effects	The logic that air noise LAmax noise levels are high so ground noise LAmax noise levels are not significant is inherently flawed. The Applicant states that they	Air noise events occur hundreds of times each day in the baseline. This is relevant context in which to assess the increase in engine ground runs that will occur on average once every three days.

			cannot assess air and ground noise together as the sources are of different nature then chooses to make a comparison when it suites their narrative.	
JLA-NVTN-E5	2.6.9	Justification for not identifying significant effects	The Applicant has attempted to provide some indication on how engine testing would contribute to the LAeq,T metric with some rather outlandish assumptions. Paragraph 2.7.2 **[REP1-050]** states that peak engine testing noise levels would last for two minutes and events would occur, on average, 0.35 times per day. As such, engine testing noise LAeq,T noise has been calculated based on event lasting for 0.7 minutes (42 seconds). An example of a typical jet aircraft engine test is provided in the figure below[1]. 	Engine ground running predictions are based on noise measurements of engine testing at Gatwick which generally follow a similar pattern to the example provided in the JLA response. During an engine test, the engines are usually run at a thrust setting known as 'ground idle' for most of the time across a nominal test period in the region of 30 – 60 minutes and only increase to thrust settings at or above 'flight idle' for periods of 5 – 10 minutes (as seen in the JLA example). Generally, noise generated during 'flight idle' thrust settings is 10 – 15 dB higher than for 'ground idle' but is still not necessarily representative of the peak levels. The highest noise levels generated as part of an engine test tend to occur when changing between ground idle and flight idle thrust settings where a peak 5 – 10 dB higher than flight idle noise is often seen. The engine ground running predictions are based on the highest peak level for an engine test where

			The duration of this typical event is 25-minutes and the figure illustrates that high levels of noise (at a distance of 100m) occur for the duration of the event. It would be helpful if the Applicant could provide a typical engine testing profile that could be used to model ground noise such that ground running events would contribute to LAeq,T ground noise levels. This should be modelled as one event occurring on a reasonable worst-case day and should not be modelled as a partial event for an average day. Engine ground running noise should be included in the assessment of likely significant effects through its contribution to LAeq,T noise levels on a reasonable worst-case day.	thrust settings above flight idle were used for 11 minutes with a peak around 7 – 10 dB higher occurring when changing back to ground idle thrust settings. This highest peak results in a sound power level of 148 dBA which has been used in the predictions. These peaks are considered to be representative of full power thrust settings and as a worst-case it has been assumed that these might occur for up to 2 minutes during an engine test (as noted in JLA response). Averaging the 11 minutes above flight idle might result in a slightly higher LAeq than assuming full power for two minutes but this is unlikely to significantly change the overall outcome of the contribution to 16 hour LAeq values. The noise levels measured at ground idle are so far below the peak or above flight idle levels that there is no need to include these in the modelling. Therefore, the engine ground run example provided in the JLAs response is not inconsistent with range of Gatwick Airport ground run procedures used in the ground noise modeling of engine ground running noise which has demonstrated that the contribution of this noise

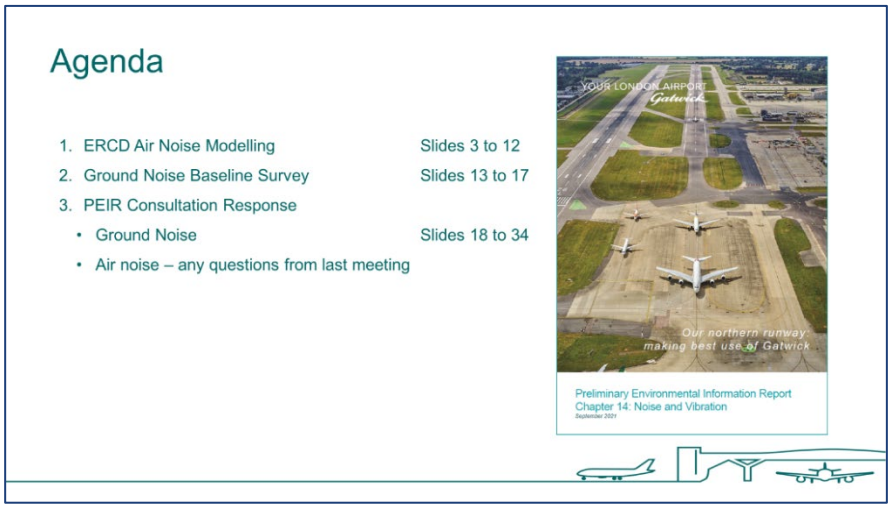
				source to daily Leq period noise levels is not significant and has not been omitted from the noise assessment, even using the worst case assumptions adopted in the ES.
JLA-NVTN-E6	3.1.1	The ground noise assessment is robust and cautious	The JLAs dispute this statement and are of the opinion that the ground noise assessment is not fit for purpose. The JLAs urge the Examining Authority to request the Applicant to update their ground noise assessment and address issues identified in **[REP1-068]** and **[REP1-097]**.	It is not considered necessary to update the ground model for the reasons set out above.
Appendix F – Aircraft Fleets Used in Noise Modelling				
JLA-NVTN-F1	Appendix F	Slower transition case vs Central case	The Need Case **[APP-250]** describes the slower transition case as "*This sensitivity assumes that the rate of transition of Gatwick's airline fleet takes longer to transition to next generation aircraft. It has been used to understand how noise, air quality and carbon impacts could be greater if the turnover of aircraft types to*	Clearly, forecasting the airport's fleet 23 years from now is difficult and relies on various assumptions. The Applicant acknowledges that these could be explained with more clarity in the Environmental Statement. **ES Appendix 14.9.5 Air Noise Envelope Background** [APP-175] Table 3.1 notes the percentage of next generation aircraft is likely to reach 100% in 2047 in both the central case fleet

			next generation aircraft is slower than expected in the core forecasts". This description gives the impression that the slower transition fleet transition merely lags behind the central case fleet transition so, when both fleets reach 100% next generation aircraft in 2047, noise contour areas should converge. However, this is not the case as the slower transition case noise contour areas are consistently higher than the central case contour areas, even when both are at 100% next generation aircraft. The central case and slower transition case contour areas are presented in Table 14.9.6 of ES Chapter 14: Noise and Vibration **[APP-039]**. Analysis of the central case and slower transition case fleets show a markedly different aircraft type fleet composition. The most prominent example of this is in the 2047 slower transition case fleet, which has replaced approximately 200	and the slower transition fleet. The transition to different aircraft by this time is uncertain, so to assess a noisier fleet the numbers of various quieter aircraft types were replaced with noisier types, even though both would be classified as next generation. Hence the slower transition fleet contours are larger. Despite the uncertainties in forecasting this far ahead, and beyond there would always be a transition progressing as older types retire so there would always be a range of noise levels that could arise depending on how the fleet transitions in the meantime. In any event, the noise envelope contour limits will be reviewed and revised after 9 years of operation and each 5 years thereafter, to ensure the noise envelope limits remain relevant and are based on more reliable shorter term which should produce a more representative outcome based on assumptions with a greater level of certainty. As such, the assessment that has been undertaken of the slower fleet transition forecast for all years is

			EA320NEO aircraft from the central case with approximately 200 B73710MAX aircraft. The Applicant should explain why the fleet composition of the slower transition case is so markedly different than the central case fleet and why the central case and slower case contours do not converge in 2047. Following on from this, it is important to understand how the fleet are modelled. The JLAs have requested that the Applicant provide details of their validation process along with SEL/LAmax baseline data for individual aircraft variants at each monitoring location. This request was originally made after the JLAs review of the PEIR and subsequent requests have been ignored by the Applicant. The JLAs would urge the Examining Authority to request the Applicant provide this information as it is important for understanding how individual aircraft	accurate as it can be when undertaking such a forward looking assessment, and it will also be subject to further scrunty through review in the future to ensure its robustness. With regards provision of information on modelling aircraft noise, the Local Authorities have agreed 'The use of ANCON is not disputed' (10.1.1 Statement of Common Ground between Gatwick Airport Limited and Crawley Borough Council point 2.13.5.2). Model validation data has been provided. The CAA's Environmental Research and Consultancy Department (ERCD) presented a sample of SEL and Lmax data to the Noise Topic Working Group on 7 June 2022 demonstrating the model validation process. Extracts from the slide deck circulated and presented to the group are included in Annex 1, below. Therefore, there is no requirement for ERCD to provide this.

			types contribute to noise contours and how changes to the fleet can affect noise contour areas.	

Annex 1: Extract from Noise Topic Working Group Meeting 7 June 2022, Slide Deck issued



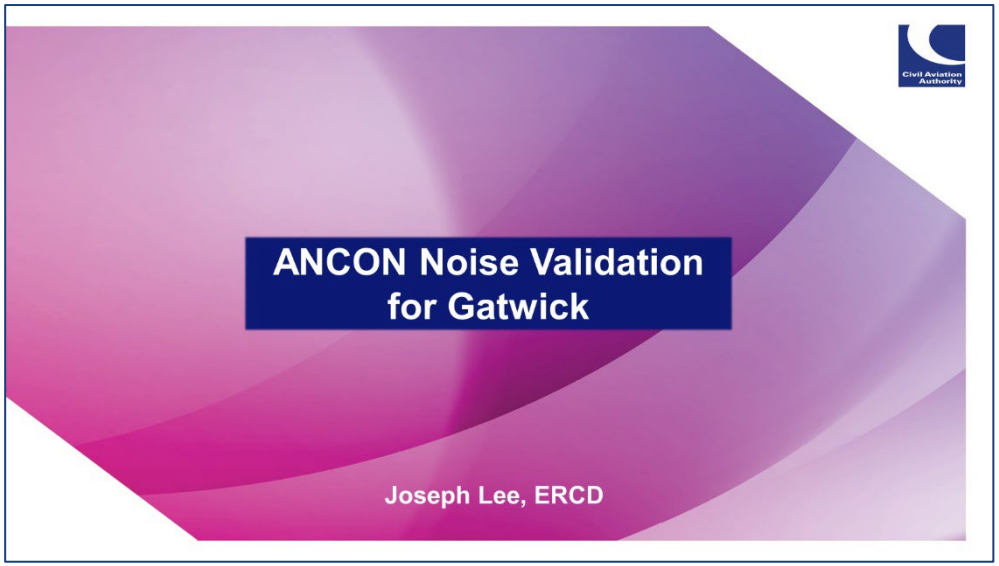
ERCD Air Noise Model: Consultation Response

Sufficient information in the ES should be provided on air noise modelling to understand the processes behind it. Information on air noise modelling should be provided, including noise measurements used to validate the noise model, the validation process, weather data, fleet forecasts and departure route splits

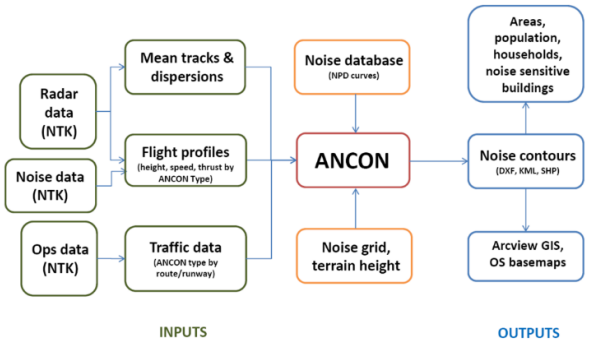
The data used from the Gatwick Noise Track Keeping (NTK) system is not provided and Noise Important Areas have not been identified.

The ANCON air noise model is validated each year by the CAA using data from Gatwick's NTK system. The specific data is unlikely to be in a format that would aid the reader in understanding the extent to which the model it validated. A technical description of ANCON is provided in R&D Report 9842. A description of the CAA's ANCON model and the validation process will be added as an appendix to the ES. The following slides have been prepared by ERCD to present to the meeting to explain the validation process.

With regards Noise Important Areas, 2 have now been designated next to Riverside Garden Park and are now considered in the traffic noise assessment.



ANCON noise modelling process



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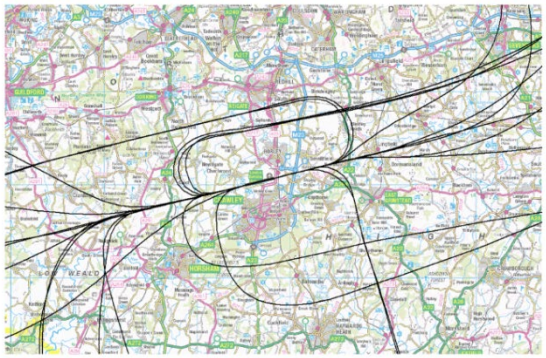
Gatwick departure mean tracks



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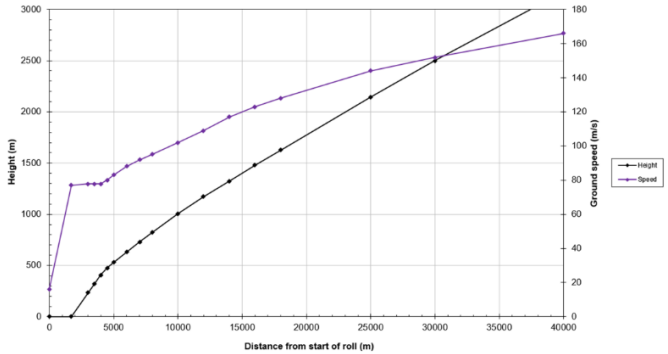
Departure average height & speed profile



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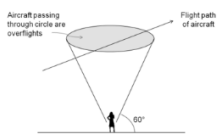
Noise events screening criteria

- Weather 
- L_{Amax} > monitor threshold +10 dB
- 60 degree cone 

- Total valid measurements > 75% overflights

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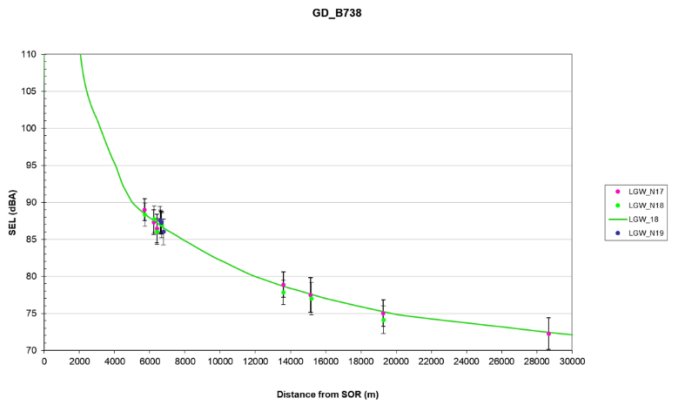
Noise validation – B738 departure SEL



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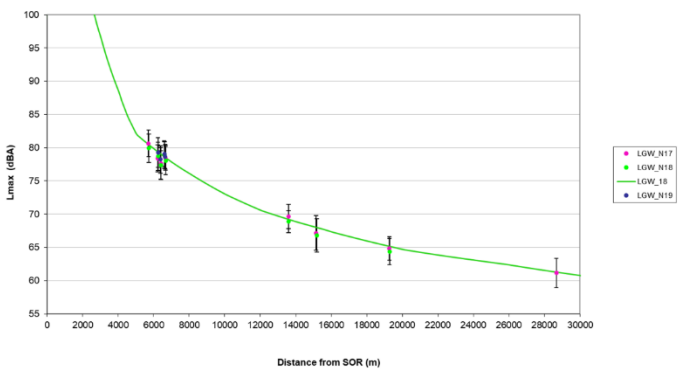
Noise validation – B738 departure L_{Amax}



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Noise validation – B738 arrival SEL

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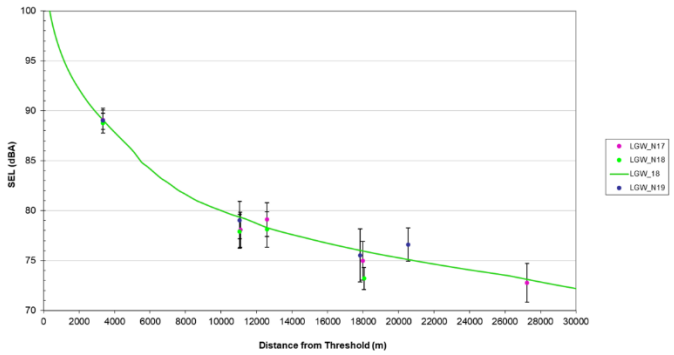

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Noise validation – B738 arrival L_{Amax}

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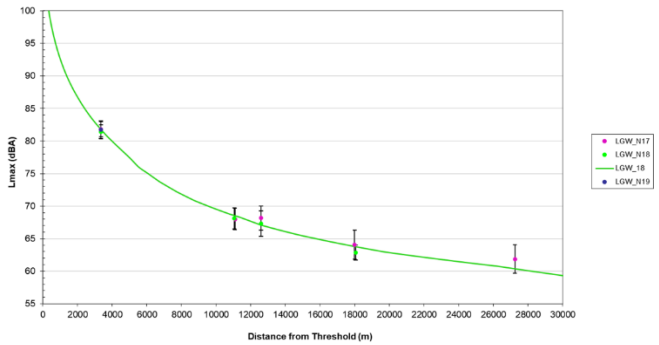

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Annex 2: A23 Noise Barrier: Environmental Review of Alternative Options

A23 Noise Barrier: Environmental Review of Alternative Options

5th August 2022 Draft

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Appendices

1 Introduction

1.1. Background

1.1.1 The proposal to make best use of Gatwick Airport's existing runways (referred to as the Project), as was assessed in the Preliminary Environmental Information Report (PEIR) of September 2021 and amended by the updated Preliminary Environmental Information (PEI) of June 2022 for the Highway Improvement Changes, included a noise barrier along the A23. Subsequently, strategic transport modelling results have enabled road traffic noise modelling for the current scheme to be completed. The results of this noise modelling have shown that there would not be significant adverse noise effects on nearby residential properties due to the Project without the Riverside Garden Park noise barrier. Therefore a noise barrier in this location would not be necessary to mitigate significant adverse noise effects. Further detail is provided in the technical note in Appendix 1.

1.1.2 In response to the noise modelling results, a number of alternative options to this element of the design of the Project are being considered. An environmental review has been undertaken of these alternative options compared to the version of this element of the design as was assessed in the PEIR/updated PEI. The approach to the environmental review is described below, the review itself in Section 2 and a summary is provided in Section 3.

1.2. Approach to environmental review

1.2.1 The following alternative options have been identified for comparison with the version of the design that was assessed for the PEIR/updated PEI which is referred to in this report as Option 1a (with noise barrier, removal of A23 footway, ramp over River Mole):

- 1b – Option 1a plus lighting in park
- 2 - No noise barrier, no ramp and do-something (Design Manual for Roads and Bridges (DMRB) compliant) A23 footway upgrade
- 3a - No noise barrier, with ramp and do-minimum (DMRB departure) A23 footway upgrade
- 3b - No noise barrier, with ramp and do-something (DMRB compliant) A23 footway upgrade
- 4 - With noise barrier, with ramp and do-something (DMRB compliant) A23 footway upgrade

1.2.2 Plans and cross sections for each of these options have been prepared by Arup and are provided in Appendix 2.

1.2.3 The environmental review has been undertaken for the following topics:

- Historic environment
- Landscape, townscape and visual
- Ecology and nature conservation
- Geology and ground conditions
- Water environment
- Traffic and transport
- Air quality
- Noise and vibration
- Climate change and carbon
- Socio-economics

- Health and wellbeing
- Agricultural land use and recreation

1.2.4 For each topic, the following has been considered and the results presented in table format in Section 2:

- The key environmental effects associated with this element of the Project as was assessed in the PEIR as amended by updated PEI.
- The way in which each alternative option compares to Option 1a including increases/decreases in adverse and beneficial effects.
- Whether there is any potential for further mitigation measures for any of the alternative options that would reduce adverse effects or increase beneficial effects.
- A conclusion for each alternative option in comparison with Option 1a, as being, on balance (using professional judgement):
  - Worse performing – adverse effects would increase and/or beneficial effects would decrease compared to option 1a
  - Better performing – adverse effects would decrease and/or beneficial effects would increase compared to option 1a
  - Neutral – effects would remain similar to Option 1a
- Where there is clearly a better or worse performing option, this is also identified.

2 Environmental review

2.1.1 Tables are provided below presenting the review for each topic using the approach described in section 1.2.

Table 2.1: Historic environment

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: The construction and operation of the North Terminal Roundabout Improvements (including the noise barrier) would not affect any heritage asset.		n/a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	The additional lighting in the park would not affect any heritage asset.		Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	The footpath upgrade and the absence of the noise barrier would not affect any heritage asset.		Neutral
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	The ramp and the footpath upgrade along with the absence of the noise barrier would not affect any heritage asset.		Neutral
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	The ramp and the footpath upgrade along with the absence of the noise barrier would not affect any heritage asset.		Neutral

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	The ramp and the footpath upgrade would not affect any heritage asset.		Neutral

Table 2.2: Landscape, townscape and visual amenity

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: Vegetation removal within Riverside Garden Park, both temporary and permanent and the introduction of a noise barrier and space for maintenance access, together with a ramp, would result in a more intensively developed road corridor/park edge interface. Effects on townscape character as identified within the PEIR. Effects on visual amenity of people using the park and residents within houses in Horley, some potential for significant adverse effects in the long term.	Potential for some replacement planting within Riverside Garden Park to mitigate long term effects on townscape character and visual amenity.	n/a

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	In addition to the impacts described for Option 1a, Option 1b would introduce further lighting infrastructure within Riverside Garden Park which would have minimal additional impacts on character or visual amenity due to the presence of lighting in close proximity on the A23. The edge of the park would be slightly more intensively developed, eroding green space character at night. Some further potential for adverse effects compared to Option 1a, although unlikely to be significant.	Lighting design to ensure minimal influence at night on the wider character of Riverside Garden Park. Low level/bollard lighting, directional light fittings.	Neutral (Daytime) Worse (Night time)
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	Reduction in vegetation removal in Riverside Garden Park, both temporary and permanent, due to reduced encroachment of new highways development. Road corridor/park edge interface would retain a similar character to existing situation, in the long term, when replacement planting established. Upgraded A23 footway and verge strip would prevent reinstatement of some screen planting along road edge. Character of townscape green space largely retained in the long term and better than reported in the updated PEI for Option 1a. Effects on visual amenity of people using the park and residents within houses in Horley would be different and, on balance, better than reported in the updated PEI for Option 1a. Less visible development due to no noise barrier or ramp offset by more open views of traffic.	Greater potential for replacement planting in Riverside Garden Park to reinstate character of green space and screen for visual receptors.	Better (best option)

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	Reduction in some vegetation removal in Riverside Garden Park, both temporary and permanent, due to reduced encroachment of new highways development however, new ramp would require same amount of vegetation removal. Road corridor/park edge interface would retain a similar character to existing situation south of the ramp, in the long term, when replacement planting established. Upgraded A23 footway and verge strip would prevent reinstatement of some screen planting along road edge. Character of townscape green space south of the ramp largely retained in the long term and better than reported in the updated PEI for Option 1a. Inclusion of the ramp would encroach into the park, resulting in long term vegetation loss and greater influence of the road in the park. Effects on visual amenity of people using the park and residents within houses in Horley would be different and, on balance, better than reported in the updated PEI for Option 1a. Less visible development due to no noise barrier offset by more open views of traffic and the ramp.	Overall, greater potential for replacement planting in Riverside Garden Park to reinstate character of green space and screen for visual receptors.	Better
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Reduction in some vegetation removal in Riverside Garden Park, both temporary and permanent, due to reduced encroachment of new highways development however, new ramp would require same amount of vegetation removal. Road corridor/park edge interface would retain a similar character to existing situation south of	Overall, greater potential for replacement planting in Riverside Garden Park to reinstate character of green space and screen for visual receptors.	Better

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	the ramp, in the long term, when replacement planting established. Upgraded A23 footway and verge strip would prevent reinstatement of some screen planting along road edge. Character of townscape green space south of the ramp largely retained in the long term and better than reported in the updated PEI for Option 1a. Inclusion of the ramp would encroach into the park, resulting in long term vegetation loss and greater influence of the road in the park. Effects on visual amenity of people using the park and residents within houses in Horley would be different and, on balance, better than reported in the updated PEI for Option 1a. Less visible development due to no noise barrier offset by more open views of traffic and the ramp.		
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Vegetation removal within Riverside Garden Park, both temporary and permanent and the introduction of a noise barrier and space for maintenance access, together with a ramp and A23 footway upgrade, would result in a more intensively developed road corridor/park edge interface. Ramp and upgraded A23 footway and verge strip would prevent reinstatement of some screen planting within northern part of park and along road edge. Effects on townscape character greater than those reported in the updated PEI for Option 1a. Effects on visual amenity of people using the park and residents within	Least potential for replacement planting within Riverside Garden Park to mitigate long term effects on townscape character and visual amenity. Views from A23 footway further urbanized.	Worse (Worst Option)

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	some houses in Horley greater than those reported in the updated PEI for Option 1a, some potential for significant adverse effects in the long term. Whilst the A23 footway would become useable, views would be confined to the road corridor and the noise barrier would block views of Riverside Garden Park.		

Table 2.3: Ecology and nature conservation

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: Vegetation removal within Riverside Garden Park.	Potential for some replacement planting within Riverside Garden Park to mitigate long term effects.	n/a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	Lighting in the park would deter bats. Potential for further adverse effects through closure of commuting route via impact of lighting deterring bats from using corridor along Gatwick Stream. Likely to be moderate adverse instead of minor and therefore significant compared to Option 1a. Depending on the extent of lighting, it could be major adverse as it would be a landscape-scale impact, removing the only corridor of movement between Gatwick and Horley.	Even low-level bollards would have a similar adverse effect.	Worse

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	No noise barrier means the Project can re-plant closer to the road. No ramp into Riverside Gardens Park means that there is more potential for vegetation retention at detailed design stage although it is likely that the expansion necessary to build the A23 footway may off set this to some extent. Overall, more potential for vegetation retention/replacement than Option 1a.	Additional space to replant compared to Option 1a.	Better (best option)
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	Overall similar to Option 1a but with less vegetation loss due to not requiring noise barrier. A do-minimum A23 footway would also limit vegetation loss and may allow for additional replanting compared to Option 1a.	Additional space to replant compared to Option 1a.	Better
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Overall similar to Option 1a but with less vegetation loss due to not requiring noise barrier. However, a do-something A23 footway upgrade would offset this to an extent, making this option slightly worse than Options 2 and 3a. Does allow for some additional replanting compared to Option 1a.	Additional space to replant compared to Option 1a.	Better
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Vegetation removal to facilitate Option 4, in particular with respect to the necessary earthworks to the existing embankment would be greatest of all options. Likely to be significantly worse in the long term than Option 1a in terms of overall impact with the lowest potential to replant due to the increased engineering required.	Largest quantum of vegetation loss and least potential for replacement planting within Riverside Garden Park to mitigate vegetation loss.	Worse (Worst Option)

Table 2.4: Geology and ground conditions

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: Potential Areas of Concern (PAOC) are identified in PEIR chapter 10 Geology and Ground Conditions. These areas represent potential sources of contamination from existing and historical land uses on the Project site and off-site. The A23 noise barrier does not encroach upon identified PAOC. Mitigation measures adopted as part of the Project would be in accordance with the proposed Project wide measures which include implementation of a Discovery Strategy in relation to previously unknown contamination, undertaking appropriate slope stability and / or piling risk assessment and preparation of a Materials Management Plan.	Further mitigation would be in accordance with the proposed Project wide measures which comprises opportunities to be explored regarding mineral use of the material excavated from the Brick Clay Resource Mineral Safeguarded Area.	n/a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	This option would not affect any PAOC compared to option 1a and therefore effects would be the same.		Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	This option would not affect any PAOC compared to option 1a and therefore effects would be the same.		Neutral

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	This option would not affect any PAOC compared to option 1a and therefore effects would be the same.		Neutral
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	This option would not affect any PAOC compared to option 1a and therefore effects would be the same.		Neutral
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	This option would not affect any PAOC compared to option 1a and therefore effects would be the same.		Neutral

Table 2.5: Water environment

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: The noise barrier requires works at the toe of the highway embankment that impacts on flood plain storage and drainage ditch alignment. Negative impact (unmitigated) on flood risk, and potentially on geomorphology and groundwater (during construction). Compensatory Flood Plain Storage would be needed. This is best avoided if possible. Small Geomorphological risk and Groundwater risk is manageable through design.		n/a

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	Identical to Option 1a. Lighting presence or otherwise has no impact on Water overall. Any mitigation for 1b would be the same as 1a.		Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	The elimination of the noise barrier would reduce impacts on the flood plain and drainage ditch diversion. This is better than 1a. The beneficial impact compared to 1a is more significant from a flood risk perspective than it is from a geomorphological perspective. Very similar overall to Option 3b.	Compensatory Flood Plain Storage may still be needed, but less than Option 1a. This could be largely mitigated by using a retaining wall instead of widening the embankment.	Better
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	The elimination of the noise barrier and less work related to the footway would reduce impacts on the flood plain and drainage ditch diversion. The beneficial impact compared to 1a is more significant from a flood risk perspective than it is from a geomorphological perspective. This is significantly better than Option 1a as it appears as though there is no flood plain encroachment. It is the best option overall.	Minimal, if any Compensatory Flood Plain Storage needed (based on sections at Ch 340 and 570 which show no flood plain encroachment).	Better (best option)
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	The elimination of the noise barrier would reduce impacts on the flood plain and drainage ditch diversion. This is better than 1a. The beneficial impact compared to 1a is more significant from a flood risk perspective than it is from a geomorphological perspective. Very similar overall to Option 2.	Compensatory Flood Plain Storage may still be needed, but less than Option 1a. This could be largely mitigated by using a retaining wall instead of widening the embankment.	Better
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	The noise barrier would require works at the toe of the highway embankment that would impact on flood plain storage and drainage ditch alignment. Negative impact (unmitigated) on flood	Compensatory Flood Plain Storage would be needed to a greater extent than required for Option	Worse (worst option)

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	risk, and potentially on geomorphology and groundwater (during construction). Negative impact is greater than Option 1a due to the greater encroachment into the flood plain and the more significant ditch diversion required. Overall, this option is the worst from a Water perspective due to the flood plain impacts.	1a. This is best avoided if possible. This could be partially mitigated by using a retaining wall instead of widening the embankment, but flood plain storage would still be lost (e.g. at sections at Ch 336, 410, 582). Compensatory flood plain storage would need to be found elsewhere in the vicinity.	

Table 2.6: Traffic and transport

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: The assessment in the PEIR and in the updated PEI concluded that there would be the following effects on pedestrians and cyclists in the vicinity of A23 London Road: Severance: Negligible during construction, minor adverse in all other assessment years Pedestrian and cycle delay: Negligible during construction and in 2029; negligible to minor beneficial in 2038 and 2047. Pedestrian and cycle amenity: Minor adverse during construction; negligible	As the assessed effects were not significant, mitigation is not required beyond that embedded in the Project proposals	n/a

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	in 2029; negligible in 2032; negligible to minor beneficial in 2047. Accidents and safety: Negligible during construction and in 2029; negligible to minor beneficial in 2032 and 2047.		
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	Whilst the addition of lighting in the park, compared to Option 1a, may make the route more attractive and could improve user safety, overall it would not change the assessment of effects related to pedestrians and cyclists.	n/a	Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	This option provides a pedestrian footway alongside the A23 London Road southbound, instead of providing the pedestrian route within the park and a ramp connection to the A23 London Road close to the Longbridge roundabout. This option would not change the assessment of effects related to severance or pedestrian and cycle delay, compared to Option 1a. Because the pedestrian route would be alongside the A23 London Road southbound carriageway, albeit with a separation verge, pedestrians and cyclists would be in closer proximity to moving traffic than would be the case in Option 1a. Although pedestrian flows in this location are low, it is considered that the effects related to pedestrian and cycle amenity for Option 2 would be minor adverse during construction (as for Option 1a); and minor adverse in 2029, 2032 and 2047 (compared to negligible or minor beneficial for Option 1a).	The effects on pedestrians and cyclists related to Option 2 are not significant and would not require additional mitigation.	Worse

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	In relation to accidents and safety for pedestrians and cyclists, bearing in mind the low numbers of pedestrians using this route, it is considered that Option 2 would give rise to negligible effects (compared to negligible or minor beneficial effects for Option 1a)		
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	This option provides a pedestrian footway alongside the A23 London Road southbound, but retains the connection into the park and pedestrian route through the park which is contemplated in Option 1a. As this option provides two possible pedestrian routes alongside the A23 London Road southbound (one adjacent to the carriageway and one within the park), pedestrians may choose either route. The route adjacent to the carriageway would bring pedestrians in closer proximity to moving traffic and is likely to be less attractive, which would lead to slightly greater impacts on pedestrians than was anticipated in the PEIR and updated PEI for Option 1a. However, given the presence of the alternative route through the park, when considered overall and compared against Option 1a, Option 3a is not expected to give rise to any different effects than were reported for Option 1a.	n/a	Neutral
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	This option provides a pedestrian footway alongside the A23 London Road southbound, but retains the connection into the park and pedestrian route through the park which is contemplated in Option 1a.	n/a	Neutral

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	As this option provides two possible pedestrian routes alongside the A23 London Road southbound (one adjacent to the carriageway and one within the park), pedestrians may choose either route. The route adjacent to the carriageway would bring pedestrians in closer proximity to moving traffic and is likely to be less attractive, which would lead to slightly greater impacts on pedestrians than was anticipated in the PEIR and updated PEI for Option 1a. However, given the presence of the alternative route through the park, when considered overall and compared against Option 1a, Option 3b is not expected to give rise to any different effects than were reported for Option 1a.		
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	This option provides a pedestrian footway alongside the A23 London Road southbound, but retains the connection into the park and pedestrian route through the park which is contemplated in Option 1a. As this option provides two possible pedestrian routes alongside the A23 London Road southbound (one adjacent to the carriageway and one within the park), pedestrians may choose either route. The route adjacent to the carriageway would bring pedestrians in closer proximity to moving traffic and is likely to be less attractive, which would lead to slightly greater impacts on pedestrians than was anticipated in the PEIR and updated PEI for Option 1a. However, given the presence of the alternative	n/a	Neutral

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	route through the park, when considered overall and compared against Option 1a, Option 4 is not expected to give rise to any different effects than were reported for Option 1a.		

Table 2.7: Air quality

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: Design includes provision of a noise barrier in the eastern verge of A23 London Road. Construction of localised retaining walls and earthwork activities from localised embankment construction and re-alignment of existing drainage. No significant effects were reported in the PEIR or updated PEI.	n/a	n/a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	No change in effects compared to Option 1a.	n/a	Neutral

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	Construction dust: A section of retaining wall would be required, along with earthwork preparation and ditch re-alignment. This would involve construction materials such as concrete and soil removal along with associated vehicles. Prior to mitigation, construction-related air quality effects would likely be worse compared to Option 1a. Embedded dust emission mitigation measures would commensurate those set out in the Institute of Air Quality Management (IAQM) guidance on the assessment of dust from demolition and construction. These measures would also be set out in a Code of Construction Practice (CoCP). With effective implementation of mitigation, it should be possible to prevent significant effects on receptors from construction-related activities. Hence the residual effect will normally be 'not significant'. Operation: Without the noise barrier there is potential for increased pollutant concentrations at receptors on Longbridge Road compared to Option 1a because the barrier can act to disrupt the transportation of pollutants from this section of the A23. However, given the modelled concentrations from the PEIR, it is expected the impact would be not significant. To quantitatively determine potential impact, detailed dispersion modelling would be required.	n/a	Worse (construction pre mitigation - no residual effects post-mitigation) Worse **(**operation)*

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	Construction dust: A section of retaining wall would be required southeast of the proposed A23 London Road pedestrian ramp. This would involve construction materials such as concrete and associated vehicles. Furthermore, provision is made for a pedestrian ramp connection between A23 London Road and Riverside Garden Park. This would involve localised ditch realignment and embankments and would potentially give rise to emission of dust through earthworks and vehicle trackout. Prior to mitigation, construction-related air quality effects would likely be worse compared to Option 1a. As stated in Option 2, embedded mitigation will follow the IAQM guidance and be set out in a CoCP. Operation: Same as Option 2.	n/a	Worse (construction pre mitigation - no residual effects post-mitigation) Worse (operation)*
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Construction dust: Embankment and retaining wall as Option 3a, however, retaining wall would be smaller, so therefore, the potential for less construction impacts compared to Option 2 and 3a. Therefore, construction-related air quality effects would likely be imperceptible compared to Option 1a. As stated in Option 2, embedded mitigation will follow the IAQM guidance and set out in a CoCP. Operation:	n/a	Worse (construction pre mitigation - no residual effects post-mitigation). Less impact expected compared to Option 2 and Option 3a. Worse (operation)*

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	Same as Option 2.		
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Construction dust: Inclusion of an embankment along A23 portion from Longbridge Roundabout to eastern end of Riverside Garden Park. Furthermore, this option would include 625m of retaining wall – the largest of the options (more construction materials and associated vehicles). Additionally, the retaining wall would be primarily underground – this has scope to involve substantial volumes of earthwork removal. Prior to the implementation of mitigation, construction-related air quality effects would likely be worse compared to Option 1a. Mitigation will follow the IAQM guidance and be set out in a CoCP. Operation: Noise barrier implemented – as with Option 1a. This can potentially have a beneficial air quality impact because the barrier can act to disrupt the transportation of pollutants. To quantitatively determine potential impact, detailed dispersion modelling would be required.	n/a	Worse (construction - no residual effects post-mitigation). This is likely to be the worst option during construction. Neutral (operation)
Note: asterisk * denotes that detailed dispersion modelling would be required to quantitatively determine effect of not having a noise barrier on air quality concentrations at nearby residential receptors.			

Table 2.8: Noise and vibration

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: The PEI consultation pre-dated the availability of strategic transport modelling traffic forecasts to model road traffic noise, so the PEI anticipated similar impacts as the PEIR, ie with the Riverside Garden Park noise barrier. It also noted the possibility of removing this barrier as follows: 'Updated strategic traffic modelling will allow traffic noise modelling to be updated for the Environmental Statement. It is likely that traffic speeds on the A23 would be reduced as a result of the speed limit being reduced from 50 to 40 mph. If this, in combination with the results of updated strategic traffic modelling, show noise increases in the two Noise Important Areas defined in the Crawley Agglomeration Noise Action Plan (the residential areas around either end of Riverside Garden Park) can be avoided without the need for this noise barrier, it may be shortened or removed.' Strategic transport modeling results have allowed noise modelling to be completed. This has shown that the combined effect of speed reduction and the proposed noise barriers on the South Terminal Roundabout flyover, on the North Terminal Roundabout flyover, and along the edge A23 past Riverside Garden Park would result in Minor/Moderate positive impacts to the housing areas, including in two Defra	National Highways have in progress a noise insulation scheme for the residential properties that form the two Noise Important Areas.	n/a

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	Noise Important Areas targeted in the Noise Action Plan for the highways authorities to reduce noise. Users of the park would also experience a Low/Medium reduction in road traffic noise but this is considered less significant than the benefits to residential properties nearest the road. Reductions in ambient noise within the park and beyond would vary, with smaller reductions further from the road and in the south of the park because in these areas noise sources within the airport are more significant and the noise barrier on the A23 past Riverside Garden Park would do very little to reduce ground noise and air noise from the airport.		
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	As 1a		Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	Residential Noise Sensitive Receptors would experience Negligible to Low noise reductions. This is consistent with Defra policy to reduce noise levels in identified Noise Important Areas, but noise levels would remain above Significant Observed Adverse Effect Level (SOAEL) in most areas so that noise reductions would likely be not significant in EIA terms. In the park traffic noise levels would increase by less than 1dB ie negligibly in the middle and far side of the park and by 1.0 to 1.5dB near the A23, ie Negligible to Low increases. These	Low noise surfacing has been discussed with National Highways but would likely not yield useful noise reduction in this area because traffic speeds will be too low. National Highways have in progress a noise insulation scheme for the residential properties that form the two Noise Important Areas.	Worse

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	increases are unlikely to be noticeable to park users and would not be significant.		
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	Residential Noise Sensitive Receptors would experience Negligible to Low noise reductions. This is consistent with Defra policy to reduce noise levels in identified Noise Important Areas, but noise levels would remain above SOAEL in most areas so that noise reductions would likely be not significant in EIA terms. In the park traffic noise levels would increase by less than 1dB ie negligibly in the middle and far side of the park and by 1.0 to 1.5dB near the A23, ie Negligible to Low increases. These increases are unlikely to be noticeable to park users and would not be significant.	Low noise surfacing has been discussed with National Highways but would likely not yield useful noise reduction in this area because traffic speeds will be too low. National Highways have in progress a noise insulation scheme for the residential properties that form the two Noise Important Areas.	Worse
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	As 3a	As 3a	Worse
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	As 1a	As 1a	Neutral

Table 2.9: Climate change and carbon

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: Greenhouse Gas (GHG): Any additional construction activities would result in increased GHG emission from either/both of embodied carbon in materials used for construction, and emissions from construction activities (plant, transport etc). However, given the scale of the Project this would be a relatively small addition to the existing estimated GHG emissions associated with Construction of the wider Project. On this basis no change to the assessment of significance arising from this project is expected (given the PEIR acknowledges that all net positive GHG emissions are significant).	Mitigation of GHG impacts would be through: reduced scale of construction; maximising reuse of excavated material from near the location of the Option; and measures to reduce GHG emissions from plant (e.g. use of alternative fuel vehicles).	n/a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	GHG: Minor increase in operational emissions from lighting. Not material in terms of significance of impacts arising from the Project. Climate Change Resilience (CCR): Similar to Option 1a.	GHG: Optimised low energy lighting.	GHG: Worse (scale is very marginal) CCR: Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	GHG: Emissions associated with the construction of the noise barrier and ramp would be expected to be removed (eg widening of earthworks) leading to minor improvement on Option 1a. CCR: As flood risk is reduced this would be better than option 1a.	None	GHG: Better (by a very minor degree compared to overall scale of Project impacts) CCR: Better (flood)

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	GHG: Emissions associated with the construction of the noise barrier would be expected to be removed leading to minor improvement on Option 1a. CCR: As flood risk is reduced this would be better than option 1a.	None	GHG: Better (by a very minor degree compared to overall scale of Project impacts). CCR: Better (flood)
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	GHG: Emissions associated with the construction of the noise barrier would be expected to be removed leading to minor improvement on Option 1a. CCR: As flood risk is reduced this would be better than option 1a.	None	GHG: Better (by a very minor degree compared to overall scale of Project impacts) CCR: Better (flood)
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	GHG: Emissions unlikely to differ to material degree from Option 1a. CCR: As flood risk is increased this would be worse than option 1a.	None	GHG: Neutral CCR: Worse (flood)

Table 2.10: Socio-economics

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: In socio-economic terms, noise effects are considered as part of resident disruption impact. At the PEIR stage there was negligible or minor adverse effects in terms of disruption, but these were based primarily on traffic issues and delays as no significant noise impacts were identified. The PEI concluded that there would be no new or materially different significant effects compared to those reported in the PEIR.		n/a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	In terms of noise effects that could create resident disruption, this option is not expected to have any significant change in the assessment compared to 1a. However, the additional inclusion of lighting to the park is considered to have potential beneficial effects on the quality and accessibility of open space provision available for community use.		Better
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	In terms of noise effects that could result in resident disruption, this option is not expected to have any significant change in the assessment compared to 1a. However, the additional design proposal to upgrade the footway is considered to have some potential beneficial effects on the residents' accessibility. However, this effect is likely to be either negligible or minor given the small proportion of the local population that might make use of this route.		Neutral

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	This option provides a two-way route for pedestrians moving north/south along A23 London Road and on this basis it is considered slightly more beneficial compared to Option 1a.		Better
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Same as above for Option 3a for socio-economics.		Better
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Effects similar to Option 3a/3b due to the two-way route for the pedestrians, but there is no park lighting. Option 4 is potentially the best for socio-economic terms albeit all options would have either minor or negligible impacts.	If park lighting is added (as per option 1b) as a further enhancement this could be the best option in socio-economic terms but still wouldn't be significant.	Better (best option)

Table 2.11: Health and wellbeing

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	The loss of mature trees and vegetation in Riverside Garden Park has the potential to adversely affect population health, with the change influencing community identity, as well as the value of the open space in terms of physical and mental health. The noise barrier provides a benefit to a relatively small population of residents near the park (and to a lesser extent park users), influencing long-term health outcomes.		n/a

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	Lighting in the park would provide a small improvement to the safety of the route. This would affect actual and perceived risks of crime. This is likely to support an increase in active travel, with physical and mental health benefits. This is better in comparison with 1a.	Other safety measures could also be included on the park path, such as a well-maintained route with firm level surface, good visibility and regular access (side paths) to open areas of the park.	Better
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	This option has more potential for vegetation retention/replacement in Riverside Garden Park, than Option 1a. This is better in comparison with 1a. Not including the noise barrier would result in negligible to low noise reductions at residential noise sensitive receptors compared to minor to moderate for Option 1a. This is worse in comparison to 1a. Not including the ramp would reduce the connectivity with the park and remove an access point that would be amenable to use by those with mobility constraints, including due to age, poor health, disability or child buggies. This forgoes a beneficial influence on health inequalities. This is worse compared to option 1a.	Additional space to replant compared to Option 1a. This would assist in maintaining the community identity and open space value of the park in supporting physical and mental health.	Better (vegetation retention/replanting considerations) Worse (noise and accessibility considerations)
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	This option has more potential for vegetation retention/replacement in Riverside Garden Park, than Option 1a. This is better in comparison with 1a.	Additional space to replant compared to Option 1a. This would assist in maintaining the community identity and open space	Better (vegetation retention/replanting considerations) Worse (noise considerations)

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	Not including the noise barrier would result in negligible to low noise reductions at residential noise sensitive receptors compared to minor to moderate for Option 1a. This is worse in comparison to 1a. Compared to option 1a there would be two path options, one along the A23 and one, parallel, within the park. This provides flexibility, including a route with greater surveillance (by traffic) along the A23. As the park path is unlit under this option, the A23 path may support active travel by addressing concerns about actual or perceived crime. The A23 route is however close to dual-carriageway traffic, which makes it less attractive as a route and the limited separation does not optimise safety (similar to its current baseline). There is a small improvement, but it is likely neutral compared to 1a.	value of the park in supporting physical and mental health.	Neutral (accessibility considerations)
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	This option has more potential for vegetation retention/replacement in Riverside Garden Park, than Option 1a. This is better in comparison with 1a. Not including the noise barrier would result in negligible to low noise reductions at residential noise sensitive receptors compared to minor to moderate for Option 1a. This is worse in comparison to 1a. Compared to option 1a there would be two path options, one along the A23 and one, access via the ramp, within	Additional space to replant compared to Option 1a. This would assist in maintaining the community identity and open space value of the park in supporting physical and mental health.	Better (vegetation retention/replanting and accessibility considerations) Worse (noise).

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	the park. The do-something A23 path improvements increase the safety of, and amenity on, the A23 path (compared to its baseline). This is likely to support an increase in active travel, with physical and mental health benefits. The benefits also accrue from providing an alternative to the unlit park path route in terms of actual and perceived crime. This is better in comparison with 1a.		
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	There would be additional benefits associated with providing two path options in comparison to option 1a, one along the A23 and one, access via the ramp, within the park. The do-something A23 path improvements increase the safety of, and amenity on, the A23 path (compared to its baseline). This is likely to support an increase in active travel, with physical and mental health benefits. The benefits also accrue from providing an alternative to the unlit park path route in terms of actual and perceived crime. For accessibility, this is better in comparison with 1a.		Better (best option)

Table 2.12: Agricultural land use and recreation

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
1a Noise barrier along A23 (as was assessed in the PEIR/updated PEI)	Key relevant effects identified in PEIR/updated PEI: There would be no new or different significant effects to those assessed in the PEIR as a result of the changes in		n/a

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	this area. The permanent loss of a strip of public open space along the southern edge of Riverside Garden Park would not adversely affect the integrity of this resource. This loss would be mitigated by the provision of new areas of public open space which would serve the local community and whilst these would not be immediately contiguous with the park, they would be connected by a pedestrian link.		
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	Agricultural Land Use: N/A Recreation: This provides a single route in the same location as Option 1a.		Neutral
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	Agricultural Land Use: N/A Recreation: This provides a single access route into Riverside Garden Park in a different location to Option 1a but in the same location as currently exists alongside the A23.	Potential to consider an additional route via steps at the western end to mirror the current desire line for pedestrians in that location, although this would not be to standard.	Neutral
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	Agricultural Land Use: N/A Recreation: This option provides two access routes into Riverside Garden Park for pedestrians compared to the single route included in Option 1a.		Better
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Agricultural Land Use: N/A Recreation:		Better (best option)

Option	Environmental effects comparison	Any potential for further mitigation?	Conclusion compared to Option 1a
	This option provides two DMRB compliant access routes into Riverside Garden Park for pedestrians compared to the single route included in Option 1a.		
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	Agricultural Land Use: N/A Recreation: This option provides two DMRB compliant access routes into Riverside Garden Park for pedestrians compared to the single route included in Option 1a. However, this does not offer further advantages for recreational access beyond Option 3b and the solution would require a larger cross-sectional footprint into the edge of the Park for the provision of the footway and barrier.		Better

3 Summary

3.1. Conclusions

3.1.1 Following the results of strategic traffic modelling, the completed road traffic noise modelling has shown that a noise barrier along the A23 would not be necessary to mitigate adverse significant noise effects.

3.1.2 Five alternative options have been identified and an environmental review has been undertaken to compare these alternative options to the version of the design that was assessed in the PEIR, as amended by the updated PEI for the Highway Improvement Changes.

3.1.3 Where a topic specialist has indicated particular option(s) as potentially performing better (adverse effects would reduce and/or beneficial effects would increase compared to option 1a) or worse (adverse effects would increase and/or beneficial effects would reduce compared to option 1a), these are noted in Table 3.1 below. Any noted best or worst options for a topic are also identified. Effects would generally otherwise be similar to Option 1a (neutral). It should be noted that the topics and their issues are not directly comparable with each other and the differences in scale vary therefore the conclusions are referring only to whether the effects for an individual topic could be better or worse than for Option 1a.

3.1.4 The environmental review shows that, without the noise barrier (Option 2, 3a and 3b), there would be an improvement in terms of environmental effects for some topics, notably Ecology and Landscape, Townscape and Visual Amenity, Water Environment (flood plain and drainage ditch diversion) and consequently CCR and to a very minor degree GHG emissions. For Ecology and Landscape, Townscape and Visual Amenity the options with the ramp (3a and 3b) are better than Option 1a but would have less potential for replanting of vegetation and therefore, would be less preferred than Option 2 without the ramp. Option 3a would limit vegetation loss more than Option 3b due to the differences between the non-compliant and compliant footway. Option 2 would provide an opportunity to potentially reduce the construction area and would be the best option for Landscape, Townscape and Visual Amenity and Ecology due to the most potential to replant/retain vegetation. For Health and Wellbeing the without noise barrier options perform better in relation to issues associated with vegetation loss (although worse for noise considerations and Option 2 would be worse for accessibility) and Option 3b performs better for accessibility considerations. Water environment finds Option 3a to be the best option due to reduced flood plain encroachment (and consequently also for CCR).

3.1.5 Without the noise barrier, noise effects to both residential noise sensitive receptors and users of Riverside Garden Park would be worse than options with the noise barrier (Options 1a, 1b and 4). Also there is potential for increased air quality pollutant concentrations at receptors along Longbridge Road although this is not expected to be significant in view of the modelled concentrations in the PEIR (detailed dispersion modelling would be required to determine this quantitatively).

3.1.6 With the noise barrier (Option 1b and 4), the effects would be the same as for Option 1a for Noise to residential properties and in Riverside Garden Park and also associated benefits for Health and Wellbeing and Socio-economics.

3.1.7 Options that would provide improvements to the A23 footway and a ramp within the park (Options 3a and 3b), enabling two routes rather than Option 1a's single route, would be beneficial for active travel and accessibility therefore improvements in effects for Recreation (particularly Option 3b that would be the best option) and Socio-economics. Health and Wellbeing identifies a distinction between Option 3a and 3b in terms of accessibility considerations with 3a being neutral and 3b being better compared to Option 1a. Option 2 would perform worse for Health and Wellbeing due to accessibility considerations and noise and also Traffic and Transport due to pedestrian and cycle amenity associated with not providing the ramp.

3.1.8 Lighting in the park (Option 1b) would worsen effects for Ecology to such an extent as would increase effects to moderate or major which would be significant. The lighting would also worsen effects during night time for Landscape, Townscape and Visual Amenity and be worse for Climate Change and Carbon (although a very marginal scale). However it would be better for Socio-economics due to potential beneficial effects on the quality and accessibility of open space provision available for community use and also for Health and Wellbeing due to an improvement in safety, supporting active travel.

3.1.9 Option 4 would be the worst option for Ecology and Landscape, Townscape and Visual Amenity as there would be the largest loss of vegetation and least potential for replanting and increased adverse effects on townscape character and visual amenity. It would also be the worst option for Water Environment as would have the greatest encroachment into the flood plain and more significant ditch diversion and a greater requirement for Compensatory Flood Plain Storage (and consequently also for CCR) and also for air quality due to the generation of construction dust (this would be mitigated via measures in the CoCP). However Option 4 would be better for Health and Wellbeing and also Socio-economics (both identified as performing best) due to accessibility considerations and would also be better for Recreation.

3.1.10 The potential for further mitigation measures (those not already identified in the PEIR and updated PEI as being adopted as part of the Project) is identified in Section 2 where applicable as follows:

- Landscape, townscape and visual amenity – for Options 1b, 2, 3a, 3b and 4
- Ecology and nature conservation - for Options 1b, 2, 3a, 3b and 4
- Water environment – for Options 2, 3a, 3b and 4
- Noise and vibration – for Options 2, 3a and 3b
- Climate change and carbon – for Option 1b
- Health and wellbeing – for Options 1b, 2, 3a and 3b
- Recreation – for Option 2

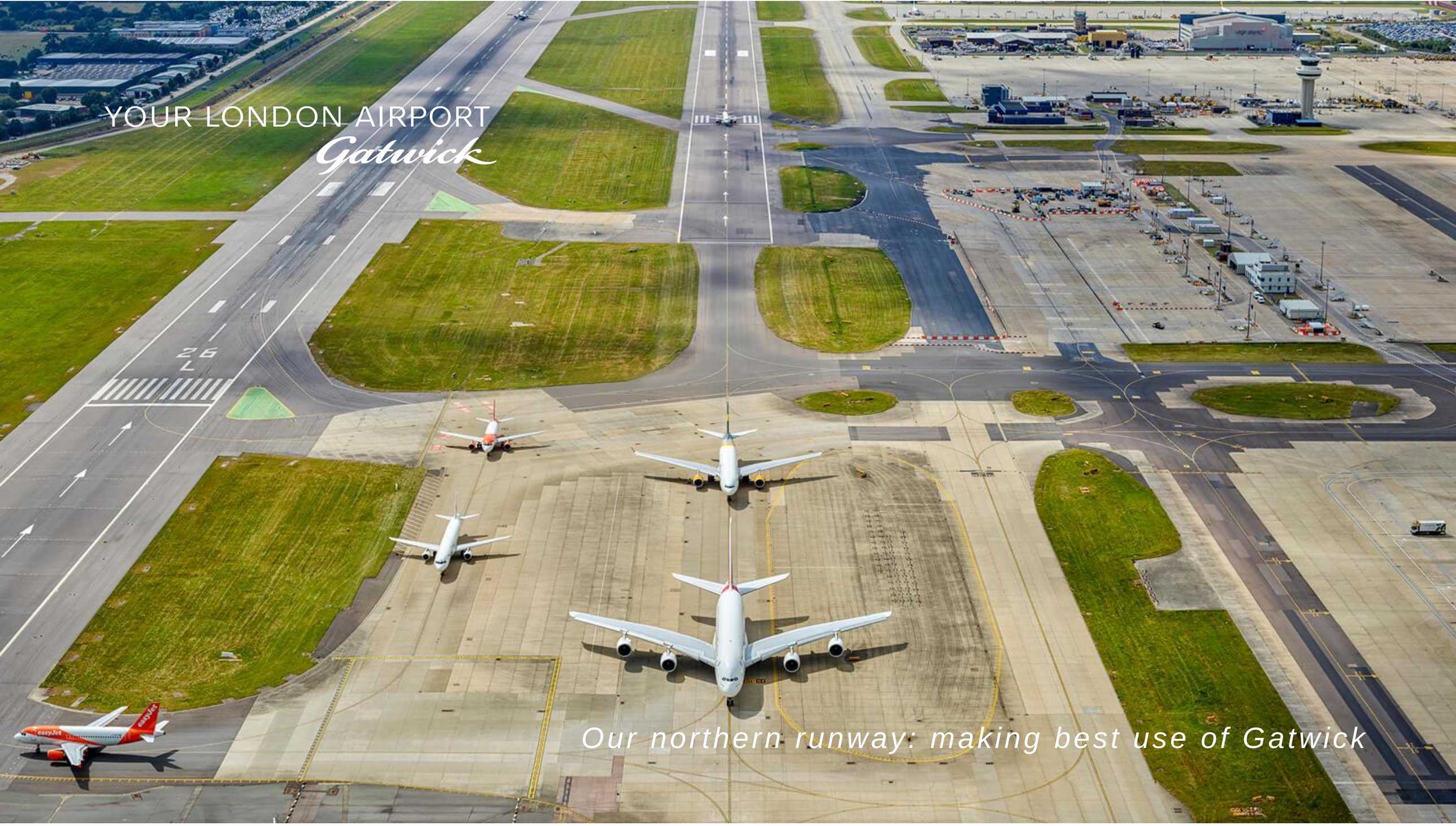
3.1.11 It is recommended that these further mitigation measures be taken into consideration for the design of the chosen option, where feasible, in order to potentially reduce adverse environmental effects and/or enhance beneficial environmental effects.

Table 3.1 : Topics where effects would be better or worse than Option 1a

Option	Where identified for a topic as being better performing than Option 1a	Where identified for a topic as being worse performing than Option 1a
1b Noise barrier along A23 (as was assessed in the PEIR/updated PEI) plus lighting in park	▪ Socio-economics ▪ Health and wellbeing	▪ Landscape, townscape and visual amenity ▪ Ecology ▪ Climate
2 No noise barrier, no ramp and do-something (compliant) A23 footway upgrade	▪ Landscape, townscape and visual amenity (best option) ▪ Ecology (best option) ▪ Water ▪ Climate ▪ Health and wellbeing (vegetation considerations)	▪ Traffic and transport ▪ Air quality ▪ Noise ▪ Health and wellbeing (noise and accessibility considerations)
3a No noise barrier, with ramp and do-minimum (departure from standard) A23 footway upgrade	▪ Landscape, townscape and visual amenity ▪ Ecology ▪ Water (best option) ▪ Climate ▪ Socio-economics ▪ Health and wellbeing (vegetation considerations) ▪ Recreation	▪ Air quality ▪ Noise ▪ Health and wellbeing (noise considerations)
3b No noise barrier, with ramp and do-something (compliant) A23 footway upgrade	▪ Landscape, townscape and visual amenity ▪ Ecology ▪ Water ▪ Climate ▪ Socio-economics ▪ Health and wellbeing (vegetation and accessibility considerations) ▪ Recreation (best option)	▪ Air quality ▪ Noise ▪ Health and wellbeing (noise considerations)
4 With noise barrier, with ramp and do-something (compliant) A23 footway upgrade	▪ Socio-economics (best option) ▪ Health and wellbeing (best option) ▪ Recreation	▪ Landscape, townscape and visual amenity (worst option) ▪ Ecology (worst option) ▪ Water (worst option) ▪ Air quality (worst option) ▪ Climate ▪

Appendix 1

Noise Barrier Note



Our northern runway: making best use of Gatwick

Noise Barrier Note

August 2022

KEY UPDATES AND CHANGES

Document Control

Prepared by	Name: Jack Smith	Date: 02/08/2022
Verified by	Name: Mike Fraser	Date: 02/08/2022
Approved by:	Name:	Date:

Revision	Purpose	Amendment	By	Date
01	First Draft	-	Jack Smith	22/03/2022
02	Draft	Updated traffic information	Jack Smith	29/03/2022
03	Draft	Including predictions using a different design (PEIR design) and modified PEIR traffic information	Jack Smith	11/04/2022
04	Draft	Including predictions using design freeze 2 ES design and updated ES traffic information	Jack Smith	05/07/2022
05	Draft	Added diagram, DMRB long-term assessment and Noise Important Areas	Jack Smith	12/07/2022
06	Draft	Added baseline 2018 predictions based on request from local authority	Jack Smith	02/08/2022

Table of Contents

1 Introduction

1.1.1 Road traffic noise modelling has been carried out to investigate the extent to which a noise barrier adjacent to the Riverside Park provides a benefit to nearby noise sensitive receptors (NSRs). All other barriers proposed in the PEIR (located on both the North and South Terminal Roundabout flyovers) are incorporated into the noise model.

1.1.2 Section 3 reports the results of the ES highway layout (Design Freeze 2) CAD model provided by the highways team. Setback distances from the curb for all barriers were also provided by the highways team. Height information for the scheme was also utilised from the CAD model. Strategic Model traffic data outputs from the ES were used.

1.1.3 Further along the programme of the ES a full assessment in line with guidance from the DMRB will be undertaken.

2 Methodology

Software and Calculation Method

2.1.1 Predictor V2021 software was used to complete the road traffic noise model. The model implemented the Calculation of Road Traffic Noise (CRTN) calculation method to predict noise levels.

Traffic Data, Model Inputs and Assumptions

2.1.2 Eighteen-hour traffic flows, the percentage of heavy goods vehicles (HGVs), and average speed (in km/h) were used to calculate the basic noise level of each road in both the Do-minimum (or Business as Usual [BAU]) case and the situation with the Project for daytime. Whereas individual hourly traffic flows, the percentage of HGVs, and average speed were utilised for night-time calculations for both the BAU and Project cases.

2.1.3 The barrier adjacent to the Riverside Park has a height of 2 m assumed. All other barriers within the model have a height of 1 m. All barriers are assumed to be reflective.

2.1.4 LiDAR 10-metre accuracy height points were used to interpolate the height information inside the Project site boundary. The data were also used to calculate the CRTN gradient noise level correction for the road noise sources.

2.1.5 All roads were assumed to have a bitumen surface with a texture depth of 1.5 mm, and source noise level elevation of 0.5 metres, following the guidance in CRTN. No additional low-noise surface correction was applied to future scenarios.

2.1.6 All locations within the study area were assumed to have acoustically hard (reflective) ground, with the exception of the Riverside Garden Park region which had a soft ground correction to account for the additional acoustic ground absorption in the area.

2.1.7 NSR locations were assumed to be 4 metres above the ground representing the first floor at residential and non-residential locations with the exception of the Riverside Garden Park, for which a height of 1.5 m (human height) was used and three-storey properties represented by NSR 6 and NSR17 used in the modelling reported, which were modelled at 5.5 metres to represent the second floor height.

3 Assessment Results

Table 1 to Table 4 present the results of the modelling using the set of data described in Sections 1 and 2. Predicted traffic noise levels are presented at all receptor locations in 2032 (the year of opening of the highway works) and 2047 (15 years after the year of opening of the highway works). The table includes the predicted noise levels for the do-minimum situation (which is referred to Business as Usual) and the situation with the Project for the barrier design scenarios. The following scenarios were run within the noise model:

- Scenario 1 contains the noise mitigation at the full extent outlined in the design drawing as of the end of June, with barriers running along the A23 Riverside Park edge (at 2 m), and North and South Terminal roundabout flyovers (at 1 m); and
- Scenario 2 contains noise mitigation on the North and South Terminal roundabout flyovers as per the PEIR (1 m) but without the specified barrier along the A23 Riverside Park edge.

Diagram 1 below shows the Scheme design, roads from the Strategic Model output, noise barriers (including the Riverside Park barrier as per Scenario 1), and noise-sensitive receptor locations at which traffic noise was predicted in the Study Area. The diagram below also shows Noise Important Areas where the highest 1% of noise levels at residential locations can be found, and where action to reduce noise is focused. For each Noise Important Area (shaded in blue in Diagram 1), the highway authority will identify proposed actions that will meet the vision and aims set out in the Government's policy on noise, unless they are satisfied that no further action can or needs to be taken in order to meet this objective.

Diagram 1: Noise Model (Scenario 1)

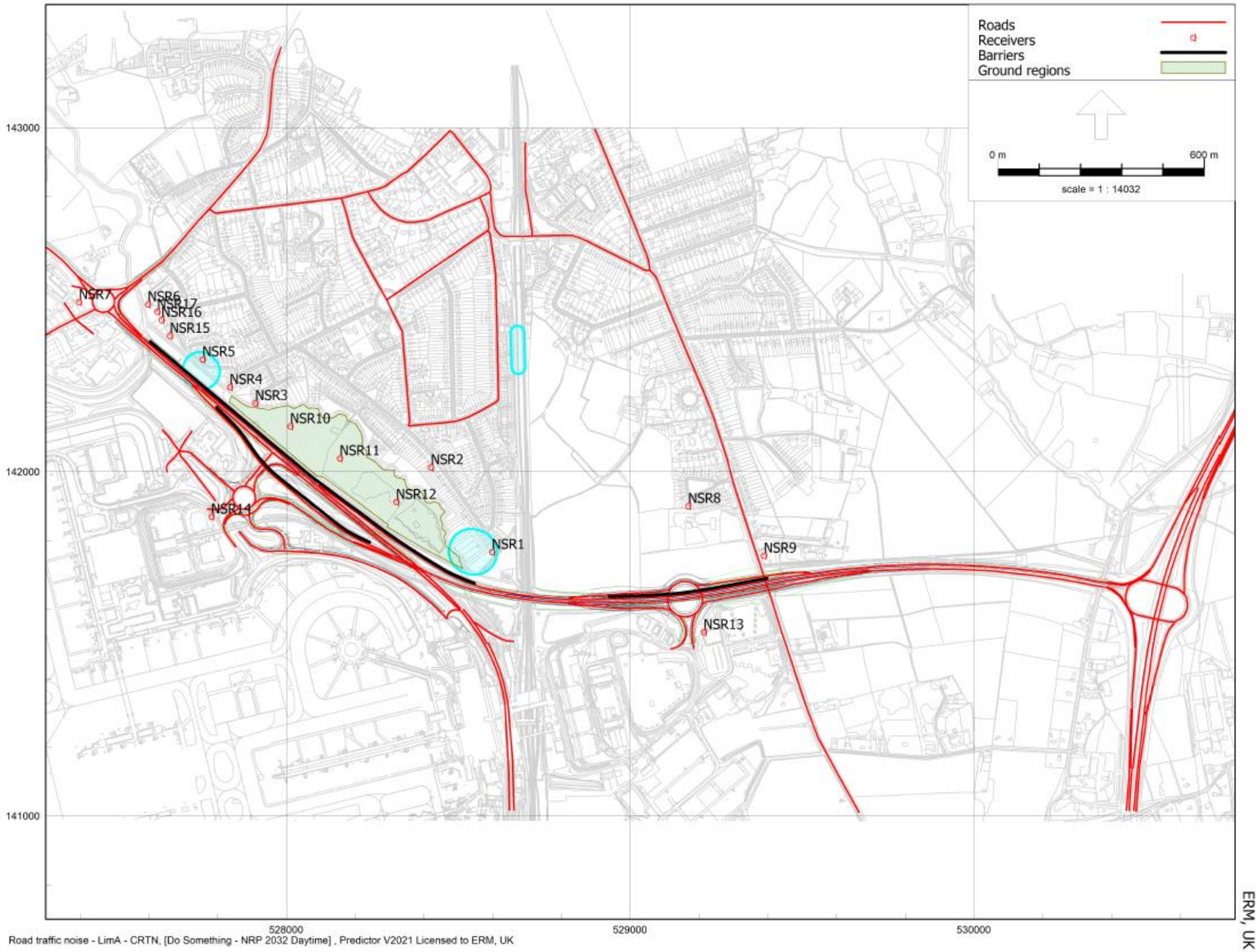


Table 1: Predicted Road Traffic Noise Levels Daytime in the Short-term

Scenario	Receptor ID / Description, $L_{A10,18hr}$ dB Results (Façade)																
	NSR1 – The Crescent East	NSR2 – The Crescent West	NSR3 – Woodroyd Gardens	NSR4 – Cheyne Walk	NSR5 – Longbridge Road East	NSR6 – Longbridge Road West	NSR7 – Povey Cross Road	NSR8 – Meadowcroft Close	NSR9 – B2036 Balcombe Road	NSR10 – Riverside Garden Park North(1)	NSR11 – Riverside Garden Park Centre(1)	NSR12 – Riverside Garden Park South(1)	NSR13 – Offices (1)	NSR14 – Premier Inn(1)	NSR15 – Longbridge Road Centre East	NSR16 – Longbridge Road Centre	NSR17 – Longbridge Road Centre West
Baseline 2018	69.9	65.2	69.0	70.9	70.5	70.2	70.4	67.4	73.7	63.0	62.8	64.2	69.7	69.3	71.2	70.1	69.8
Business As Usual 2032	70.5	65.9	70.2	72.1	71.6	71.2	71.2	67.9	74.2	64.0	63.5	64.9	69.8	69.7	72.3	71.2	70.9
With Scheme 2032 Scenario 1	67.3	63.2	64.8	65.9	65.6	69.9	71.3	65.9	73.0	60.1	61.4	61.6	68.1	69.9	67.8	68.4	68.9
With Scheme 2032 Scenario 2	69.1	65.2	69.3	71.1	70.5	70.5	71.3	66.1	73.0	64.4	64.1	64.3	68.1	69.9	70.6	69.8	69.8
Reduction Due to Park Barrier	1.8	2.0	4.5	5.2	4.9	0.6	0.0	0.2	0.0	4.3	2.7	2.7	0.0	0.0	2.8	1.4	0.9
Comparison of BAU against Scenario 1	-3.2	-2.7	-5.4	-6.2	-6.0	-1.3	0.1	-2.0	-1.2	-3.9	-2.1	-3.3	-1.7	0.2	-4.5	-2.8	-2.0
Comparison of BAU against Scenario 2	-1.4	-0.7	-0.9	-1.0	-1.1	-0.7	0.1	-1.8	-1.2	0.4	0.6	-0.6	-1.7	0.2	-1.7	-1.4	-1.1
(1) Noise-sensitive receptors represent open park areas or non-residential receptors, and results are presented as free-field values.																	
	Where the Receptor ID / Description is highlighted, then a likely significant effect is identified at the individual receptor.																

Table 2: Predicted Road Traffic Noise Levels Night-time in the Short-term

Scenario	Receptor ID / Description, $L_{Night, outside}$ dB Results (Free-field)																
	NSR1 – The Crescent East	NSR2 – The Crescent West	NSR3 – Woodroyd Gardens	NSR4 – Cheyne Walk	NSR5 – Longbridge Road East	NSR6 – Longbridge Road West	NSR7 – Povey Cross Road	NSR8 – Meadowcroft Close	NSR9 – B2036 Balcombe Road	NSR10 – Riverside Garden Park North	NSR11 – Riverside Garden Park Centre	NSR12 – Riverside Garden Park South	NSR13 – Offices	NSR14 – Premier Inn	NSR15 – Longbridge Road Centre East	NSR16 – Longbridge Road Centre	NSR17 – Longbridge Road Centre West
Baseline 2018	56.7	53.2	57.8	59.5	59.1	59.7	61.2	55.6	63.6	54.1	53.5	54.3	58.4	58.3	60.0	59.2	59.1
Business As Usual 2032	57.3	53.9	58.8	60.4	59.9	60.3	61.7	56.2	64.1	54.9	54.1	54.9	59.2	58.9	60.7	59.9	59.8
With Scheme 2032 Scenario 1	53.9	51.3	53.8	55.1	55.1	59.5	61.7	54.5	62.8	51.3	51.9	51.7	56.8	57.2	57.3	58.0	58.4
With Scheme 2032 Scenario 2	55.3	52.8	57.9	59.6	59.2	60.0	61.6	54.6	62.8	54.8	54.1	53.9	56.8	57.1	59.6	59.1	59.2
Reduction Due to Park Barrier	1.4	1.5	4.1	4.5	4.1	0.5	<0.1	0.1	0.0	3.5	2.2	2.2	0.0	<0.1	2.3	1.1	0.8
Comparison of BAU against Scenario 1	-3.4	-2.6	-5.0	-5.3	-4.8	-0.8	0.0	-1.7	-1.3	-3.6	-2.2	-3.2	-2.4	-1.7	-3.4	-1.9	-1.4
Comparison of BAU against Scenario 2	-2.0	-1.1	-0.9	-0.8	-0.7	-0.3	-0.1	-1.6	-1.3	-0.1	0.0	-1.0	-2.4	-1.8	-1.1	-0.8	-0.6
	Where the Receptor ID / Description is highlighted, then a likely significant effect is identified at the individual receptor.																

Table 3: Predicted Road Traffic Noise Levels Daytime in the Long-term

Scenario	Receptor ID / Description, $L_{A10,18hr}$ dB Results (Façade)																
	NSR1 – The Crescent East	NSR2 – The Crescent West	NSR3 – Woodroyd Gardens	NSR4 – Cheyne Walk	NSR5 – Longbridge Road East	NSR6 – Longbridge Road West	NSR7 – Povey Cross Road	NSR8 – Meadowcroft Close	NSR9 – B2036 Balcombe Road	NSR10 – Riverside Garden Park North(1)	NSR11 – Riverside Garden Park Centre(1)	NSR12 – Riverside Garden Park South(1)	NSR13 – Offices (1)	NSR14 – Premier Inn(1)	NSR15 – Longbridge Road Centre East	NSR16 – Longbridge Road Centre	NSR17 – Longbridge Road Centre West
Baseline 2018	69.9	65.2	69.0	70.9	70.5	70.2	70.4	67.4	73.7	63.0	62.8	64.2	69.7	69.3	71.2	70.1	69.8
Business As Usual 2032	70.5	65.9	70.2	72.1	71.6	71.2	71.2	67.9	74.2	64.0	63.5	64.9	69.8	69.7	72.3	71.2	70.9
Business As Usual 2047	70.8	66.1	70.6	72.4	71.9	71.4	71.4	68.3	74.6	64.3	63.8	65.1	70.1	70.0	72.6	71.4	71.1
With Scheme 2047 Scenario 1	67.7	63.6	65.1	66.3	65.9	70.2	71.7	66.4	73.5	60.4	61.8	61.9	68.4	70.2	68.1	68.7	69.2
With Scheme 2047 Scenario 2	69.5	65.5	69.6	71.4	70.8	70.8	71.6	66.5	73.5	64.7	64.4	64.6	68.4	70.2	70.9	70.2	70.1
Reduction Due to Park Barrier	1.8	1.9	4.5	5.1	4.9	0.6	<0.1	0.1	0.0	4.3	2.6	2.7	0.0	0.0	2.8	1.5	0.9
Comparison of BAU 2032 against Scenario 1	-2.8	-2.3	-5.1	-5.8	-5.7	-1.0	0.5	-1.5	-0.7	-3.6	-1.7	-3.0	-1.4	0.5	-4.2	-2.5	-1.7
Comparison of BAU 2032 against Scenario 2	-1.0	-0.4	-0.6	-0.7	-0.8	-0.4	0.4	-1.4	-0.7	0.7	0.9	-0.3	-1.4	0.5	-1.4	-1.0	-0.8
Comparison of BAU Cases	0.3	0.2	0.4	0.3	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.2

(1) Noise-sensitive receptors represent open park areas or non-residential receptors, and results are presented as free-field values.

Where the Receptor ID / Description is highlighted, then a likely significant effect is identified at the individual receptor.

Table 4: Predicted Road Traffic Noise Levels Night-time in the Long-term

Scenario	Receptor ID / Description, $L_{Night, outside}$ dB Results (Free-field)																
	NSR1 – The Crescent East	NSR2 – The Crescent West	NSR3 – Woodroyd Gardens	NSR4 – Cheyne Walk	NSR5 – Longbridge Road East	NSR6 – Longbridge Road West	NSR7 – Povey Cross Road	NSR8 – Meadowcroft Close	NSR9 – B2036 Balcombe Road	NSR10 – Riverside Garden Park North	NSR11 – Riverside Garden Park Centre	NSR12 – Riverside Garden Park South	NSR13 – Offices	NSR14 – Premier Inn	NSR15 – Longbridge Road Centre East	NSR16 – Longbridge Road Centre	NSR17 – Longbridge Road Centre West
Baseline 2018	56.7	53.2	57.8	59.5	59.1	59.7	61.2	55.6	63.6	54.1	53.5	54.3	58.4	58.3	60.0	59.2	59.1
Business As Usual 2032	57.3	53.9	58.8	60.4	59.9	60.3	61.7	56.2	64.1	54.9	54.1	54.9	59.2	58.9	60.7	59.9	59.8
Business As Usual 2047	57.5	54.0	58.8	60.4	59.9	60.4	61.7	56.6	64.1	55.0	54.3	55.1	59.4	58.9	60.7	59.9	59.8
With Scheme 2047 Scenario 1	54.2	51.6	54.1	55.3	55.3	59.8	61.9	54.9	63.1	51.6	52.1	52.0	57.2	57.3	57.6	58.3	58.7
With Scheme 2047 Scenario 2	55.7	53.1	58.1	59.8	59.5	60.3	61.8	55.1	63.1	55.1	54.3	54.2	57.2	57.2	59.9	59.4	59.4
Reduction Due to Park Barrier	1.5	1.5	4.0	4.5	4.2	0.5	<0.1	0.2	0.0	3.5	2.2	2.2	0.0	<0.1	2.3	1.1	0.7
Comparison of BAU 2032 against Scenario 1	-3.1	-2.3	-4.7	-5.1	-4.6	-0.5	0.2	-1.3	-1.0	-3.3	-2.0	-2.9	-2.0	-1.6	-3.1	-1.6	-1.1
Comparison of BAU 2032 against Scenario 2	-1.6	-0.8	-0.7	-0.6	-0.4	0.0	0.1	-1.1	-1.0	0.2	0.2	-0.7	-2.0	-1.7	-0.8	-0.5	-0.4
Comparison of BAU Cases	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0
	Where the Receptor ID / Description is highlighted, then a likely significant effect is identified at the individual receptor.																

Appendix 2

Plans and Cross Sections for the Options