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consultants in acoustics, noise and vibration

**MID SUSSEX
DISTRICT
COUNCIL**

**GATWICK
AIRPORT
SECOND RUNWAY**

**NOISE IMPACT
ANALYSIS OF THE
GATWICK
AIRPORT
SECOND RUNWAY
PROPOSAL ON
MSDC**

JANUARY 2015

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GATWICK AIRPORT SECOND RUNWAY
NOISE IMPACT ANALYSIS OF THE GATWICK AIRPORT SECOND
RUNWAY PROPOSAL ON MSDC**

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1. INTRODUCTION

1.1 Background

1.1.1 Southdowns Environmental Consultants Ltd (Southdowns) was appointed in December 2014 by Mid Sussex District Council (MSDC) to conduct a noise impact analysis of the consultation documents associated with the Airport Commission consultation on the Gatwick Airport second runway option in the Consultation Document [1]. The Consultation Document is supported by business case and sustainability assessments, including the Gatwick Airport second runway: business case and sustainability assessment [2]. The purpose of the review of the consultation documents is primarily to advise Council Officers and Members on the identified noise impact of the Gatwick Airport second runway option and identify matters relating to noise which are considered to warrant further analysis or assessment and to inform MSDC's consultation response.

1.2 Scope of Noise Impact Analysis

1.2.1 The Airports Commission consultation seeks views on the three options identified in the Commission's Interim Report [3]. These views are elicited through questions on the three options, appraisal methodology and overall approach, comments on specific areas of the Commission's appraisal and any other comments. This noise impact analysis is only concerned with the consideration of matters which have the potential to affect the acoustic environment of the Mid Sussex District Council area and its residents.

1.2.2 The approach followed in this noise impact analysis report has been to review the proposals and provide commentary on a particular technical issue (including an indication of the likely interests and other merits for MSDC in requesting or undertaking further analysis) based upon the information presented in the Airport Commission (or promoter) consultation documents, along with suggestions for areas to be included in the MSDC consultation response.

1.2.3 The extent and technical depth to which any consultation response point has been presented and discussed in this review has been limited by the timescales and resources made available for this review. It is likely, therefore, that some of the key points raised will require more substantive research and technical evaluation once the Council has finalised its response strategy and that further points for evaluation will emerge, especially if the findings of this report are to be considered by the Airports Commission.



1.3 The Airports Commission and Consultations

- 1.3.1 The Airports Commission is an independent commission established in 2012 to consider how the UK can maintain its status as a global hub for aviation and improve the use of existing runway capacity.
- 1.3.2 The commission invited options, in February 2013, for making the best use of existing runway capacity in the next 5 years and to provide additional capacity in the longer term.
- 1.3.3 In order to inform its work the commission published discussion papers on a number of aviation matters. Discussion Paper 05: Aviation Noise [4] gives an overview of how noise affects people, measurement of aviation noise, quantification of noise effects and mitigation options. Discussion Paper 07: Delivery of New Runway Capacity [5] includes sections on the noise impact of additional runways on local communities.
- 1.3.4 The Interim Report explained the view of the Airports Commission that additional runway capacity in the south east of England would be required by 2030. The Interim Report identified three lead options for additional runway capacity with two options for Heathrow and one for Gatwick. The Interim report committed to consult on its appraisal of the short-listed options and include detailed business cases and environmental assessments (including noise assessments) for each option.
- 1.3.5 The Gatwick option to be considered further was for a new runway to the south of the existing runway.
- 1.3.6 The consultation on increasing the UK's long-term aviation capacity was published on the 11th of November 2014 and runs through to the 3rd of February 2015.
- 1.3.7 Responses from the consultation will be used to validate and challenge the interim assessments in the consultation and be used to inform the Final Report, due in the summer of 2015.

1.4 Consultation Documents

- 1.4.1 The Consultation Document and business case and sustainability assessments are underpinned by detailed technical reports. The Airport Commission technical documents include noise analyses of additional airport capacity. The documents reviewed in this noise impact analysis are:
- Additional airport capacity: noise analysis. Noise: Baseline [6];
 - Additional airport capacity: noise analysis. Noise: Local Assessment [7];
 - Additional airport capacity: noise analysis. Noise: National Assessment [8];
 - Additional airport capacity: noise analysis. Noise: Baseline and Local Assessment Methodology Addendum [9]; and
 - Additional airport capacity: noise analysis. Noise: Figures [10].
- 1.4.2 The Option Promoter report for the Gatwick Airport second runway also included and a number of noise related documents that are included as part of their response. The documents that have been reviewed and considered within this noise impact analysis are:



- A Second Runway for Gatwick: Appendix A7 Air Noise: [11];
- A Second Runway for Gatwick: Appendix A7 Air Noise: Figures [12]; and
- Air noise assessment for 95mppa case [13].

1.4.3 The Airports Commission held a public discussion session on the 16th of December 2014 and this noise impact analysis also considers the transcript of this meeting [14].

1.4.4 Documents and reports outside of the references detailed above have not been reviewed as part of the noise impact analysis for MSDC.

1.5 Key Analysis Themes

1.5.1 The review and noise impact analysis has therefore focussed predominantly on these themes:

- Baseline and Gatwick 2nd runway noise modelling and modelling assumptions;
- Noise metrics used;
- $L_{Aeq,16hr}$ average and easterly and westerly operations;
- L_{AMax} criteria and WHO criteria;
- Communities;
- N70 day / N60 dB night;
- Noise Insulation policy;
- Operational aviation noise;
- Operational ground noise;
- Mixed-mode operation – no alternation is proposed;
- Night noise and sleep disturbance;
- Tranquillity and quiet areas;
- Schools;
- Flight paths, P-RNAV and swathe;
- Fleet mix assumptions; and
- Application of National Noise Policy and Guidance in the consultation.



2. GATWICK AIRPORT CURRENT OPERATIONS

2.1 Gatwick airport

- 2.1.1 Gatwick Airport is located around 3km northwest of the Copthorne community that is part of the MSDC area.
- 2.1.2 Gatwick Airport has the world's busiest single-use runway (08L/26R) with up to 55 aircraft movements per hour. In August 2014 the runway handled 906 movements in a day with an aircraft taking off or landing every 93 seconds.
- 2.1.3 Gatwick Airport is operating at around 85% capacity with 252,833 ATMs in the financial year 2013/14. The Airports Commission forecast that the capacity limit will be reached by the 2030s.
- 2.1.4 Though Gatwick Airport operates as a single runway airport it has a second runway (08R/26L), to the north of the main runway, that can only be used when the main runway cannot be used. During normal operations the second runway is used as a taxi-way. The main (08L/26R) and second (08R/26L) runways are too close to each other to be used at the same time.

2.2 Mid Sussex District Council Area and Current Gatwick Operations

- 2.2.1 MDSC is overflowed by two of the current Standard Instrument Departure (SID) routes. These routes are 26R SFD (Seaford) and 08L TIG/WIZ (Tiger/Wizad). When the airport is operating on westerly departures the MSDC community of Copthorne is around 1.5 km south of the arrivals path to the runway.

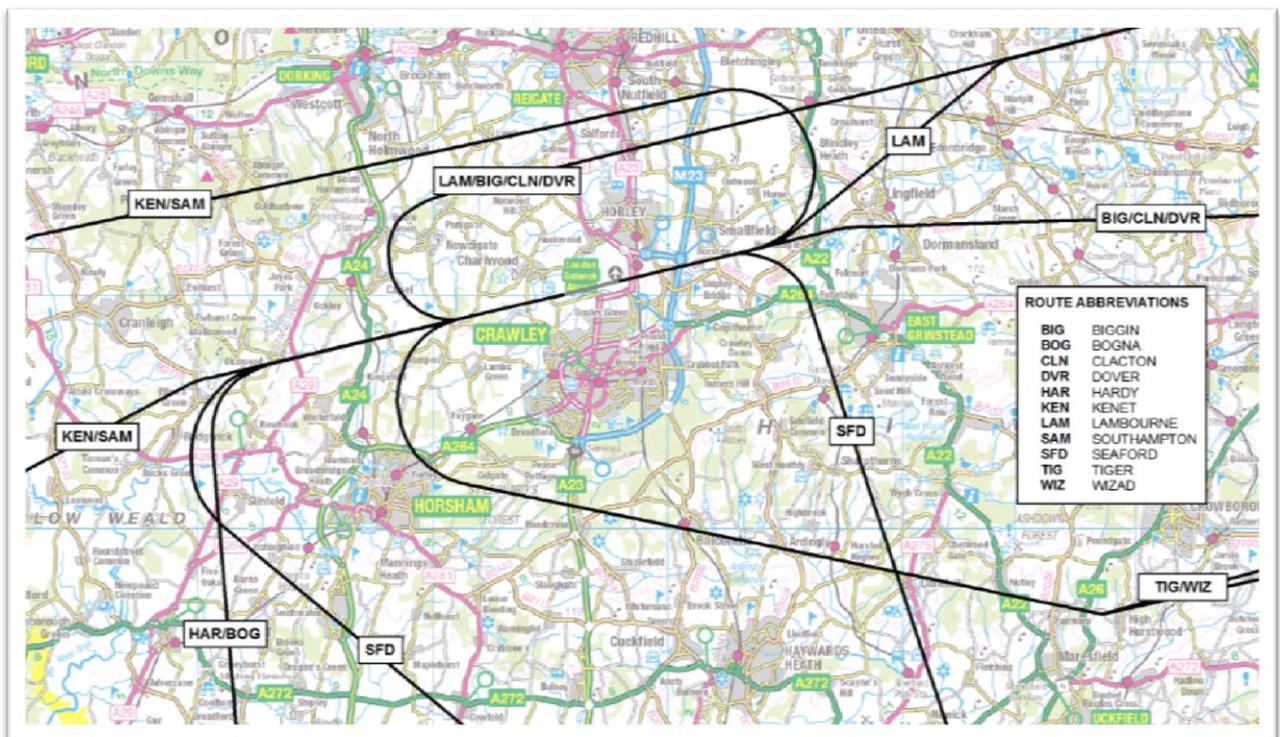


FIGURE 2.1 GATWICK SID DEPARTURE ROUTES



2.2.2 Aircraft to and from Gatwick Airport do not keep exactly to the centreline of the flight path and radar flight tracks show areas that have been overflown. Figure 2.2 displays typical flight radar tracks for Gatwick Airport.

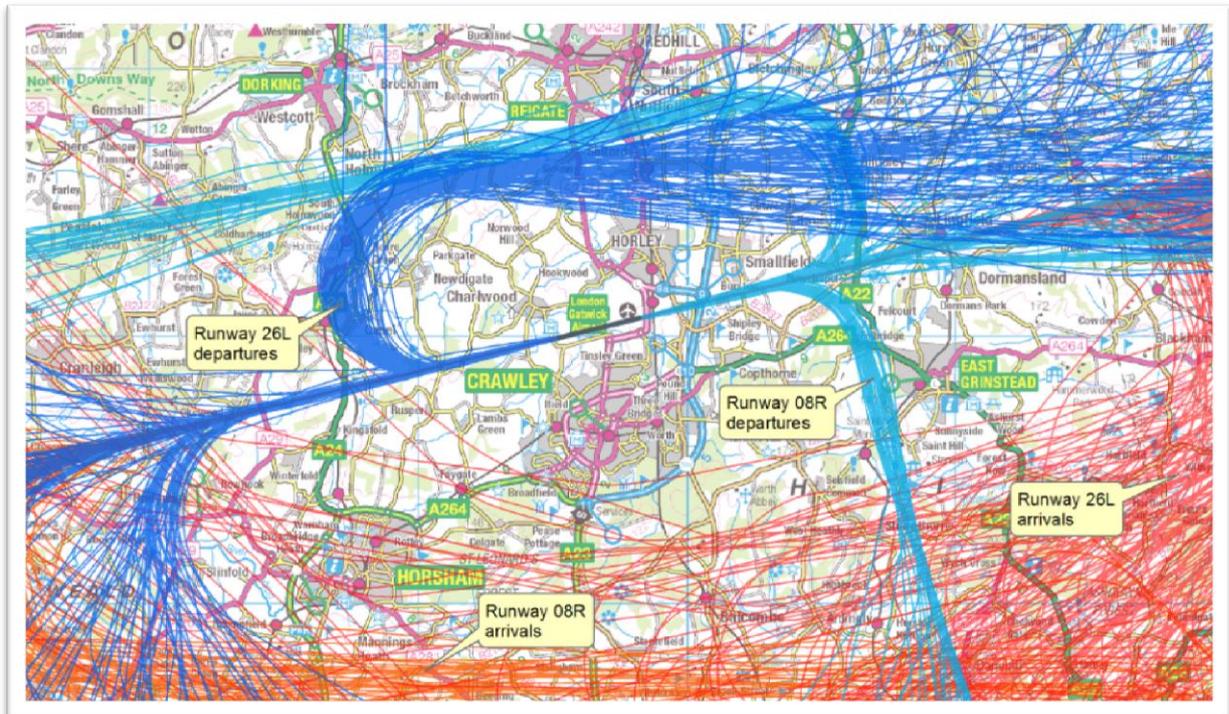


FIGURE 2.2 GATWICK FLIGHT RADAR TRACKS

2.2.3 The flight paths over the MSDC area are not regularly used for day departures with Figure 2.3 showing that 26L TIG/WIZ use was 0% 2012 and 2013 and 08R SFD was being used for, on average, 4% of departures in 2012 and 9% of departures in 2013 [15].

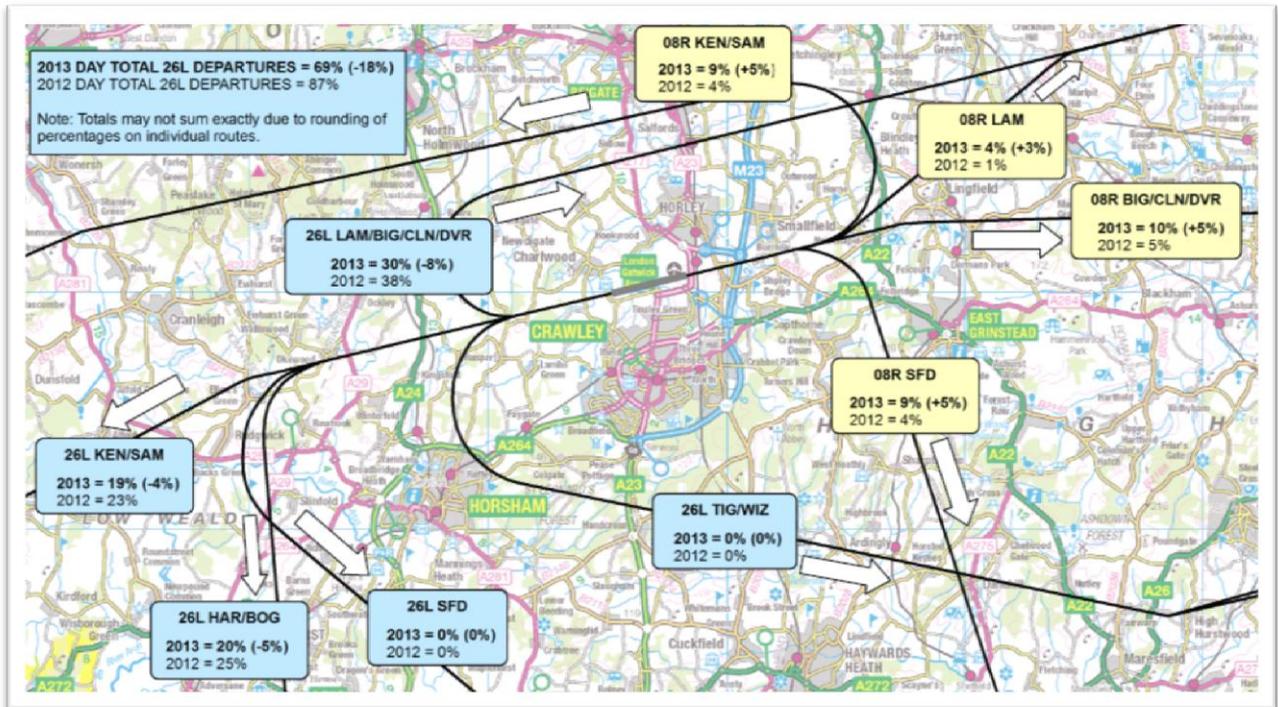


FIGURE 2.3 GATWICK AIRPORT DAY DEPARTURES SID TRAFFIC DISTRIBUTIONS IN 2012 AND 2013

2.2.4 Night departure flight usage of the SID flight paths over the MSDC area was also low with Figure 2.4 showing that 26LTIG/WIZ was being used 0% in 2013 and 08R SFD being used for 10% of night departures in 2013.

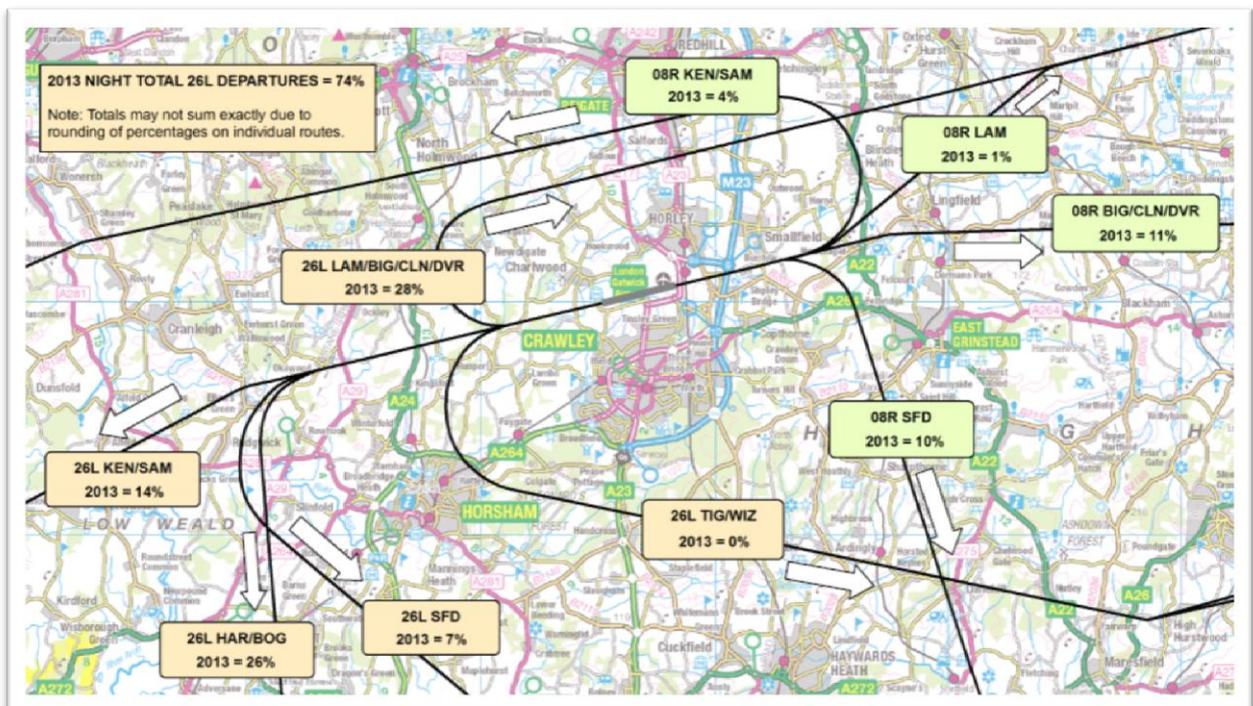


FIGURE 2.4 GATWICK NIGHT FLIGHT DEPARTURE SID TRAFFIC DISTRIBUTIONS IN 2013



- 2.2.5 The 08R SID departure route is the SID route that is most often used (typically under 10%) over the MSDC area and this route is used during easterly operation (when the wind is blowing from the east). The modal split between westerly and easterly operations cannot be predicted as it is dependent upon the direction the wind is blowing from. The historic modal split is shown below in Figure 2.5.
- 2.2.6 The location and number of noise sensitive receptors in the MSDC area in relation to the SID departure routes needs to be considered. The population count in the Gatwick Airport area in 2013 is shown below in Figure 2.6. From ERCD Report 1402 the following analysis can be made:
- MSDC does not fall within the $L_{Aeq,16hr}$ 57dB modelled contours for day actual modal split or standard modal split for 2013; and
 - MSDC does not fall within the $L_{Aeq,8hr}$ 48dB modelled contours for night actual modal split or standard modal split for 2013;
- 2.2.7 The Airports Commission consultation supporting information contains Figures for modelling of aircraft noise metrics for 2013 operations at Gatwick Airport from which the following analysis can be made:
- MSDC does not fall within the N70 contours;
 - MSDC does not fall within the N60 contours; and
 - MSDC does not fall within the L_{den} contours.
- 2.2.8 The north of the MSDC areas is near the arrivals path to 26L and complaints regarding aircraft noise have been received from residents of Copthorne. Copthorne is described in the Mid Sussex Local Plan [16] as a large village with a population of around 5,000 where aircraft noise levels, in particular at night, are a constraint on development.

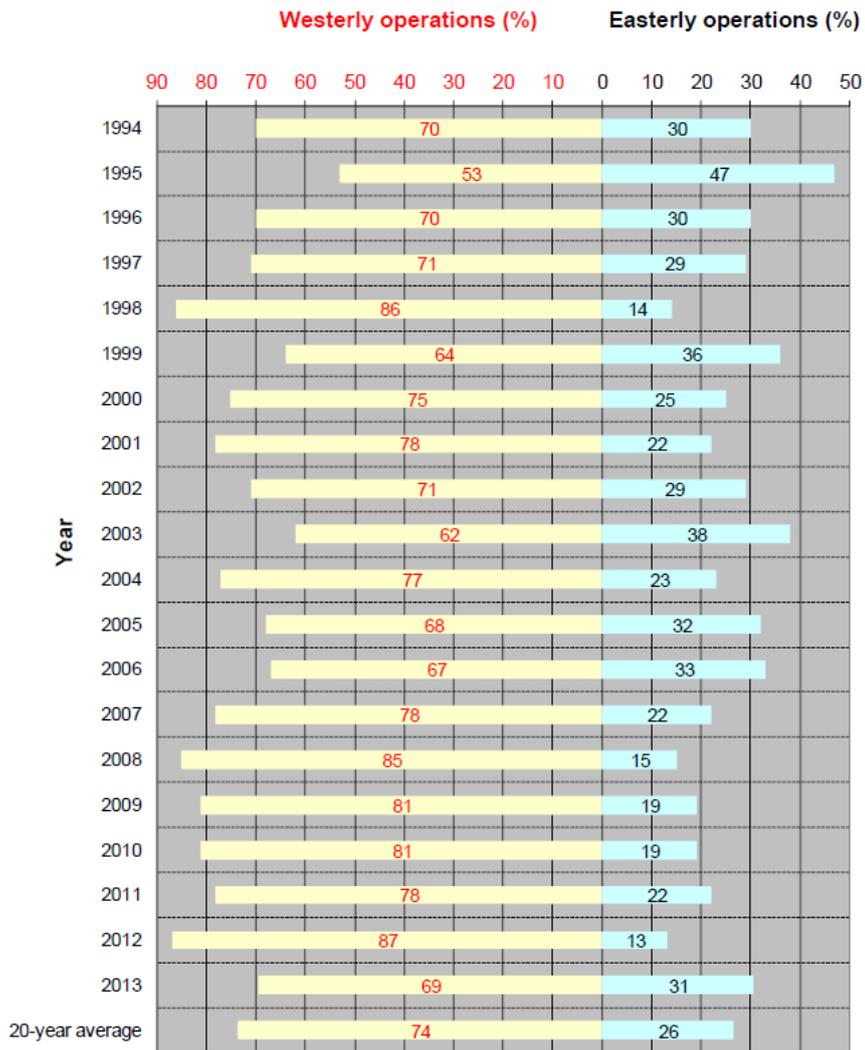


FIGURE 2.5 GATWICK MODAL SPLIT FOR AVERAGE SUMMER DAY

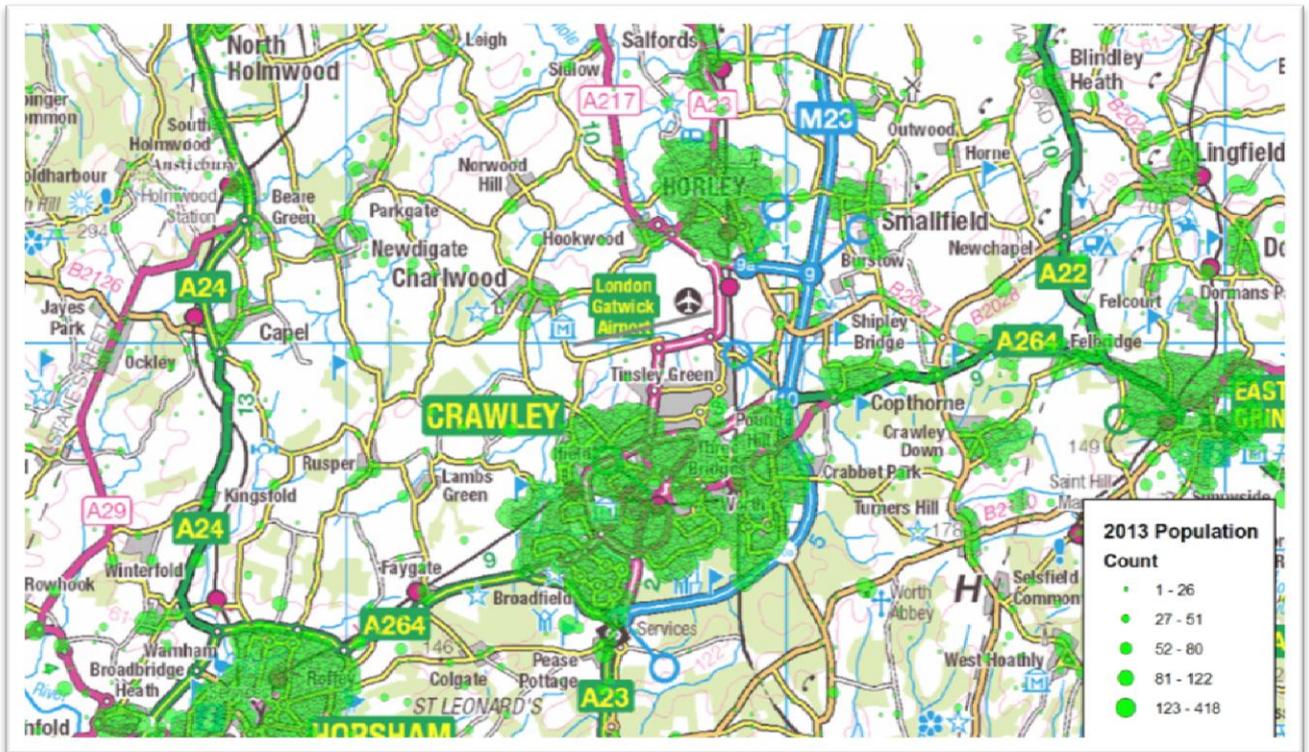


FIGURE 2.6 POPULATION DATA POINTS AROUND GATWICK AIRPORT



3. GATWICK AIRPORT COMMISSION PROPOSALS

3.1 Gatwick Airport 2R Scheme Overview

- 3.1.1 In the proposed Gatwick 2R scheme the additional runway would be located around 2km west of the Copthorne community that is part of the MSDC area.
- 3.1.2 The 2R scheme at Gatwick Airport proposes to increase ATMs up to 98 aircraft movements per hour and give a capacity for the airport to accommodate up to 560,000 ATMs.
- 3.1.3 The Do-Minimum option would have an increase of 27,399 ATMs between 2013 and 2030 to give a capacity of 277,919 ATMs.
- 3.1.4 The 2030 options have been chosen for analysis, in this review, as for the other scenarios there is a high degree of conjecture on the fleet mix and though the number of ATMs go up the predicted noise levels generally come down. As such the 2030 scenarios are considered the least subject to high levels of uncertainty.
- 3.1.5 The Airports Commission states that as a broad rule the population exposed to aircraft noise would approximately double for both day flights and night flights as a result of the proposed second runway.
- 3.1.6 The assessment of need has indicated and used in the modelling assumptions that for the 2030 Gatwick 2R-X option (carbon capped at 37.5 million tonnes) there would be 318,909 ATMs and for the Gatwick-2R-XC (carbon traded) option there would be 480,623 ATMs.
- 3.1.7 Two options have been assessed by the Airports Commission, the carbon capped ATM option Gatwick-2R-X and the carbon traded option Gatwick-2R-X-C. The changes to the population as a whole (not just MSDC area) are reproduced below in Table 3.1

Carbon capped (37.5 million tonnes) Gatwick-2R-X Option
Between the Do-Minimum and Do-Something scenarios the number of people within the $L_{Aeq,16hr} > 54dB$ contour would increase by around 9,600, from 8,000 to 17,600 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the N70 >20 events contour would more than quadruple, from 2,100 to 10,500 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the $L_{Aeq,8hr} > 48dB$ contour would roughly double, from 11,700 to 22,300 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the N60 (night) >25 events contour would increase by 7,700, from 11,800 to



19,500 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the $L_{DEN} > 55\text{dB}$ contour would increase by 12,700, from 9,400 to 22,100 in the 2030 scenario
Carbon Traded Gatwick-2R-X-C Option
Between the Do-Minimum and Do-Something scenarios the number of people within the $L_{Aeq,16hr} > 54\text{dB}$ contour would increase by around 22,900, from 8,000 to 30,900 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the N70 >20 events contour would increase by more than seven times, from 2,100 to 15,400 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the $L_{Aeq,8hr} > 48\text{dB}$ contour would roughly double, from 11,700 to 24,500 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the N60 (night) >25 events contour would increase by 8,600, from 11,800 to 20,400 in the 2030 scenario
Between the Do-Minimum and Do-Something scenarios the number of people within the $L_{DEN} > 55\text{dB}$ contour would increase by 25,100, from 9,400 to 34,500 in the 2030 scenario

TABLE 3.1 GATWICK 2ND RUNWAY AIRPORTS COMMISSION PREDICTED IMPACTS FOR 2030

- 3.1.8 The Airports Commission has stated that in relation to the objective of minimising noise impact and where possible reducing impacts that the Gatwick Second Runway will have an adverse impact.
- 3.1.9 When flight path improvements, mitigation and compensation are considered the schemes impacts could be sufficiently mitigated so as to be considered neutral. Nevertheless the Airports Commission does not consider this likely.
- 3.1.10 Gatwick Airport Limited has proposed an extended noise compensation scheme covering all households within the $L_{Aeq,16hr} 57\text{ dB}$ contour that would entitle them to annual compensation equivalent to Band A Council Tax (£1,000).



3.1.11 Gatwick Airport Limited has also proposed that night flights could be grouped on the current runway to prevent impact on the population centre of Crawley, to the south. This would also help protect the MSDC community of Cophorne.



4. AIRPORTS COMMISSION NOISE ASSESSMENT

4.1 Overview of Assessment Methodology Used and Noise Metrics

4.1.1 The Consultation provides an overview of the scheme and details that one of the objectives is that of the Aviation Policy Framework to “minimise and where possible reduce noise impacts” and identifies that the Commission is not looking at airport expansion in isolation but will consider interaction with the transport network and with broader policies (including noise).

4.1.2 The Consultation document details that a single metric would be unlikely to provide a rounded view of the potential impacts of the options and that a ‘noise scorecard’ with a range of noise metrics is being used. The noise scorecard is shown below in Table 4.1 and includes a range of average and frequency (number of events) metrics including:

- Day (Average $L_{Aeq,16hr}$ and ‘Number above’ N70 contour);
- Night (Average $L_{Aeq,8hr}$ and ‘Number above’ N60 contour);
- 24 hours (L_{den});

Period	Average measure		Frequency measure (based on number above contour)
	UK Measure	EU Measure	
Day	54-72 L_{Aeq16h} in 3dB increments		‘Number above’ N70 contour
Night	48-72 L_{Aeq8h} in 3dB increments		‘Number above’ N60 contour
24-hour		55 L_{den}	

TABLE 4.1 AIRPORT COMMISSION NOISE SCORECARD

4.1.3 The noise metrics used in the assessment of the Gatwick Airport Second Runway are single event metrics, exposure metrics and supplementary metrics are detailed below in Table 4.2.

Noise Metric	Description
$L_{AS,max}$	The sound pressure level of the A-weighted maximum noise level during an event, with a slow time-response (1s).
$L_{Aeq,T}$	The A-weighted sound pressure level if the sound was a continuous steady state.
$L_{Aeq,16hr}$	The A-weighted equivalent continuous noise level, assessed over an average summertime daytime / evening period (07.00-23.00).
$L_{Aeq,8hr}$	The A-weighted equivalent continuous noise level, assessed over an average



	summertime night period (23.00-07.00).
L_{night}	The A-weighted equivalent continuous noise level, assessed over an annual average night period (23.00-07.00).
L_{den}	The A-weighted equivalent continuous noise level, evaluated over an annual average 24 hour period, with a 10 dB penalty added to the levels at night (23.00-07.00) and a 5 dB penalty added to the levels in the evening (19.00-23.00) which is to reflect people's increased sensitivity to noise during these periods.
N70	The number of times the L _{AS,max} 70dB threshold level is exceeded on an average day.
N60	The number of times the L _{AS,max} 60dB threshold level is exceeded on an average night.

TABLE 4.2 NOISE METRICS USED IN THE CONSULTATION

4.1.4 The noise metrics calculated were:

- L_{Aeq,16h} noise contours from 54 dB to 72 dB, in 3 dB intervals;
- L_{Aeq,8h} noise contours from 48 dB to 72 dB, in 3 dB intervals;
- L_{den} noise contours from 55 dB to 75 dB, in 5 dB;
- intervals;
- N70 (16-hour average day) contours (>20 to >500); and
- N60 (8-hour average night) contours (>25 to >500).

4.1.5 The noise predictions are based on the following input data:

- Number of ATMs and fleet mix;
- Flight paths, threshold displacements, approach path, take-off power and climb rates;
- Allocation of ATMS to runways and flight paths;
- Runway split assumptions; and
- Population data.

4.1.6 The Commission have used demand forecast with a carbon-cap as a 'rough lower end case' and a 'top end case' to assess future noise impacts. These scenarios have been used to calculate the number of air transport movements (ATMs) and the fleet mix by the Civil Aviation Authority's (CAA) Environmental Research and Consultancy Department (ERCD) to develop noise contours for each option. The flight paths are shown in Figure 4.1. It is important to note that these flight paths are indicative and a further consultation would be taken on the location of the actual flight paths.



4.2 Do- Minimum

- 4.2.1 Jacobs U.K. Limited, on behalf of the Airports Commission, has presented baseline noise modelling, undertaken by ERCD, defined as the 'Do-Minimum' development option. Baselines have been produced for the base year (2030), intermediate year (2040) and end year (2050).
- 4.2.2 It is forecast that the annual ATMs at Gatwick Airport will increase by 14% from 250,520 in 2013 to 285,420 in 2050 and in the absence of any other changes this would lead to an increase in noise exposure at receptors of 0.6 dB (A). Nevertheless it has been assumed in the baseline report that there will be significant changes and modernisation in the aircraft operating to and from Gatwick. For the 2030 Do-Minimum assessment year the assessment of need indicates 277,919 ATMs.
- 4.2.3 Without the proposed second runway at Gatwick there would be reductions in the daytime noise metrics if the improvements to aircraft technology assumed in the baseline assessment are implemented.
- 4.2.4 The night noise metrics indicate the number of people exposed to 50 or more events exceeding $L_{AS,Max}$ 60dB during the night will increase 4,900 to 7,200 from westerly take offs at night during the aviation 'shoulder periods' of 23:00-23:30 and 06:00 -07:00, during the night.
- 4.2.5 The effect of population growth in the area is significant and is forecast to result in a 19% increase in assessed population, from 2013 to 2050, in the $L_{Aeq,16hr}$ 54dB contour (if the noise impact were to remain constant over the period).
- 4.2.6 For the 2030 Do-Minimum assessment by the Airports Commission the population in the $L_{Aeq,16hr}$ 54dB contour is predicted to decrease by 1,700 as a result of improvements in aircraft noise performance from "Imminent" design aircraft.

4.3 Gatwick 2nd Runway

- 4.3.1 Jacobs U.K. Limited, on behalf of the Airports Commission, has presented modal split noise modelling of the 2nd runway proposal, undertaken by ERCD, defined as the 'Gatwick-2R-X' and Gatwick-2R-X-C (carbon capped) options. Aircraft noise contours for both options have been produced for the base year (2030), intermediate year (2040) and end year (2050).
- 4.3.2 The noise impact on all locations is not considered further in this review and this review only considers potential impacts on the MSDC area unless otherwise stated for population assessments, which are not itemised by area.

4.4 Mid Sussex District Council Noise Impact

- 4.4.1 For the Do-Minimum option no community of MSDC is within the 2030 $L_{Aeq,16hr}$, N70, $L_{Aeq,8hr}$, L_{den} or N60 contours.
- 4.4.2 As part of proposed Gatwick 2R schemes MSDC is to be overflowed by additional (un-named) routes. These routes are shown in Figure 4.1. MSDC would be overflowed by an easterly departure route which diverges over the MSDC area (blue line) and the community at Copthorne would be around 750m south of the arrivals path to the southern runway.



4.4.3 The study area only includes the settlement of Copthorne in the MSDC area and the area north of Crawley Down and has not considered other areas within the MSDC area that would be under a flight path. The study area is defined by the red line shown in Figure 4.2 and is derived from the maximum extent of the Do-Minimum and Do-Nothing modal split noise contours.

4.4.4 For the Do-Something Gatwick-2R proposals part of the settlement of Copthorne is within the $L_{Aeq,16hr}$ 54 and 57 dB contours, $L_{Aeq,8hr}$ 48 and 51dB contours, N70 20 and 50 contours, N60 25 contour and L_{den} 55 dB contour. These contours are shown in Figures 4.3 -4.7.

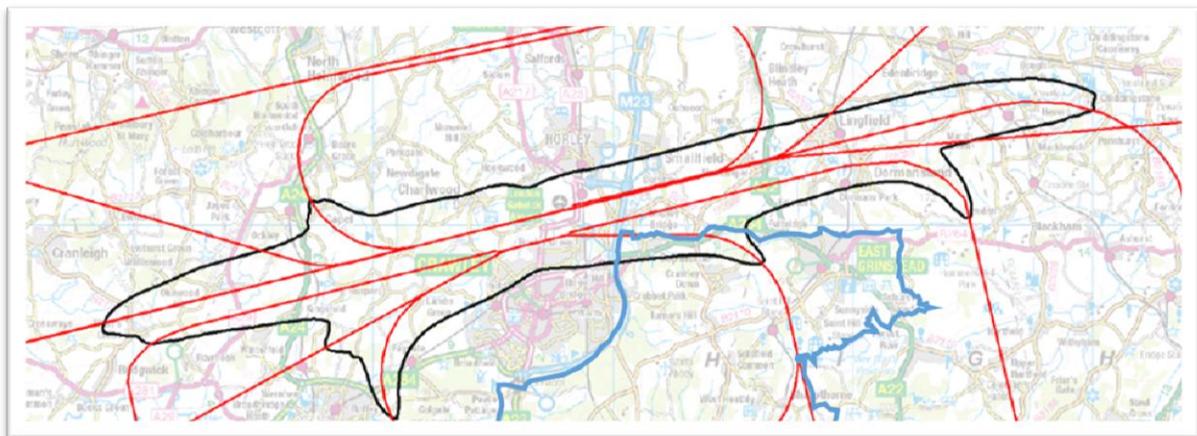


FIGURE 4.1 INDICATIVE PROPOSED FLIGHT PATHS FOR GATWICK 2R PROPOSAL

4.4.5 MSDC contains rural areas and tranquil areas of tranquillity (including in the High Weald AONB and the South Downs National Park) that are not currently overflown. The second runway proposal will lead to some of these areas being overflown and when the relatively low ambient noise levels in the MSDC area are considered it is likely that there will be a significant noise impacts and adverse effects. It is also considered increased exposure to aircraft noise leading to potential health effects and annoyance which may in turn lead to complaints regarding aircraft noise relating to the second runway proposal will be received, if the proposal goes ahead.

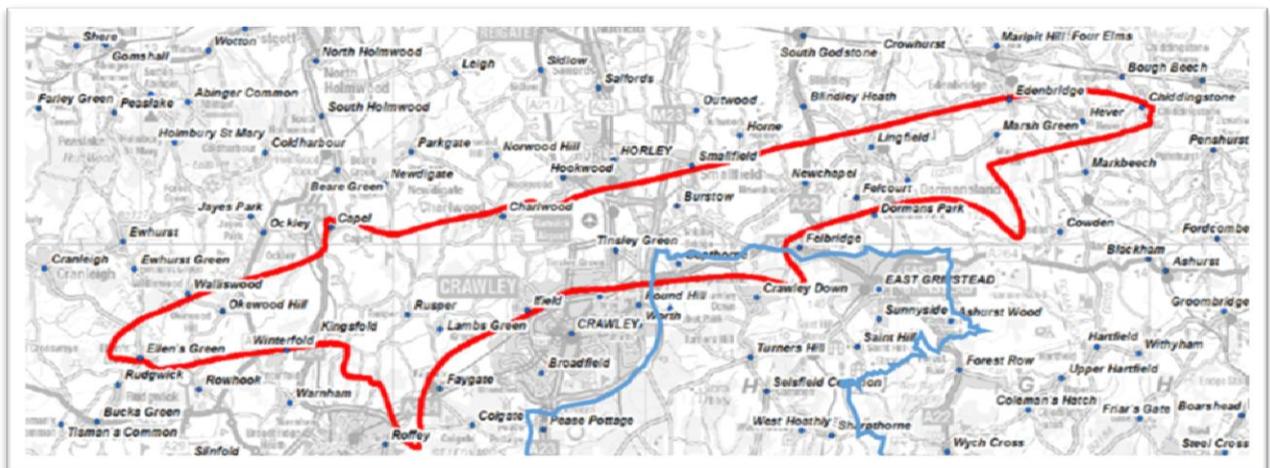




FIGURE 4.2 AIRPORT COMMISSION GATWICK AIRPORT STUDY AREA

4.4.6 The settlement of Copthorne is the only settlement in the MSDC area, in the local assessment, that is within the study area. No itemisation of the individual community noise sensitive receptors is given in the local assessment.

4.4.7 The air noise appendix accompanying the submission by Gatwick Airport does detail the noise sensitive community receptors with the study area. The following noise sensitive community receptors are identified within MSDC:

- Copthorne C of E Junior School (RH10 3HR);
- Copthorne Preparatory School (RH10 3HR);
- Peter Bunny Nursery School (RH10 3EX);
- The Coach House Nursery (RH10 3HR);
- Peter Pan Playgroup (RH10 3RE);
- Jack and Jill Pre School (RH10 3QX);
- St John the Evangelist's C of E Church (RH10 3RD); and
- Copthorne Chapel (RH10 3ET).

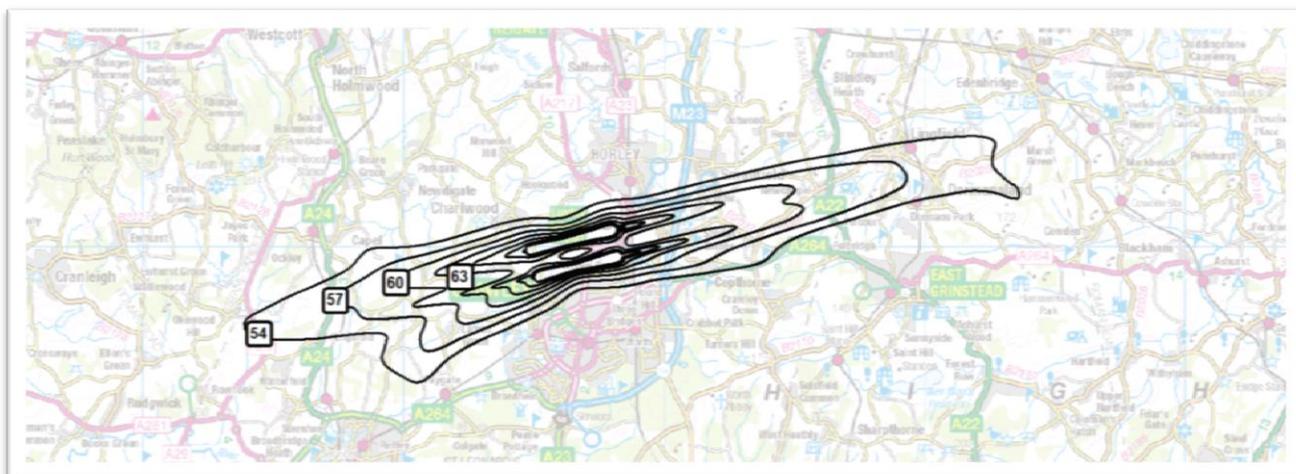


FIGURE 4.3 2050 GATWICK-2R-X $L_{AEQ,16HR}$ CONTOURS

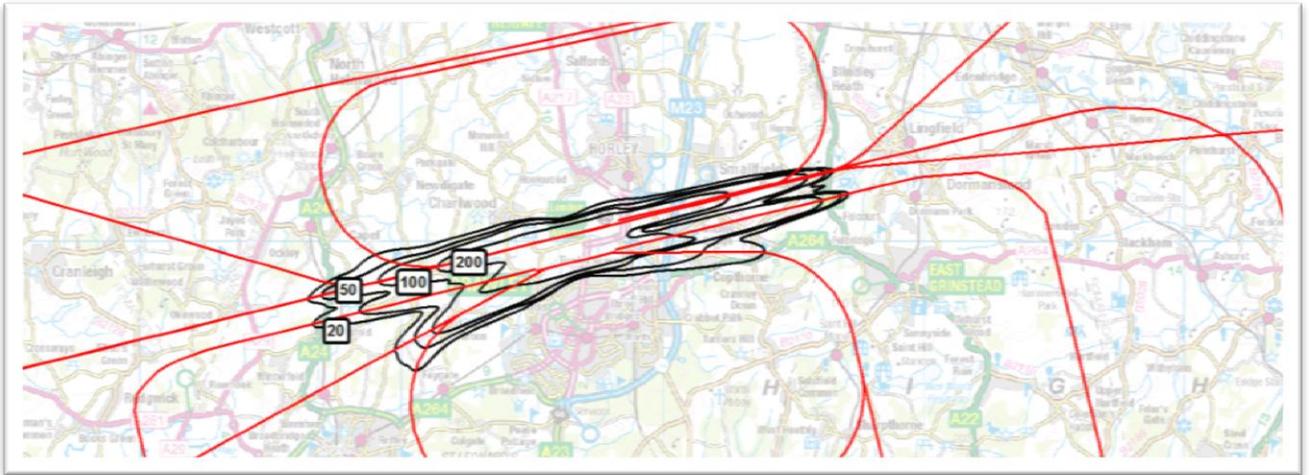


FIGURE 4.4 2030 GATWICK-2R-X N70 CONTOURS AND ROUTES

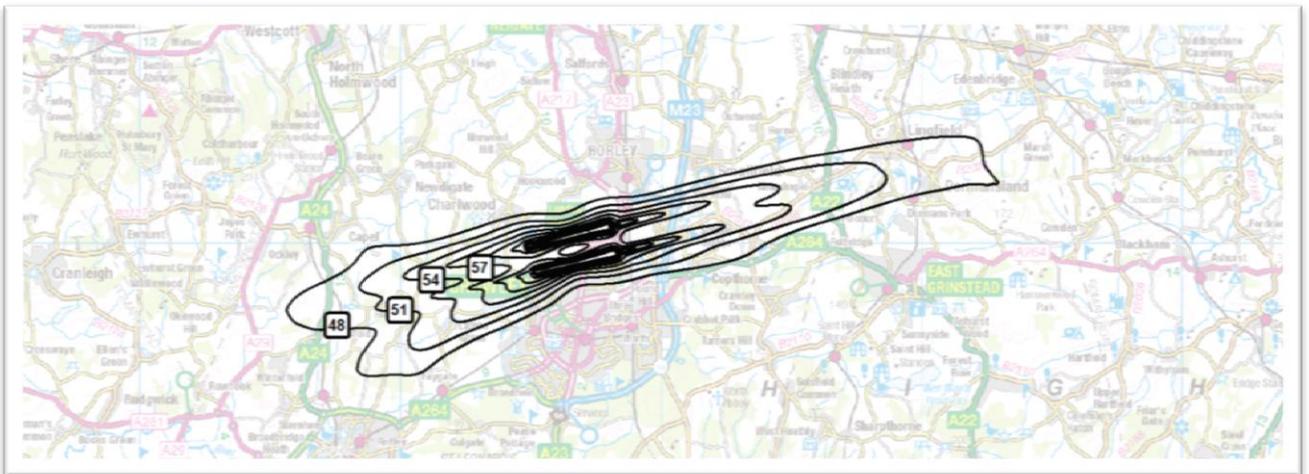


FIGURE 4.5 2030 GATWICK-2R-X LAEQ,8HR CONTOUR

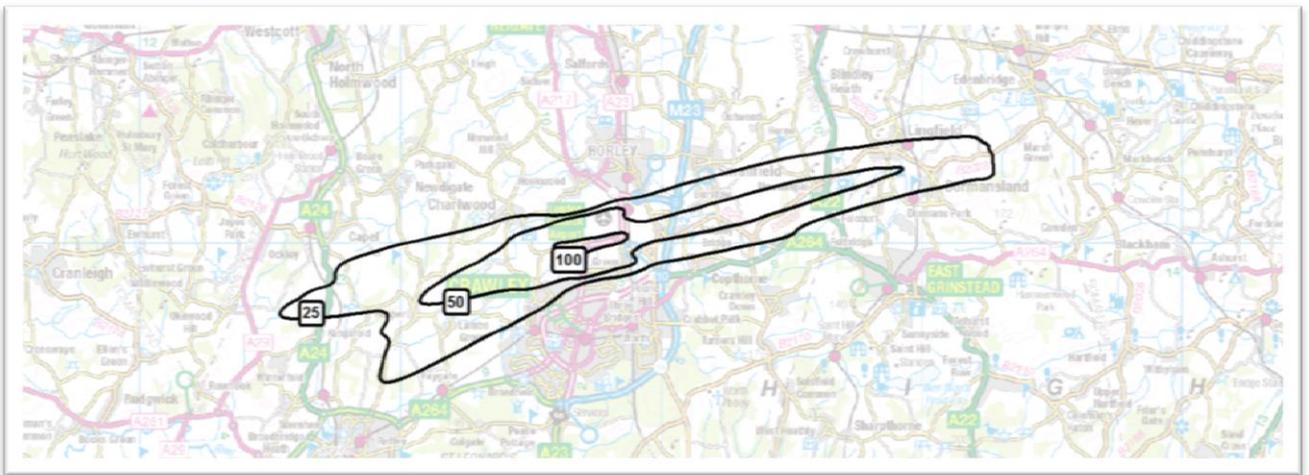


FIGURE 4.6 2050 GATWICK-2R-X N60 CONTOURS

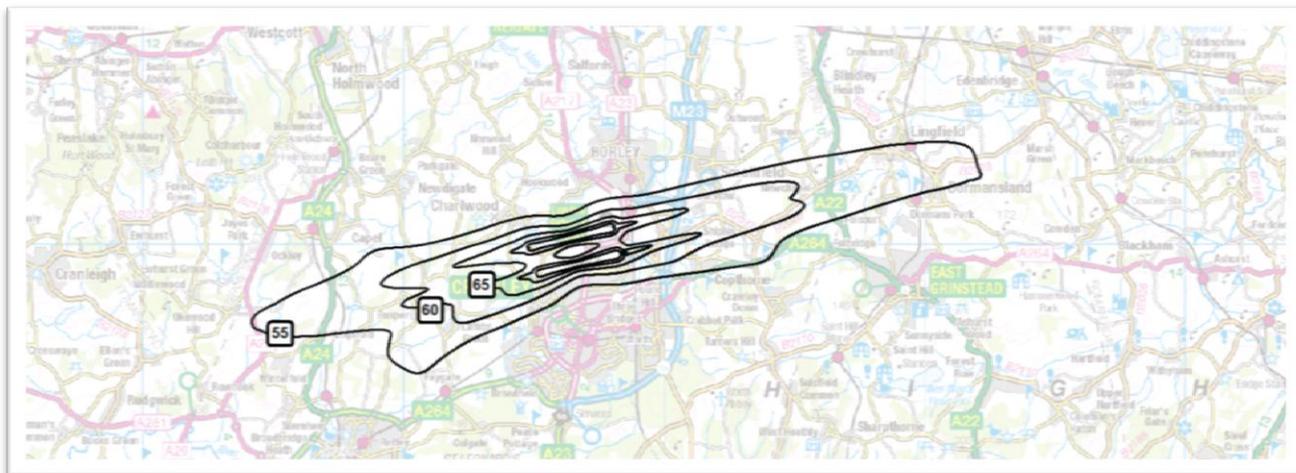


FIGURE 4.7 2030 GATWICK 2R-X L_{DEN} CONTOURS



5. COMMENTARY AND DISCUSSION

5.1 Introduction

5.1.1 This section presents a discussion on the methodology and findings of the Airport Commission's noise assessments and their impact on the MSDC area.

5.2 Modal Split

5.2.1 The Airports Commission consultation has used modal split contours that average out the aircraft noise levels that would be experienced when the airport is operating normally i.e. on easterly or westerly operations, with the aircraft taking off into the wind direction.

5.2.2 When easterly or westerly operation contours are used the total contour footprint is greater in extent and more accurately represents the noise exposure of communities exposed to aircraft noise during actual operations (i.e. easterly or westerly operations) rather than a notional average of the two operating modes.

5.2.3 The easterly and westerly operation contours are produced as part of the production of the modal split contours and to not include them as part of the consultation does not allow the community to have an indication of what the noise levels will be on a particular day when the airport is operating normally.

5.2.4 As such the modal average contours in the consultation at best can be considered as understating the potential aircraft noise exposure or impact. At worst it could be considered as misleading, in particular for communities that would be affected during easterly operations as the 25% easterly standard modal split will average down the contour area foot print substantially and not give an accurate indication of the noise impact on communities near the easterly flight paths.

5.3 Noise Metrics Used

5.3.1 $L_{Aeq,16hr}$ 57dB has been used in the Airports Commission Consultation to define the onset of significant community annoyance. The Commission's discussion paper on aircraft noise considers that focussing on the $L_{Aeq,16hr}$ 57 dB contour does not adequately represent the adverse effects felt by communities around airports and that adverse effects can be experienced outside these contours and that airports can produce contours lower than 57dB and explore alternative metrics.

5.3.2 WHO guidelines on community noise [17] consider that the onset of serious annoyance occurs at $L_{Aeq,16hr}$ 55dB and moderate annoyance at $L_{Aeq,16hr}$ 50dB, as shown below in Table 5.1. It may therefore be considered more appropriate to use the $L_{Aeq,16hr}$ 54dB contour to mark the onset of significant community annoyance, especially when considered with the tonal, episodic and intrusive characteristics of aircraft noise, likely quiet ambient noise levels in areas that are not currently under flight paths and other factors which indicate a greater degree of annoyance from aircraft noise compared to other transportation noise sources. Robust evidence would need to be prepared to support a case to challenge the use of the 57 dB contour however.

5.3.3 The findings of the attitudes to noise from aviation sources in England (ANASE) study [18] and a recent review of the findings [19] indicate that $L_{Aeq,16hr}$ 57dB is not an accurate indicator of the onset of significant community annoyance with aircraft



noise. These studies indicate the onset of significant community annoyance is below $L_{Aeq,16hr}$ 57dB and other events based metrics should be used as well. This view is supported by the Civil Aviation Authority, in their consultation response [20] on the Aviation Policy Framework [21], who consider that “*Despite the concerns raised by peer reviewers regarding the overall robustness of the study, the CAA considers that results from the pilot study support the adoption of a lower level for the approximate onset of significant annoyance, around 54dB $L_{eq,16h}$* ”.

Specific environment	Critical health effect(s)	L_{Aeq} [dB]	Time base [hours]	$L_{Amax,fast}$ [dB]
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
School class rooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	during class	-
Pre-school Bedrooms, indoors	Sleep disturbance	30	sleeping -time	45
School, playground outdoor	Annoyance (external source)	55	during play	-
Hospital, ward rooms, indoors	Sleep disturbance, night-time	30	8	40
	Sleep disturbance, daytime and evenings	30	16	-
Hospitals, treatment rooms, indoors	Interference with rest and recovery	#1		

TABLE 5.1 CRITERIA FOR HEALTH EFFECTS IN WHO COMMUNITY GUIDELINES FOR NOISE

- 5.3.4 The Airports Commission consultation includes plots of the $L_{Aeq,16hr}$ 54dB contour and an assessment of the number of households and population within the contour band but does not give a breakdown of the location of these receptors by community or local authority area. It is noted those households within the $L_{Aeq,16hr}$ 54dB contour will not be offered a mitigation package under the mitigation proposed by Gatwick Airport.
- 5.3.5 $L_{Aeq,8hr}$ contours have been supplied for the night period but the use of these contours may not give a robust indication for potential impact of biological effects, sleep quality, well-being and medical conditions.
- 5.3.6 The WHO Night Noise Guidelines [22] recommend the use of $L_{Amax,inside}$ and $L_{night,outside}$ to assess the impacts of night noise on various effects, detailed below in Table 5.2. Neither of these metrics has been used in the Airports Commission consultation.
- 5.3.7 The WHO guidelines set a Night Noise Guidance (NNG) level of $L_{night,outside}$ of 40dB as a long-term aim and an Interim Target (IT) of $L_{night,outside}$ 55dB for the protection of public health. As $L_{night,outside}$ (a façade metric) can be considered broadly as the annual $L_{Aeq,8hr}$ contours the modelled $L_{Aeq,8hr}$ 48dB (free-field) contour would be 8-10.5 (up to 2.5dB façade correction) dB above the WHO long-term NNG value and therefore the consultation has not considered the NNG value and the extent of the noise effects from airport operations during the night period.



- 5.3.8 The IT value falls between the $L_{Aeq,8hr}$ 51 and 57dB contours. The guidance states that above $L_{Aeq,8hr}$ 55dB adverse health effects occur frequently and a sizeable proportion of the population is highly annoyed and sleep disturbed and there is evidence of the increased risk of cardio-vascular disease.
- 5.3.9 The WHO states that the “interim target (IT) of 55 dB $L_{night,outside}$ is recommended in the situations where the achievement of NNG is not feasible in the short term for various reasons. It should be emphasized that IT is not a health-based limit value by itself. Vulnerable groups cannot be protected at this level. Therefore, IT should be considered only as a feasibility-based intermediate target which can be temporarily considered by policy-makers for exceptional local situations.”
- 5.3.10 Other criteria for sleep disturbance and health effects at night are detailed below in Table 5.2.
- 5.3.11 BS8233 [23] gives recommended design noise levels for various types of building and activities. Noise criteria include $L_{Aeq,8hr}$ 30 dB for the period 23:00-07:00 and recommends the use of SEL or $L_{AF,max}$ levels to assess individual noise events and use of the WHO guideline levels for sporadic noise events. BS8233 considers that the sound attenuation from a partially open window is 15dB. With an older property with single glazing or a wider open window the sound attention may be as low as 10dB.
- 5.3.12 With 15dB sound attenuation from a partially open window the modelled $L_{Aeq,8hr}$ 48 dB external contour will not show if the BS8233 $L_{Aeq,8hr}$ 30dB inside sleeping area criterion, to avoid sleep disturbance, is being exceeded for areas outside the modelled $L_{Aeq,8hr}$ 48 dB contour.

Effect	Indicator	Threshold, dB	
Biological effects	Change in cardiovascular activity	*	
	EEG awakening	$L_{Amax,inside}$	35
	Motility, onset of motility	$L_{Amax,inside}$	32
	Changes in duration of various stages of sleep, in sleep structure and fragmentation of sleep	$L_{Amax,inside}$	35
Sleep quality	Waking up in the night and/or too early in the morning	$L_{Amax,inside}$	42
	Prolongation of the sleep inception period, difficulty getting to sleep	*	*
	Sleep fragmentation, reduced sleeping time	*	*
	Increased average motility when sleeping	$L_{night, outside}$	42
Well-being	Self-reported sleep disturbance	$L_{night, outside}$	42
	Use of somnifacient drugs and sedatives	$L_{night, outside}$	40
Medical conditions	Environmental insomnia**	$L_{night, outside}$	42



TABLE 5.2 SUMMARY OF EFFECTS AND THRESHOLD LEVELS FOR NOISE EFFECTS AT NIGHT

- 5.3.13 N70 is a metric used to give an indication of the number of noise events above $L_{AS,max}$ 70dB and is used with the $L_{Aeq,16hr}$ metric.
- 5.3.14 N60 is a metric used in to assess the night time noise impact by modelling the number of events above $L_{AS,Max}$ 60dB at night. The 60 dB value was chosen as it equates to the sleep disturbance level of 50dB in AS2021 [24], an Australian Standard relating to aircraft noise intrusion in relation to building location and construction. This standard states clearly in the foreword it is applicable to communities which are accustomed to aircraft noise and is not applicable to communities which are newly-exposed to aircraft noise as a result of construction of new runways or the redesign of flight paths. The appropriateness of this standard is therefore questionable when applied to proposals for new runways and flight paths.
- 5.3.15 $L_{AS,max}$ 60dB external would be roughly equivalent to $L_{AS,max}$ 45dB internal if sound attenuation for a partially open window is considered as 15dB. It is noted the Airports Commission has modelled $L_{AS,Max}$ (slow time weighting) whereas the WHO and other guidelines recommend using fast weighting. As a rule of thumb aircraft noise $L_{AS,Max}$ levels are around 3dB lower than $L_{AF,Max}$ levels. Use of the $L_{AS,Max}$ levels for the contours may therefore be considered to have the effect of lowering the contour values by 3dB.
- 5.3.16 The N60 contours start at 25 events and it is noted that onset sleep disturbance will occur below this level and as such is recommended the contours start at 10-15 events for the onset of sleep disturbance to correlate with WHO guidelines for number events considered to cause sleep disturbance.
- 5.3.17 L_{DEN} contours are not considered further in this review.

5.4 Noise Insulation and Mitigation

- 5.4.1 Noise mitigation is proposed by Gatwick Airport in the form of compensation to the equivalent of Council Tax Band A (£1,000) for dwellings with the $L_{Aeq,16hr}$ 57dB contour. The modal split for this contour is not stated. Part of Copthorne is within the $L_{Aeq,16hr}$ 57dB contour for the Gatwick-2R-X-C option.
- 5.4.2 The Airports Commission consultation states "*Planning applications for noise sensitive development submitted to neighbouring planning authorities should account for the second runway's noise contours*". This may require changes to MSDC planning policy. It is also noted that the notional contours in the consultation are likely to underestimate the noise environment as result of the averaging down by the modal split of the contours, in particular in MSDC which is under the proposed flight paths during easterly operations.
- 5.4.3 Development of new noise preferential routes using Precision Area Navigation (P-RNAV) capabilities and increased stakeholder engagement issues is considered part of the mitigation. It is considered likely that these routes will be optimised to avoid population centres, though it is noted the community at Copthorne is directly beneath some of the departure routes.



5.5 Aviation Policy

- 5.5.1 The Aviation Policy Framework states the Government's aim 'to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise'. The Gatwick 2nd runway proposal is contrary to this and will increase the number of people exposed to aircraft noise and introduce noise sensitive receptors and areas that were not previously exposed to aircraft noise, to aircraft noise.

5.6 Mixed Mode and Alternation

- 5.6.1 The Gatwick 2nd runway proposals are for aircraft to take off and land from both runways at the same time. This procedure is known as mixed mode and means that there will be no respite for communities from noise during operation hours of the airport.
- 5.6.2 Heathrow currently runs an operation procedure called segregated mode where one runway is used for arrivals and one runway for departures. The use of the runways is then switched over at 15:00 hrs to give respite to the communities in the area so they are not overflowed all day.
- 5.6.3 BAA, who operate Heathrow, has made requests to use mixed mode at Heathrow but planning consent has not been applied for by BAA, following the Labour Government retraction of the Cranford Agreement in 2010, on the basis of the noise impact and number complaints following new mixed mode flight paths being tested in 2014. During the 5 month trial 86,000 noise complaints were received compared to 18,826 for normal operations in 2013.

5.7 P-RNAV

- 5.7.1 Precision Area Navigation (P-RNAV) is a procedure where the aircraft's flight management system navigates the aircraft and requires that an aircraft is capable of track-keeping accuracy for 95% of its flight time. The CAA plans to phase in P-RNAV gradually so as to make the noise impact of the focusing of the routes less sudden and allow an on-going review process for assessment of noise and other impacts.
- 5.7.2 P-RNAV will have the effect of resulting in a narrow swathe of flight departure tracks with the aim of avoidance of population centres where feasible.
- 5.7.3 Gatwick has run a trial of operation of RNAV Standard Instrument Departure (SID) over several years and the consultations on this have revealed that when this procedure is operational the flights using 08R SFD route are slightly closer to East Grinstead than using the standard SID.
- 5.7.4 The effect of the use of P-RNAV will be to limit the swathe of noise sensitive receptors that are overflowed, though the areas beneath the P-RNAV routes will be subjected to aircraft noise with less respite to noise from variation in the route.
- 5.7.5 An indication of the narrowing of the swathe with use of P-RNAV compared to standard departures is shown in Figure 5.1 below:



FIGURE 5.1 ILLUSTRATION OF STANDARD DEPARTURE ROUTE (LEFT IMAGE) AND P-RNAV DEPARTURE ROUTE (RIGHT IMAGE) SWATHE WIDTH.

- 5.7.6 MSDC may wish to consider further the potential impact of the narrow P-RNAV swathes proposed as there are communities in MSDC that are under the indicative P-RNAV routes for the Gatwick Airport 2R proposals.

5.8 Schools

- 5.8.1 The Airports Commission Consultation has considered schools within study area and considered them against the modal split $L_{Aeq, 16\text{ hr}}$ contours.
- 5.8.2 Building Bulletin 93 [25] defines the acoustic standards for new schools and recommendations for existing schools. The guidance considers low ambient noise levels are required, in particular for Special Educational Needs and Disability (SEND) children having hearing or communication needs including visual impairments, hearing loss or auditory processing difficulty, attention deficit hyperactivity disorders (ADHD) and autistic spectrum disorders.
- 5.8.3 Pupils with hearing impairment, autism and other special needs are often very sensitive to specific types of noise, particularly those with strong tonal, impulsive or intermittent characteristics (such as aircraft noise). The document states that this should be taken into consideration in the design of areas which may be used by such children.
- 5.8.4 The Equality Act 2010 [26] places a duty on schools and local authorities to provide strategies and plans for improving the accessibility of schools for disabled pupils and staff including acoustic improvements to the internal and acoustic environments which would benefit hearing impaired and other pupils. MSDC's duty under this act may place additional burden on MSDC and their schools as they may be required to mitigate and improve the acoustic environment that has been degraded by aircraft noise if the Gatwick 2R proposal is selected.
- 5.8.5 BB93 gives performance standards for indoor ambient noise levels for new build school rooms and refurbishment of spaces. These standards are given as $L_{Aeq,30\text{mins}}$, not $L_{Aeq,16\text{hr}}$, in order to limit the potential disruption from noise that could occur during a lesson. The upper limits for indoor ambient noise are shown below in Table 5.3.
- 5.8.6 WHO guidelines and BB93 also indicate $L_{Aeq, \text{during play}}$ is 55dB in school playgrounds to avoid annoyance and BB93 also recommends that at least one area suitable for outdoor teaching activities is below $L_{Aeq,30\text{mins}}$ 50 dB.



Type of Room	Room classification for the purpose of airborne sound insulation		Upper Limit for the indoor ambient noise level $L_{Aeq,30mins}$ dB
	Activity Noise (Source room)	Noise tolerance (Receiving room)	
Nursery School Rooms	Average	Medium	35 [40]
Primary school: classrooms, class bases, general teaching areas, small group rooms	Average	Medium	35 [40]
Primary music room	High	Medium	35 [40]
Secondary music classroom	Very high	Low	35 [40]
Small and large practice/group room	Very high	Low	35 [40]
Teaching spaces specifically for students with Special Educational Needs	Average	Low	30 [35]
SEN Calming Room	High	Low	35 [35]
Quiet study areas	Low	Medium	40 [45]
Resource areas	Average	Medium	40 [45]
Assembly halls, multi-purpose halls	High	Low	35 [40]
Atria, circulation spaces used for circulation and socialising but not teaching	Average	Medium	45 [50]
Dining rooms	High	Medium	45 [50]

TABLE 5.3 UPPER LIMITS FOR INDOOR AMBIENT NOISE LEVEL $L_{Aeq,30mins}$

[1] – Values in parentheses are for conversion and refurbishment, those in non-parentheses are for new build

5.8.7 The modal split contours do not reflect the noise environment when the airport is operating on easterly or westerly operations and as such schools outside of the study area may suffer adverse noise impacts that have not been considered as part of the Airport Commission Consultation.

5.8.8 In order for an informed indication on the potential impact of the Gatwick 2nd runway proposal $L_{Aeq,30mins}$ contours for both worst case easterly and westerly proposed operations will need to be produced. These should form part of the Airport Commissions consultation. Without these $L_{Aeq,30mins}$ contours for easterly and westerly operations consultees cannot make an informed consideration of the potential noise impact on schools.

5.9 Fleet mix assumptions

5.9.1 The noise modelling relies on the use of a forecast fleet mix for the Do-Minimum and Gatwick 2nd runway options. The fleet mix assumptions were updated in an addendum to the noise assessment in the interests of transparency of the



assessment. The fleet mix used will strongly influence the modelled noise levels and caution should be applied when projecting fleet mixes to avoid underestimating the potential noise impact. The fleet mix uncertainty may make the 2040 and 2050 modelled contours less robust and a sensitivity test should be applied to these fleet mix projections and contours modelled from them.

5.10 Quiet Areas and Tranquillity

- 5.10.1 The impact on quiet areas and tranquillity has not been considered as part of the Airports Commission assessments.
- 5.10.2 European and government policy calls for quiet areas and areas of tranquillity to be protected and improved whereas with the proposal there will be noise impacts on the High Weald AONB, nature reserves, the South Downs National Park and the tranquillity of the MSDC area.
- 5.10.3 No monetisation assessment has been included in the consultation of this potential loss of amenity.

5.11 Stacks and Holding Patterns

- 5.11.1 No information is given in the consultation on the potential impact of the location of aircraft holding and stacking changes as a result of Gatwick 2nd runway proposal. Though the stacking and holding patterns are not part of this consultation the increase in ATMs and changes in use of airspace as a result of the proposal may lead to a noise impact that has not been considered as part of this consultation.

5.12 Ground Noise

- 5.12.1 Though not considered in detail by the Airports Commission a modelled noise contour plot is available for the 2030 Do-Minimum and Gatwick 2R option, shown below in Figure 5.2. No night ground noise contours are available in the consultation. The $L_{Aeq,16hr}$ 57dB contours do not extend to the MSDC area and the M23 corridor separates the contour area from the MSDC area. The MSDC settlement of Copthorne is around 2km away to the east. Ground noise impacts may occur during temperature inversions. Gatwick is located in an area that is prone to temperature inversions and during these inversion ground noise may be heard in Copthorne.

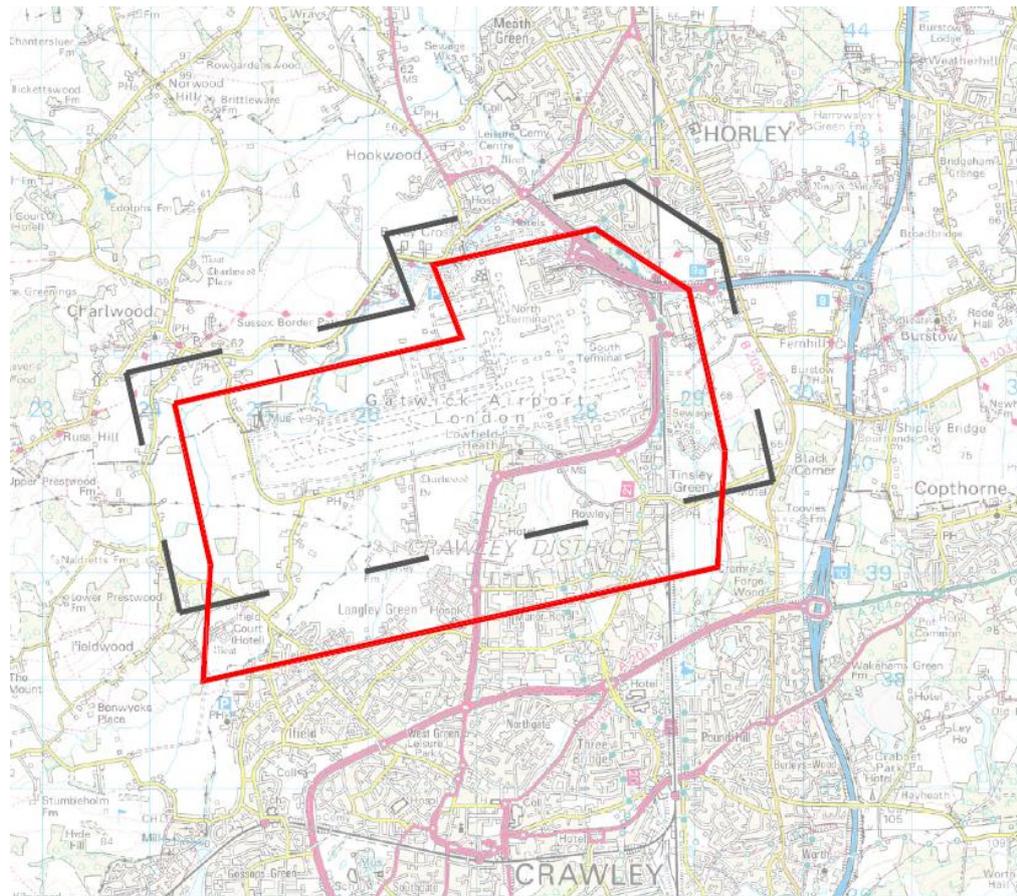


FIGURE 5.2 AIRPORTS COMMISSION 2030 DO-MINIMUM (BLACK) AND 2ND RUNWAY (RED) $L_{AEQ,16HR}$ 57 DB GROUND NOISE CONTOURS.

5.13 Assessment of Significance and Cross Reference to National Policy

5.13.1 The National Planning Policy Framework, the Noise Policy Statement for England [27] and National Planning Policy Guidance on noise [28] define the government’s policy on noise.

5.13.2 The NPSE advanced the concepts of NOEL, LOAEL and SOAEL in relation to adverse noise effects and significant adverse effects on health and quality of life, and the Planning Practice Guidance for Noise provides example outcomes for each of these three categories. This is re-produced below in Table 5.4:

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and	Noise can be heard, but does not cause any change in	No Observed	No specific



not intrusive	behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	Adverse Effect	measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

TABLE 5.4 PLANNING PRACTICE GUIDANCE EXAMPLE EFFECT LEVELS



- 5.13.3 According to the Planning Practice Guidance example outcomes an observed adverse effect is characterised as a perceived change in quality of life for occupants of a building or a change in the acoustic character of an area, as well as possessing the potential for some forms of sleep disturbance. Applying this guidance it is considered that adverse effects will occur outside of the study area in the consultation
- 5.13.4 The Airports Commission consultation makes no assessment of significance of the effect of the proposals to these Government guidance publications and presents noise impacts through being within the $L_{Aeq,16hr}$ 57dB contour, and to a lesser extent the other noise metrics.

5.14 Limitations of this review

- 5.14.1 This analysis on behalf of MSDC has been limited by time and resources and is not intended to be a noise analysis of all the aspects of the consultation relating to noise. This study focuses on certain aspects of the consultation, which are discussed in the preceding sections of this report.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 The Airports Commission consultation does not allow for any meaningful conclusions to be drawn with regards to the potential noise impact on the Mid Sussex District Council noise sensitive receptors, for the following reasons:

- Use of ‘averaged-out’ modal split contours means that the noise environment during normal easterly or westerly operation has not been portrayed or analysed;
- The use of the modal split contours has limited the study area and communities and noise sensitive receptors that may be adversely impacted by noise from the proposal have not been considered;
- The impact on schools, in particular SEND children, and the additional duties of schools and local authorities cannot be considered in detail without easterly and westerly $L_{Aeq,30mins}$ contour plots to shown the noise environment in a metric that reflects the educational requirements;
- No breakdowns or itemisation of the noise impacts is given by community or local authority area and therefore the individual, community or local authority will find it difficult to consider the information in the context of the impact on the individual community or local authority and make an informed response;

6.1.2 Nevertheless a number of general assumptions can be made:

- Areas of MSDC that were not previously overflown are going to be overflown, including in likely quiet rural areas and communities;
- There will be departure routes over MSDC and in particular over the community at Cophorne that will be directly beneath easterly departure paths and also close to westerly arrival routes;
- Use of P-RNAV will concentrate the noise impacts in the areas beneath the departure path in a narrow swathe; and
- The Gatwick 2nd runway proposal appears to be contrary to the NPSE, Aviation Policy Framework and the Commission’s appraisal framework aim to reduce the number of people in the UK significantly adversely affected by aircraft noise.

6.2 Recommendations

6.2.1 The following recommendations are made:

- That the Airports Commission consultation be extended to include easterly and westerly operation contour plots for the noise metrics currently in the consultation and include $L_{Aeq,30,mins}$ contour plots to facilitate the assessment of noise impacts on schools within MSDC;
- The duration of the consultation is extended to allow the communities and local authorities to consider the additional noise contour and population information;
- That the Airports Commission consultation includes analysis of the communities and local authorities affected by the proposal and a breakdown of the noise levels and number of noise sensitive receptors in each community affected by the proposal is given;
- That the $L_{Aeq,16hr}$ 54dB contour is used to mark the onset of significant community annoyance in the daytime (following ANASE recommendations and CAA consideration) and the assessment of impact is re-assessed on this basis;
- That N60 15 contours are produced for night to indicate the impact on sleep disturbance;
- The commitment is made by Gatwick Airport to offer compensation to those in the $L_{Aeq,16hr}$ 57dB contour is extended to any dwelling within any of the easterly or westerly operations contours for any noise metric, with appropriate mitigation packages;
- An arrangement is made that if the Gatwick 2nd runway proposal is chosen an arrangement in the manner of the 'Cranford Agreement' is put in place to prevent departures from the southern runway over Cophthorne;
- An agreement is made that if the Gatwick 2nd runway proposal is chosen Gatwick Airport will fund the mitigation packages necessary to ensure a suitable noise environment in indoor and outdoor spaces at schools and nurseries;
- A commitment is obtained from Gatwick Airport that segregated mode will be used rather than mixed mode, so communities that are overflowed can be given respite from aircraft noise;
- That the Airports Commission consultation considers the modelled aircraft noise contours with the ambient noise levels and indicate the potential total noise levels and quantifies the change in noise levels as some of the areas within MSDC are likely to have very low ambient noise levels, in particular at night and changes of $L_{Aeq,T}$ 20dB or more may occur outside of the Airports Commission aircraft noise study area;

- That a sensitivity test is undertaken on the fleet mix assumptions to indicate the potential deviation from the modelled noise levels if aircraft noise reduction measures and next generation aircraft rollout does not occur as rapidly as anticipated in the fleet mix assumptions; and
- That the monetisation assessment is re-run using the westerly and easterly operation contours and the monetisation of the Annoyance, Sleep Disturbance, Acute Myocardial Infarction, Hypertension and Quality Adjusted Life Years is itemised on a local authority and community basis so the additional burden of the proposal on the local authorities can be assessed.

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