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<b>Title of Airspace Change Proposal</b>	<b>Introduction of New Standard Instrument Departure Procedures from Runway 15</b>
<b>Change Sponsor</b>	<b>Birmingham Airport Ltd (BAL)</b>
<b>SARG Project Leader</b>	<b>[REDACTED]</b>
<b>Case Study commencement date</b>	<b>15 August 2013</b>
<b>Case Study report as at</b>	<b>17 November 2015</b>
<b>Report Reference</b>	<b>SARG/ERCD/AG/Birmingham SIDs ACP</b>

### Instructions

In providing a response for each question, please ensure that the 'Status' column is completed using the following options:

- **Yes**
- **No**
- **Partially**
- **N/A**

To aid the SARG Project Leader's efficient Project Management it may be useful that each question is also highlighted accordingly to illustrate what is resolved ( Green ), **not resolved** ( Amber ) or **not compliant** ( Red ) as part of the SARG Project Leader's efficient project management.

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<b>1.</b>	<b>Introduction</b>	
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This report describes the environmental considerations relevant to the proposed changes to the Standard Instrument Departure (SID) procedures for Runway 15 at Birmingham Airport. The Airspace Change Proposal (ACP) has been submitted by Birmingham Airport Ltd (BAL). The development of the proposal was assisted by Cyrrus Ltd.

This assessment is based upon information presented in the proposal document entitled Birmingham Airport Change Proposal: Introduction of New Standard Instrument Departure Procedures from Runway 15 (undated, but received by the CAA in August 2013), its various appendices plus associated consultation material and subsequent information received as the result of queries raised with the sponsor following submission of the ACP. It also includes the additional data and documentation submitted as a result of the trials undertaken by BAL of the southbound SIDs encompassed by “Option 5” and “Option 6”.

The need for this airspace change results from the relocation of the departure end of runway for Runway 15 which was moved as a result of the runway extension. Therefore, both the northbound and southbound SIDs from Runway 15 must be revised to reflect the new runway configuration.

<b>2.</b>	<b>Guidance to the CAA</b>	<b>Status</b>
<b>2.1</b>	<b>Is the proposal consistent with Government policy and/or guidance from Government to the CAA?</b>	<b>Yes</b>

Guidance issued to the Civil Aviation Authority sets<sup>1</sup> out a framework for the environmental objectives that the CAA must consider when assessing airspace change proposals. In addition to these objectives, there may be other legitimate operational objectives, such as the overriding need to maintain an acceptable level of air safety, the desire for sustainable development or to enhance the overall efficiency of the UK airspace network, which need to be considered alongside these environmental objectives. The Government looks to the CAA to determine the most appropriate balance between these competing characteristics.

Flights over National Parks and AONBs are not prohibited by legislation<sup>2</sup> as a general prohibition against over-flights would be impractical. Government policy focuses on minimising the over-flight of more densely populated areas below 7,000 feet (amsl), but balances this with CO<sub>2</sub> emissions between 4,000 and 7,000 feet (amsl). However, where it is practical to avoid over-flight of National Parks and AONBs below 7,000 feet (amsl), the Guidance asks that the CAA encourages this.

<sup>1</sup> DfT, Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, January 2014

<sup>2</sup> National Parks and Access to the Countryside Act 1949, National Parks (Scotland) Act 2000, and “Duties on relevant authorities to have regard to the purposes of National Parks, Areas of Outstanding Natural Beauty (AONBs) and the Norfolk and Suffolk Broads Guidance Note”, DEFRA 2005.

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<b>3.</b>	<b>Rationale for the Proposed Change</b>	<b>Status</b>
<b>3.1</b>	<b>Does the rationale for the ACP include environmental reasons?</b>	<b>No</b>

The airspace change is necessitated solely due to the change in runway length and specifically the movement of the Departure End of Runway (DER) for Runway 15 by 391m. This means that the departure procedures for Runway 15 have to be redesigned.

The rationale for the change is stated by the sponsor as “it is the overriding requirement for the safe and compliant design of procedures consequent upon the runway reconfiguration which drives the change, whether or not an overall environmental benefit can be established.”

<b>4.</b>	<b>Nature of the Proposed Change</b>	<b>Status</b>
<b>4.1</b>	<b>Is it clear how the proposed change will operate, and therefore what the likely environmental impacts will be?</b>	<b>Yes</b>

The key objective was to retain as far as practicable the conventional SID procedures but because new SIDs were required, and these had to comply with current design criteria, the initial portions of the current, conventional SIDs could not be replicated. However, even with the new procedures, the sponsor sought to minimise if possible the noise impact for communities close to the airport.

The sponsor explains that noise and track-keeping data show that aircraft had difficulty adhering to the current conventional SIDs from runway 15 which include the ‘Hampton Turn’ – “modern aircraft do not accurately adhere to the nominal ground track of the existing procedures and do not satisfactorily achieve the closely spaced opposite direction turns.” Radar track patterns showed traffic is concentrated to the east of the Hampton Turn, but still within the existing 3km-wide NPR swathe.

The sponsor explains that “PANS OPS obstacle clearance requirements are such that the minimum distance when considering the obstacle environment at which a turn can be initiated is 2.2nm from DER. The outcome of this is that the existing SIDs cannot be replicated.”

Changes in the SIDs will also result in changes to the Noise Preferential Routes (NPRs) and their associated swathes. The NPRs currently end at 3,000ft, when traffic can then be tactically vectored by ATC, though BAL has been trialling an increase to 4,000ft with a view to making this permanent if the proposal is approved (however the increase in height of the NPR is not an element of this proposal). The proposal includes the reduction in the width of the Runway 15 NPR swathes from 3km to 2km, to reflect greater accuracy of RNAV SIDs. The results from the trial of Options 5 & 6 demonstrate that a reduction to a 2km swathe is feasible whilst still achieving high NPR-adherence.

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There will be no change to dimensions of controlled airspace and therefore there will be no impact on other airspace users operating outside controlled airspace.

Despite the focus of this proposal being the introduction of RNAV SIDs for Runway 15, conventional SIDs are still required from the runway. These are included to accommodate two operators, with a combined fleet of 16 aircraft. However, not all current conventional SIDs will be re-designed – only two are proposed to continue in operation (TNT for northbound traffic and DTY for southbound traffic).

<b>4.2</b>	<b>Have alternative options been considered, and have the environmental impact of each alternative been assessed?</b>	<b>Yes</b>
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Options were considered for both the northbound and southbound SIDs from Runway 15, and where these options were felt to be feasible, the environmental impact was assessed. As noted below, the environmental impact of Option 6X was not assessed to the same degree as those for Option 4 (northbound) and Options 5 & 6 (southbound), but this assessment was adequate for determining its impact in comparison to Options 5 & 6.

None of the feasible options are able to retain a “Hampton Turn” due to design criteria, and therefore all of the proposed SIDs will impact upon Hampton in Arden equally. That said, as already noted in 4.1 above, traffic using the conventional SIDs were unable to adhere to the existing Hampton Turn with any great regularity and therefore the aim of the Turn (avoidance of Hampton in Arden) was not being achieved consistently.

### **Northbound procedures**

There are currently two northbound SIDs – Trent (TNT) and Whitegate (WHI).

Five options were considered:

1. Do nothing;
2. Replicate the existing nominal ground tracks (design criteria determined that this is not possible);
3. Use an “Offset Departure” procedure (CAA confirmed not possible);
4. Straight ahead to a reconfigured Northbound Turn;
5. Retain a reconfigured Hampton Turn and delay the Northbound Turn (unfeasible due to design criteria, and the track would impact more people than Option 4).

Whilst all of these options were presented and explained in the consultation, only Option 4 was considered viable and therefore it was the only one that was assessed for its environmental impacts. Option 4 is the preferred design as BAL is unable to have a procedure that retains both the Hampton Turn and the Balsall Turn using current design criteria.

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The runway extension, plus the CAA's regulatory requirements, plus design criteria meant that the existing SIDs could not be replicated. In addition, radar tracks indicate that traffic is not currently adhering to the closely spaced opposite direction turns of the existing SIDs.

BAL explains that "Whilst the proposed procedure does not incorporate a Hampton Turn, it is anticipated that aircraft would not pass substantially closer to Hampton in Arden than is currently achieved with the non-compliant procedure. The proposed procedure also benefits Barston and Balsall Common by taking the nominal track further away from those locations."

The subsequent trial has demonstrated that there are some issues with aircraft remaining within the NPR swathe associated with the northbound RNAV SIDs and that this is being investigated by BAL with the aim of improving adherence to the SID and NPR. BAL has commissioned design work to improve the track-keeping on both the RNAV and Conventional SIDs and intends to work with airlines and the CAA to implement improved track-keeping on these SIDs. Work is currently underway to enable the redesign of the northbound SIDs so that they can be improved at the earliest opportunity. The revised design will be submitted to the CAA for consideration.

### **Southbound procedures**

There are currently four southbound conventional SIDs – DTY (Daventry), WCO (Westcott), CPT (Compton) and COWLY.

Six options were considered, plus a further modified option ("Option 6X"):

1. Do nothing
2. Replicate the existing nominal ground tracks (design criteria determined that replicating the Hampton Turn is not possible);
3. Use an "Offset Departure" procedure (CAA confirmed not possible);
4. Adopt a reconfigured Hampton Turn (CAA confirmed not possible);
5. Straight ahead to 3.6nm beyond DER (eliminate the Hampton Turn)
6. Adopt a further modified Right Turn after Departure

Whilst all of these options were presented and explained in the consultation, only Option 5 was considered viable and therefore it was the only one that was assessed for its environmental impacts in the initial consultation. Option 5 would move the track closer to Balsall Common, but because it is straight-out, BAL originally felt that the adherence to the nominal track would be better than if a turn was required (such as the existing Hampton Turn).

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In proposing Option 5 in the initial consultation, the sponsor explained that “Whilst the proposed procedure does not incorporate a Hampton Turn, it is anticipated that aircraft would not pass substantially closer to Hampton-in-Arden than is currently being achieved by the non-compliant procedure”.

Option 6 was subsequently developed further as a result of consultation feedback and then consulted upon by BAL.

BAL explains that “There are no operational or airspace management advantages or disadvantages of Option 5 over Option 6 or vice versa; both are equally acceptable.”

A modified option (“6X”) was considered as a result of further consultation feedback but was discounted because BAL concluded that it “would bring in a larger number of properties beneath the centreline than Option 5 or 6”, namely BAL concluded the Option’s noise impact would not be better than either of those two Options.

In considering consultation feedback, BAL acknowledges that “Turn at an altitude/height” is an acceptable procedure for departing aircraft but is not compatible with the Future Airspace Strategy (FAS) because such a design is not RNAV-1 compliant. It is also not consistent with a policy of concentrating traffic so that the fewest number of people are overflown because it will result in a greater degree of traffic dispersion.

In submitting the ACP to the CAA for consideration, Option 5 was initially the sponsor’s preferred proposal for southbound departures as it felt that this would offer a genuine noise benefit to the community closest to the airport (Barston).

### **Southbound - Option 6X**

The dismissal of this Option was based on a count of properties (not headcount) within two swathes (200m wide to represent the centreline, and 2km wide to represent the new NPR swathe) yet with no weighting for those properties closer to the airport.

### **Trial to consider the noise impacts of Options 5 and 6**

The CAA’s assessment of the original submitted proposal concluded that the expected noise benefit to Barston of Option 5 would not be a genuinely perceivable difference based on the likely noise levels at that location for Options 5 and 6. BAL agreed that a trial of both Options be undertaken to provide better evidence of the likely noise levels and departure tracks at that location. The trial is considered in more detail in Section 5.2 below and in Appendix 3.

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<b>5.</b>	<b>Noise</b>	<b>Status</b>
<b>5.1</b>	<b>Has the noise impact been adequately assessed?</b>	<b>Yes</b>

As required by CAP725,  $L_{eq}$  contours and SEL footprints were produced by BAL to assess and portray the noise impact. These were provided by the CAA's Environmental Research & Consultancy Dept (ERCD) on a consultancy basis. Population and household counts for both the contours and footprints were rounded to the nearest 100 so any impacts within that limit will not be reflected in the totals due to rounding. Contours and footprints were produced for the options that were consulted upon (Option 4 for northbound departures, Options 5 & 6 for southbound departures), but not for Option 6X for southbound departures.

A separate ACP was developed and submitted to the CAA for changes to Instrument Approach Procedures (IAPs) for arriving aircraft on Runway 33. The changes to IAPs were required as a result of the runway extension, but were assessed and consulted upon separately. Therefore, in order not to assume the implementation of the IAPs, noise modelling for the SIDs ACP was undertaken for scenarios that both included and excluded the impact of the changes to Runway 33 IAPs and the resulting change in the start of roll position for Runway 33. As the CAA approved the separate IAP ACP in August 2013, it is only those scenarios that account for the implementation of new IAPs that are considered in this report.

#### $L_{eq}$ Contours

Accepting that the population and household counts are rounded, there is no difference between the totals for:

- $L_{eq}$  contours that reflect the Arrivals/IAP change but don't include the Departures/SID change;
- $L_{eq}$  contours that reflect both the Arrivals/IAP change and the Departures/SID change.

This is even though the size of the second set of contours is marginally larger than the first and due to the fact that the population is not uniformly distributed within the noise contour. As the inclusion or exclusion of the new SIDs makes no difference to the population and household counts, this means that the proposal for the new Runway 15 SIDs does not affect the noise contours at the airport.

Furthermore, when comparing Option 5 with Option 6 in terms of the impact as shown by  $L_{eq}$  contours (assuming that the IAP ACP is already in place), there is no difference in population or household counts between these two options. The difference in the geographic location of the contours when comparing Options 5 & 6 is marginal, with the contours for Option 5 being slightly further eastwards, reflecting the fact that flights would depart "straight-out" rather than flying the right turn at Eastcote which is a feature of Option 6.

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### SEL Footprints

If there are changes that effect any night flights, SEL footprints are required by CAP725. Footprints are required for the noisiest and most frequent aircraft types. For BAL, the noisiest aircraft that operated at night in 2013 was the Boeing 767-200, and the most frequent was the Boeing 737-300/400/500 (on the RNAV SIDs) and the on the non-RNAV SIDs it was the Boeing 737-300/400/500 (noisiest) and BAe146 (most frequent).

Whilst there is a recognised relationship between the 90 SEL footprint and sleep disturbance, there is no such relationship demonstrated for the 80 SEL footprint. That said, the 80 SEL footprint can still be used as a means of portraying noise impact.

The results of the SEL footprints show that:

- There is no significant difference in population counts and household counts for the 90 SEL footprints when comparing the new RNAV SIDs with the current conventional SIDs. In most cases the analysis shows no difference at all, or else the difference in population is 100, which can be accounted for simply by rounding.
- There is no difference in population counts and household counts for the 90 SEL footprints when comparing the new RNAV SIDs for Option 5 with those for Option 6 and therefore the 90 SEL footprints do not serve as a useful measure for deciding between Option 5 and Option 6 for the southbound SIDs.
- Option 4 (northbound departures) – 80 SEL footprints: the new footprint for the noisiest aircraft on the RNAV SID shows a reduction in population and households. This is largely due to the removal of Meriden from the footprint, but it is offset by capturing new households on the north side of Balsall Common.
- Option 4 (northbound departures) – 80 SEL footprints: the new footprint for the most frequent aircraft on the RNAV SID shows an increase in population and households. This is largely due to the new footprint capturing the properties at Berkswell and some on the north side of Balsall Common.
- Options 5 & 6 – 80 SEL footprints for both of the Options are generally worse than the footprints based on the current departure routes. The one exception is for Option 6, the noisiest aircraft on the DTY SID shows no change in impact when compared with the existing equivalent conventional SID (P1C2).
- Options 5 & 6 – 80 SEL footprints on WCO/COWLY/CPT: the footprints for the noisiest aircraft are worse for Option 5 than Option 6. The key reason is that the Option 5 footprints capture properties on the westside of Balsall Common and those in Meer End, whilst Option 6 excludes these but instead captures properties in Temple Balsall. The footprints for the most frequent aircraft are also worse for Option 5 than Option 6, because the Option 5 footprints capture some of the properties on the westside of Balsall Common.

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- Options 5 & 6 – 80 SEL footprints on DTY have a similar impact to those for WCO/COWLY/CPT: the footprints for the noisiest aircraft are worse for Option 5 than Option 6. The key reason is that the Option 5 footprints capture properties on the westside of Balsall Common and those in Meer End, whilst Option 6 excludes these but instead captures properties in Temple Balsall. The footprints for the most frequent aircraft are also worse for Option 5 than Option 6, because the Option 5 footprints capture some of the properties on the westside of Ballsall Common, though Option 6 captures the smaller community at Temple Balsall.

The submission from BAL recognises that the 80 SEL footprints for Option 5 represent larger increases in people and households than the increases portrayed by the Option 6 footprints – namely that based solely on these footprints, Option 5 is worse than Option 6. The submission also notes that there is no guidance in CAP725 as to the impact of 80dBA SEL and therefore BAL has not used these footprints as a basis for making a decision. Instead, it developed its own methodology to decide between Options 5 & 6.

<b>5.2</b>	<b>Has the noise impact been adequately presented in the consultation and the submitted proposal?</b>	<b>Yes</b>
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Option 6X was not consulted upon and so the impact of that option was not portrayed in the consultation material, nor were the impacts of Options 5 & 6 portrayed in the consultation by the measures that were used to discount Option 6X (namely the 200m and 2km swathes as explained below).

#### BAL's Decision Methodology

Two different approaches were used by BAL for deciding, on an environmental basis, which of the options was preferable for the southbound SIDs.

The first approach was used to decide whether or not Option 6X offered benefits over either Option 5 or 6 (which were consulted upon). BAL based this first decision on two criteria:

- The households beneath a 200m wide swathe that it felt represented the centreline of the new SIDs;
- The households beneath a 2km wide swathe that represented the boundary of the proposed new NPR swathe.

On the first of these criteria, Option 5 had the least households. On the second criteria, Option 6 had the least households. Therefore on neither of these two criteria did Option 6X offer a greater environmental benefit than Options 5 or 6. On that basis BAL discounted Option 6X as an option and did not consult upon it.

Having discounted Option 6X, the second approach was used to decide between Options 5 & 6, and this approach is set out in the supporting document from BAL titled "Deciding between Option 5 and Option 6". The methodology for eliminating Option 6X was not used for making this second decision. The conclusion in the document is:

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“The differences between Options 5 and Option 6 environmentally are broadly marginal when compared with each other, or indeed when compared to what is flown by aircraft today. In summary, Option 5 has been selected as the preferred option for the following reasons;

- The greater support from the formal consultees
- Marginally better environmental outcome, as the area closest to the Airport, which has the potential to be directly overflown is the village of Barston. Option 5 offers marginally greater relief to Barston than Option 6.”

In basing BAL’s decision on these two aspects, it is worth making the following observations:

- This decision by BAL appears to be based at least in part on the volume of positive responses from a sub-set of respondents. This is not an environmental factor, and appears to give greater weight to the responses from “formal” consultees than those of “individual community” respondents.
- Based on BAL’s methodology Option 6X would have offered the same degree of “relief” to Barston as Option 5, and would then have offered greater relief to Balsall Common than Option 5.
- The decision criteria used by BAL at that point were not based on any measured or modelled noise impacts – they are based entirely on an assumption that the difference in SID nominal track at Barston between Option 5 & 6 would result in a noise benefit for Barston from choosing Option 5.

Appendix 1 of this report offers more detail on the possible criteria on which a decision could be made between the southbound Options, and Appendix 2 sets out a summary of impacts.

#### **CAA Consideration of Original Preference of Option 5**

One of the reasons for BAL preferring Option 5 was the expected “relief” that it would offer Barston. The route passes to the east of Barston (though not by much) whereas Option 6 shows the SID passing directly over Barston.

Upon receipt of the airspace change proposal, our own analysis of the expected difference in noise impact at Barston from these two Options showed that there was likely to be very little difference in the noise impact at Barston. The noise modelling revealed that aircraft on the Option 5 SID would be less than 1dBA lower than equivalent aircraft on the Option 6 SID at Barston. Such a difference would not be perceptible. That being the case, the basis for favouring Option 5 over Option 6 was weakened.

We also undertook a similar comparison for a location on the westside of Balsall Common. This revealed that aircraft on the Option 6 SID would be almost 7dBA less than equivalent aircraft on the Option 5 SID. This indicated that despite the fact that Balsall Common is further from the airport and

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therefore generally experiences lower noise levels than Barston simply because aircraft would be higher at Balsall Common than at Barston, the community at Balsall Common could have a much larger (and perceptible) benefit from Option 6 than Barston would from Option 5.

#### **Noise and track-keeping results from the trial of Options 5 & 6**

The details of the trial and the findings are outlined in Appendix 3. In general the results support the original conclusion that the impact at Barston in terms of the difference in noise levels between Options 5 & 6 is small and would be imperceptible. Whilst noise levels generally in Balsall Common and Balsall Street East are lower than in Barston, a larger and perceptible difference in noise levels would be achieved by selecting Option 6 in preference to Option 5.

<b>6.</b>	<b>Emissions</b>	<b>Status</b>
<b>6.1</b>	<b>Has the impact on CO<sub>2</sub> emissions been adequately assessed?</b>	<b>Yes</b>

The CO<sub>2</sub> emissions analysis was undertaken by NATS using its own KERMIT model on behalf of BAL.

The anticipated reductions in total annual emissions are small:

- approx. 1,300 tonnes of CO<sub>2</sub> in the year of implementation, but based upon “worst case” (i.e. very optimistic) traffic forecasts;
- approx 700 tonnes of CO<sub>2</sub> based on actual traffic volumes in 2011

reflecting the fact that the changes to the SIDs (for Options 4 and 5) have a very small reduction in track mileage.

This analysis reflects the impact of Option 4 for the Northbound SIDs but only reflects Option 5 for the southbound SIDs. Therefore there is no information that allows a comparison between Option 6 and the current southbound SIDs, or against Option 5.

In the absence of any analysis but based upon a visual comparison of the designed SIDs for Option 6, any reduction in emissions resulting from Option 6 would be likely to be even less than that for Option 5 and may even be neutral when compared with the current conventional SID. On the basis of the scale of the impact upon CO<sub>2</sub> emissions, and the fact that the overriding environmental consideration for this ACP was the noise impact, the absence of an assessment of Option 6 is not critical in this instance.

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Since the submission of the original proposal by BAL to the CAA, the DfT has issued new guidance<sup>2</sup> to the CAA that clarifies that the noise impact is the priority environmental impact to consider rather than CO<sub>2</sub> emissions for airspace changes that affect aircraft below 4,000ft. For that reason, the minor CO<sub>2</sub> benefit that Option 5 offers over Option 6 should not outweigh possible noise benefits that the two southbound Options may offer.

<b>6.2</b>	<b>Has the impact on CO<sub>2</sub> emissions impact been adequately presented in the consultation and the submitted proposal?</b>	<b>Yes</b>
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As noted above, the impact of Option 6 on CO<sub>2</sub> emissions was neither assessed nor commented upon in the supplementary consultation material. Normally this omission could be deemed to affect the ability of consultees to make a fully informed comparison of the options. However, in the case of this proposal, the impact on CO<sub>2</sub> emissions is not only a minor factor, but the impact of Option 6 on CO<sub>2</sub> emissions is likely to be even less beneficial than Option 5, and potentially no better than the current situation.

<b>7.</b>	<b>Local Air Quality</b>	<b>Status</b>
<b>7.1</b>	<b>Has the impact on Local Air Quality been adequately assessed?</b>	<b>Yes</b>

The airport is within the boundaries of Solihull Metropolitan Borough Council, which has no notified Air Quality Management Areas (AQMAs). The proposal does not affect traffic below 1,000ft, the airport does not sit within or adjacent to any AQMAs and therefore no Local Air Quality (LAQ) assessment is required by CAP725.

The sponsor does note that the impact on LAQ was considered by Solihull MBC as part of the planning application for the runway extension and that the Council's conclusion was that the extension would be likely to have a negligible impact beyond the airport.

<b>7.2</b>	<b>Has the impact on Local Air Quality been adequately presented in the consultation and the submitted proposal?</b>	<b>Yes</b>
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The consultation and proposal both highlight the findings of the LAQ assessment undertaken as part of BAL's planning application for the runway extension, but does not explicitly explain why a similar assessment was not necessary for the ACP. However, for the reason stated in 7.1 above, no assessment would be required for this proposal.

<sup>2</sup> DfT, Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, January 2014

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<b>8.</b>	<b>Tranquillity</b>	<b>Status</b>
<b>8.1</b>	<b>Has the impact on tranquillity been adequately considered?</b>	<b>Yes</b>

BAL considered the impacts upon both tranquillity and visual intrusion, with reference to both SSSIs (up to 3,000ft) and AONBs and National Parks (up to 7,000ft). In terms of these impacts, the CAA would typically only expect sponsors to consider AONBs and National Parks. The addition of SSSIs is useful in terms of demonstrating consideration of any impacts upon biodiversity.

Four SSSIs are currently overflowed by traffic on the conventional SIDs and will continue to be overflowed by traffic on the new RNAV SIDs.

There are no AONBs or National Parks overflowed by traffic on the conventional SIDs below 7,000ft. The Cotswolds AONB is overflowed above 10,000ft but the pattern of traffic using these SIDs at that height will be similar to existing traffic; the AONB is also currently overflowed by other traffic and will continue to be so. On that basis the sponsor has concluded that these changes will have no impact on tranquillity or visual intrusion and this conclusion is reasonable on that basis.

<b>8.2</b>	<b>Has the impact on tranquillity been adequately presented in the consultation and the submitted proposal?</b>	<b>Yes</b>
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A statement on tranquillity and visual intrusion was included with both the consultation material and the proposal documentation.

<b>9.</b>	<b>Visual Intrusion</b>	<b>Status</b>
<b>9.1</b>	<b>Has the impact of visual intrusion been adequately considered?</b>	<b>Yes</b>

Taking into account the nature of this proposed change, the impact upon visual intrusion has been adequately considered. Refer to the comments in 8.1 above.

<b>9.2</b>	<b>Has the impact of visual intrusion been adequately presented in the consultation and the submitted proposal?</b>	<b>Yes</b>
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A statement on tranquillity and visual intrusion was included with both the consultation material and the proposal documentation.

<b>10.</b>	<b>Biodiversity</b>	<b>Status</b>
<b>10.1</b>	<b>Has the impact upon biodiversity been adequately considered?</b>	<b>Yes</b>

Taking into account the nature of this proposed change, the impact upon biodiversity has been adequately considered. Consideration was given to possible impacts upon Sites of Special Scientific Interest (SSSIs) – see comments in 8.1 above.

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<b>10.2</b>	<b>Has the impact upon biodiversity been adequately presented in the consultation and the submitted proposal?</b>	<b>Yes</b>
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There are no specific statements on the impact on biodiversity, but considering the nature of this proposal, this absence is acceptable. The consultation and proposal material do make reference to two SSSIs to the south of the airport, but these are already overflown by aircraft on approach to Runway 33.

<b>11.</b>	<b>Continuous Descent Approaches</b>	<b>Status</b>
<b>11.1</b>	<b>Has the implementation of, or greater use of, CDAs been considered?</b>	<b>No</b>

This proposal does not offer opportunities for greater use of CDAs as this proposal only affects departing aircraft rather than arriving aircraft.

<b>12.</b>	<b>Impacts Upon National Parks and/or AONBs</b>	<b>Status</b>
<b>12.1</b>	<b>Does the proposed change have an impact upon any National Parks or Areas of Outstanding Natural Beauty (AONBs)?</b>	<b>No</b>

The statutory purposes of National Parks are to conserve and enhance their natural beauty, wildlife, and cultural heritage and to promote opportunities for the understanding and enjoyment of their special qualities by the public. The statutory purpose of AONBs is to conserve and enhance the natural beauty of their area. In exercising or performing any functions in relation to, or so as to affect, land in National Parks and AONBs, the CAA is required to have regard to these statutory purposes under s.19 and Schedule 2 of the Civil Aviation Act 1982. This duty was re-stated in the revised Air Navigation Guidance issued in 2014.

This duty was also reiterated in the Aviation Policy Framework (March 2013) which stated “the CAA has legal duties to have regard to the purposes of National Parks and Areas of Outstanding Natural Beauty and must therefore take these into account when assessing airspace changes.”

Whilst recognising this duty it is also true that flights over National Parks and AONBs are not prohibited by this legislation as a general prohibition against over-flights would be impractical.

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In the case of this proposal, the change does not affect traffic over AONBs or National Parks, other than potentially some flights above 10,000ft over the Cotswolds AONB. At this altitude, aircraft would no longer be on a SID (the SIDs terminate at 6,000ft). In addition, any potential change to traffic at 10,000ft and above over the AONB would be deemed not significant in terms noise or tranquillity, in accordance with the DfT's current Guidance.<sup>3</sup>

<b>13.</b>	<b>Traffic Forecasts</b>	<b>Status</b>
<b>13.1</b>	<b>Have traffic forecasts been provided, are they reasonable, and have these been used to reflect the future impact of the proposal?</b>	<b>Yes</b>

The sponsor has opted to use the traffic forecasts from the Planning Application for the runway extension (2009) – even though these traffic volumes have not been achieved – and therefore the forecasts can be taken as showing a “worst case” forecast (i.e. more optimistic) rather than a more realistic one. If anything this has exaggerated the noise impact as illustrated by the noise contours for the forecast years (2013 and 2022). The CAA agreed it was content for these forecasts to be used (partly on the grounds of consistency between the Planning Application and the ACP) once this aspect was explained – and this was indeed set out in the consultation material. As an illustration, traffic volumes in 2012 were less than in 2007. Despite recent strong passenger growth to a record of 10.2 million for 2015, passenger numbers remain below those forecast for 2013 and 2022.

Whilst changes to the SIDs themselves do not result in an increase in traffic volumes or a change in aircraft types, the runway extension is expected to result in additional traffic and an increase in larger aircraft types. The consultation explains that “It should be noted that without the Runway Extension, the forecasts, in terms of the number of ATMs will be smaller due to the limitations of runway length. There would also be a slightly different aircraft mix, with fewer large aircraft types in operation.”

<b>14.</b>	<b>Consultation</b>	<b>Status</b>
<b>14.1</b>	<b>If undertaken, has evidence of non-aviation stakeholder consultation been provided?</b>	<b>Yes</b>

Copies of consultation correspondence with non-aviation stakeholders has been provided.

The consultation was launched on 11 Jan 2013, and the consultation on Option 6 was launched on 12 April 2013. The consultation closed on 17 May 2013, which allowed an extension for the consideration of Option 6.

Option 6 was developed in response to requests by respondents to try and replicate the existing “Hampton Turn” which features in the conventional southbound SIDs.

<sup>3</sup> DfT, Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions, January 2014

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Consultation was undertaken with “formal” stakeholders (industry and community representatives) but there were also a number of responses from individuals that were not directly consulted.

<b>14.2</b>	<b>Has account been taken of the results of the environmental factors raised by consultees or has evidence been provided to indicate why this has not been possible?</b>	<b>Yes</b>
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Yes – the consideration of Option 6X was in large part as a response to consultee feedback.

<b>15.</b>	<b>Compliance with CAP 725</b>	<b>Status</b>
<b>15.1</b>	<b>Have all environmental assessment requirements specified in CAP 725 been met, where applicable?</b>	<b>Yes</b>

Yes – though the comments on CO<sub>2</sub> emissions for Option 6 at Section 6 above should be noted.

<b>16.</b>	<b>Other Aspects</b>	<b>Status</b>
<b>16.1</b>	<b>Are there any other aspects of the ACP, that have not already been addressed in this report, that may have a bearing on the environmental impact?</b>	<b>No</b>

None

<b>17.</b>	<b>Recommendations</b>	<b>Status</b>
<b>17.1</b>	<b>Are there any recommendations for the Post-Implementation Review?</b>	<b>Yes</b>

Following the trial, but separate for this Airspace Change Proposal, BAL has committed to:

- Investigating the impact of raising the ceiling altitudes of the NPR to 4000 feet. This would be likely to reduce the number of people and households directly overflowed by aircraft between 3000-4000 feet, though it is also likely to result in concentration of traffic at that altitude meaning some locations may be overflowed more often. BAL will assess the impact of this with its Air Traffic Control but separately from this Airspace Change Proposal. The trialling of this altitude increase has been completed by BAL; the next stage would be to implement this increase which BAL has indicated it intends to do upon a final decision of this proposal.
- Investigate the Noise Abatement Departure Procedures (NADP) used at the airport by airlines. NADP are a specification of thrust settings, climb profiles and flap settings used by airlines which can provide noise benefits to some communities but have the potential to create a noise disbenefit to others communities.

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It is recommended that the progress on these commitments is reviewed as part of the PIR.

<b>18.</b>	<b>Government Approval</b>	<b>Status</b>
<b>18.1</b>	<b>Is the approval of the Secretary of State for Transport required in respect of the environmental impact of the airspace change proposal?</b>	<b>No</b>

Birmingham is not a designated airport and so for that reason changes to NPRs do not need to be referred to the Secretary of State. Equally, the key noise measures ( $L_{eq}$  contours and 90 SEL footprints) show no changes as a result of the proposed SIDs. Whilst there is evidence that the change is likely to adversely affect some residents, the impacts can reasonably be considered to not be significant enough to require approval by the Secretary of State.

<b>19.</b>	<b>Conclusions</b>	
<b>19.1</b>	<b>Can an overall environmental benefit be demonstrated (or justified/supported)?</b>	<b>No</b>

No, an overall environmental benefit is not demonstrated, though the rationale for the proposed change was not that a benefit would be achieved. Whilst the sponsor has sought to address and minimise the environmental impacts, other factors (e.g. design criteria for the new SIDs) have restricted the scope to do so.

### Conclusions

#### Noise:

- The options for both northbound and southbound are indistinguishable from the current SIDs and from each other on the basis of the  $L_{eq}$  contours and 90 SEL footprints. Knowing that, there are several supplementary methods by which the impact of the Options could be compared. These are outlined in this report and the results of most would favour Option 6 over Option 5.
- The relief offered to Barston if Option 5 is implemented instead of Option 6 is likely to be imperceptible.
- The relief offered to Balsall Common and Balsall Street East if Option 6 is implemented instead of Option 5 would be perceptible.

#### CO<sub>2</sub> Emissions:

- The impact on CO<sub>2</sub> emissions is small, and the focus of the design has been to address the noise impact rather than the emissions impact. The combined impact of Options 4 and 5 is a small reduction in emissions, but as noted in Section 6 above, the impact of Option 6 (and also Option 6X) was not assessed.

#### Other impacts:

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- There is no expected impact on Local Air Quality
- There is no expected impact on Tranquillity, Visual Intrusion or Biodiversity.

<b>Outstanding Issues</b>		
Serial	Issue	Action Required

<b>Additional Compliance Requirements (to be satisfied by Change Sponsor)</b>	
Serial	Requirement

<b>Environmental Assessment Sign-off/Approvals</b>			
	Name	Signature	Date
Environmental Assessment completed by [REDACTED]	[REDACTED]	[REDACTED]	17 November 2015
Environmental Assessment approved by [REDACTED]	[REDACTED]	[REDACTED]	31 March 2016

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## Appendix 1 – Comparison of potential decision criteria for Southbound SIDs

Accepting that the impacts illustrated by both the  $L_{eq}$  contours and the 90 SEL footprints offer no distinction between Options 5 & 6, on what other environmental basis is it reasonable to make a decision?

### Possible use of 80dBA SEL footprints as a decision criterion?

Whilst there is no established dose-response relationship for these footprints, they are a requirement of CAP725 and therefore they were developed and presented by BAL as part of the consultation. They do portray an impact of noise, and had already been modelled, so could they have been used as a means of deciding between Options 5 & 6, in the absence of a difference being shown based on  $L_{eq}$  contours or 90dBA SEL footprints?

BAL chose not to use the 80 SEL footprints as a basis for choosing between options for the following reason:

“CAP725 provides no narrative to assess the impact at 80dB(A), (such as the 57dB(A) LAeq as the onset of community annoyance, or 90 dB(A) SEL as the onset of sleep disturbance), therefore the SEL at 80dB(A) has not formed part of the decision making process.”

Based solely on the 80 SEL footprints, Option 5 has a greater noise impact than Option 6. Option 6X was not consulted upon and therefore 80 SEL footprints were not produced for that option, so it is not possible to categorically state whether it is better or worse than either Option 5 or 6 on the basis of 80 SEL footprints.

### The new 2km wide NPR swathe

Undertaking a count of households within the new NPR swathe (2km wide rather than the existing 3km wide, and ending at 3,000ft) is not an approach that is suggested in CAP725, but arguably it presents a way of portraying the number of households (and by implication, the number of people) that have the potential to be overflowed. However, as a measure, it gives no indication of the noise impact – it assumes that all households are equally affected no matter how far they are from the airport or how far from the centreline.

Based on the count of households in this swathe, Option 6 has the smallest number of households, followed by Option 6X and then Option 5 has the largest number of households.

### The 200m “Centreline” as a measure of impact.

Whilst the use of a 200m wide swathe around the SID is a useful indication of which properties are likely to be most directly overflowed, particularly if the aircraft are using RNAV, it is not the best measure of households that will experience a noise impact. A better measure is the 2km swathe

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that represents the new NPR swathe because even though aircraft flying a PRNAV SID are likely to be contained well within the NPR swathe, it offers a better representation than the 200m Centreline of the area that would experience a noise impact from the departing aircraft, and it is the NPR swathe boundary that will be used for monitoring track compliance of departing aircraft.

The number of households within the 200m and 2km swathes was used by BAL to compare Option 6X with Option 5 & 6. These measures have not then been used by BAL to decide between Option 5 & 6.

Based on the count of households directly below this centreline, Option 5 has the smallest impact. Options 6 and 6X have a similar, larger impact as represented by the number of households.

#### Others

In choosing Option 5, BAL referred to the existing DfT Air Navigation Guidance (2002) at the time that the consultation and proposal were made which advised:

“The design of departure procedures closer to an airport, where aircraft are lower and noise levels are higher, should generally be given greater weight over their design further afield in circumstances where a trade-off between the two cannot be avoided. However, the relative size of the populations affected in such cases should also be weighed in the balance, along with the differences in noise levels at points along the route.”

And for that reason, and after deciding not to use 80 SEL footprints, BAL chose the option where the SID does not directly overfly Barston (Option 5). However, it should be noted that Option 6X matches the design of Option 5 at the point the SID passes Barston and therefore would have the same impact on Barston whilst offering greater relief to Balsall Common than Option 5, but less relief than Option 6.

One final factor that could be considered to favour Option 6 over Option 5 is the following observation made in the supplementary consultation document for Option 6:

“A consequence of Option 6 is that the departure route splits from the arrival route for Runway 33 (a straight in) at an earlier point, therefore reducing the time that those properties beneath the extended centreline of the runway are potentially overflown.”

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## Appendix 2

### Deciding between options – a summary of Options 5, 6 & 6X (Southbound SIDs)

	L <sub>eq</sub> Contours	90 dBA SEL footprint	80 dBA SEL footprint	2km wide NPR swathe <sup>4</sup> (households)	200m wide swathe <sup>5</sup> , i.e. the “centreline” (households)	Other
<b>Option 5</b>	No difference between Option 5 or 6.	No difference between Option 5 or 6.	For both the DTY SID and the CPT/COWLY/WCO SID, the footprint for Option 5, for both the noisiest and most frequent aircraft types contains a larger population and larger number of households than the equivalent footprints for Option 6. On this basis, Option 5 is worse than Option 6.	1305	45	The sponsor identified two reasons for preferring Option 5 over Option 6 in its original proposal once other factors (Leq contours & 90 SEL footprints) were discounted because they showed no difference <sup>6</sup> : <ul style="list-style-type: none"> <li>• “The greater support from the formal consultees</li> <li>• Marginally better environmental outcome, as the area closest to the Airport, which has the potential to be directly overflowed is the village of Barston. Option 5 offers marginally greater relief to Barston than Option 6.”</li> </ul>
<b>Option 6</b>				648	81	
<b>Option 6X</b>	Not assessed using L <sub>eq</sub> contours – but unlikely to differ from either Option 5 or 6	Not assessed using 90 SEL footprints – but unlikely to differ from either Option 5 or 6	Not assessed so unable to compare with Option 5 and 6 on this measure.	732	82	Not consulted upon so support from consultees is not known. This option has the same design as Option 5 at the point it passes Barston.

<sup>4</sup> On the basis of the 2km NPR swathe, Option 5 is worse than Option 6 or 6X. Option 6 affects the least number of households.

<sup>5</sup> On the basis of the 200m centreline, Option 5 overflies the least number of households. There is negligible difference between Options 6 and 6X.

<sup>6</sup> Methodology outlined in the sponsor’s document entitled “Deciding between Option 5 and Option 6”.

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Use of the “Centreline” as a measure of impact.

Whilst the use of a 200m wide swathe around the SID is a useful indication of which properties are likely to be most directly overflown, particularly if the aircraft are using RNAV, it is not the best measure of households that will experience a noise impact. A better measure would be the 2km swathe that represents the new NPR swathe because even though aircraft are likely to be contained well within the NPR swathe, it offers a better representation of the area that would experience a noise impact from the departing aircraft, and it is also the boundary that will be used for monitoring track compliance of departing aircraft.

Impact on Hampton in Arden

All three options (5, 6 & 6X) make no difference to Hampton in Arden – at that point in the route, the SIDs are all straight-out from the airport and each option would have the same noise impact on that community.

Impact on Barston

- The SID for Option 5 does not pass directly over Barston, but still passes close, on the eastside of the village such that it is still within the 2km NPR swathe, and close to the 200m centreline swathe.
- The SID for Option 6 passes directly over Barston.
- The SID for Option 6X is in the same position as Option 5 at the point it passes Barston.

Impact on Ballsall Street & Ballsall Common

Both communities are further from the airport than Barston – Ballsall Street is approximately 2km further southeast than Barston.

- The SID for Option 5 is the route that takes traffic closest to Ballsall Street & Ballsall Common. Ballsall Street is just to the east of the 200m centreline swathe, and well within the 2km NPR swathe. Properties on the westside of Ballsall Common are within the 2km swathe.
- The SID for Option 6 is the option that takes traffic furthest from Ballsall Street & Ballsall Common. Both communities would be outside a 2km NPR swathe.
- The SID for Option 6X lies between Option 5 and Option 6. The 200m centreline is further from Ballsall Street than Option 5 but not as far as Option 6. Ballsall Street is within the 2km NPR swathe, but almost all of the properties in Ballsall Common are beyond the 2km swathe.

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## Appendix 3

### BAL Trial of Options 5 & 6 - Notes

As part of its consideration of the original proposal submitted by BAL, the CAA undertook noise modelling of the expected impacts at Barston and Balsall Common. This was undertaken for two main reasons:

1. The standard noise metrics of a 57 dBA  $L_{eq}$  noise contour and a 90 dBA SEL noise footprint showed no difference between Options 5, 6 or 6X, and therefore offered no basis on which to favour one Option over another.
2. To check the assumption made by BAL that Option 5 would offer a benefit to Barston, the closest community to the airport that could be taken account of within the new SID design.

### Initial Noise Modelling Undertaken by CAA

The modelling was undertaken when the original proposal was submitted to the CAA and was based on two typical aircraft types (B733 and B762) that fly from Birmingham Airport. The modelling used the vertical profile of the designed SID to determine expected heights at the two locations. The results of this modelling are shown in the tables below.

**Table 1: Departure Sound Exposure Levels (SEL) in Barston**

	<b>Option 5</b>	<b>Option 6</b>	<b>Difference</b>
<b>B733</b>	83.4	84.3	+0.9
<b>B762</b>	85.8	86.6	+0.8

**Table 2: Departure Sound Exposure Levels (SEL) at junction of Barston Street and Station Road, Balsall Common**

	<b>Option 5</b>	<b>Option 6</b>	<b>Difference</b>
<b>B733</b>	80.7	73.9	-6.8
<b>B762</b>	83.7	76.9	-6.8

This modelling indicated that the difference in noise levels at Barston between Options 5 & 6 (and by default also Option 6X because its path is between Options 5 & 6) would be imperceptible. In contrast, the difference at Balsall Common would be greater, with Option 6 offering a perceptible benefit over Option 5.

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On the basis that the results indicated that Barston would receive no meaningful noise benefit from either Option 5, Option 6 or Option 6X, BAL agreed that a trial would enable the collection of actual noise data to determine if this finding was reasonable.

### **Trial – Noise monitoring results**

The methodology for the trial was developed by BAL and was then reviewed and approved by the CAA.

BAL explained that the purpose of the trial was “To assess the difference in the noise climate in the operation of both Options 5 and 6 on the communities of Barston and Balsall Street East to determine whether or not the difference between both options was significant in each community. Significance was defined as a difference of more than 3dB(A).”

A portable noise monitor was placed alternately in Barston and in Balsall Street East to record aircraft using the SIDs for Options 5 and 6. The results of the trial are set out in BAL’s document “Trial of southbound R-NAV SIDs for Runway 15”.

The trial was intended to run from 1 May 2014 until 1 November 2014 with Options 5 and 6 alternating on a monthly basis. However, upon commencement of the Option 6 SIDs in June 2014 it became apparent that the turn point was not in the correct location. The Option 6 design was corrected and the adjusted Option 6 SID was introduced on 13 November 2014. In order to achieve a full six-month trial i.e. three months per option, the trial was extended to 13 February 2015 with the agreement of the CAA.

BAL took the decision to continue noise monitoring whilst the incorrect version of Option 6 was being flown. In effect, this was similar to Option 6X from the original proposal. BAL has also assessed the impact of the incorrect Option 6 (i.e. Option 6X) and it was found that this would provide no benefit to Barston but would reduce any benefit for Balsall Street East.

The ACP also introduces a new SID for northbound departures from Runway 15. This has also been in trial owing to it being part of the wider ACP. The trial has provided BAL with the opportunity to review the performance of aircraft flying this route.

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**Comparison of average noise levels (Lmax) by aircraft type between Option 5 and 6 for Barston (as measured by BAL)**

Aircraft Type	Option 5 (1L)			Option 6 (2Y)			Max Level Difference
	Number of Movements	Number of NMT Events	Average Max Level	Number of Movements	Number of NMT Events	Average Max Level	
B738	135	134	74.7	90	89	75.5	0.8
B752	133	133	72.4	16	16	74.2	1.8
E170	133	129	73.1	126	122	72.9	-0.2
A321	92	91	74.9	43	43	76.9	2.0
DH8D	88	39	67.2	90	37	67.5	0.3
A320	61	61	74.0	53	50	73.6	-0.4
A319	59	58	71.7	33	33	72.8	1.1
E190	57	57	73.9	64	62	75.0	1.1
CRJ9	34	32	68.6	51	44	69.1	0.5
B77W	25	25	75.0	22	22	77.5	2.5
F100	18	17	72.3	18	18	73.2	0.9

The results of the noise monitoring at Barston show that whilst there are typically small differences between Options 5 and 6, with Option 6 resulting in greater noise levels, the difference is less than 3dBA and would not be perceptible at that location.

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**Comparison of average noise levels (Lmax) by aircraft type between Option 5 and 6 for Balsall Street East (as measured by BAL)**

Aircraft Type	Option 5 (1L)			Option 6 (2Y)			Max Level Difference
	Number of Movements	Number of NMT Events	Average Max Level	Number of Movements	Number of NMT Events	Average Max Level	
B738	78	76	72.7	76	58	68.1	-4.6
E170	76	75	71.1	162	63	67.4	-3.7
A321	65	64	73.5	45	39	69.0	-4.5
B752	57	53	71.7	37	23	68.7	-3.0
A320	34	33	71.9	64	37	67.8	-4.1
E190	30	29	73.3	86	59	68.5	-4.8
A319	18	18	70.8	58	33	67.9	-2.9
B77W	14	14	74.9	34	33	70.5	-4.4

The results of the noise monitoring at Balsall Street East show that the typical differences between Options 5 and 6 are greater than 3dBA, with Option 5 resulting in greater noise levels. The difference in these noise levels is likely to be perceptible at that location. It is worth noting though that the differences recorded are not as large as those anticipated by the noise modelling undertaken pre-trial by the CAA.

**Trial – NPR track-keeping**

BAL requires aircraft on departure to fly along Noise Preferential Routes (NPRs) until they have reached 3000 feet. The new NPRs introduced during the trial were coincident with the SIDs for Options 5 and 6 and BAL. To monitor track keeping, a swathe is defined around a NPR. BAL chose to reduce the width of the existing NPR swathe from 1.5km to 1km either side of the NPR to reflect the improved accuracy expected to be achieved by the RNAV SIDs.

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Track-keeping performance refers to the ability of aircraft to fly within the NPR swathe until they have reached 3000 feet altitude. During the trial each departure track was analysed and any aircraft leaving the NPR swathe below 3000 feet was recorded as 'off track'.

The results are:

- Option 5 = 99.75% on track
- Option 6 = 99.93% on track.

The track-keeping results show that reducing the NPR swathe from 3km to 2km is feasible and achievable, and BAL proposes to adopt the 2km swathe for whichever Option is implemented.

In addition, BAL is prepared to commit to:

- Investigating the impact of raising the ceiling heights of the NPR to 4000 feet. This would be likely to reduce the number of people and households directly overflowed by aircraft between 3000-4000 feet, though it is also likely to result in concentration of traffic at that height meaning some locations may be overflowed more often. BAL will assess the impact of this with its Air Traffic Control but separately from this Airspace Change Proposal.
- Investigate the Noise Abatement Departure Procedures (NADP) used at the airport by airlines. NADP are a specification of thrust settings, climb profiles and flap settings used by airlines which can provide noise benefits to some communities but have the potential to create a noise disbenefit to others communities.

It is recommended that these two commitments are reviewed for progress as part of the Post-Implementation Review.

### **Further Noise Modelling Undertaken by the CAA**

On receipt of the trial results, the CAA undertook further noise modelling to check if the findings from BAL's noise monitoring appear reasonable, using the actual radar tracks produced by the trial. The noise modelling also sought to test:

- If there is a meaningful difference in noise levels between the DTY SIDs and the other SIDs from Runway 15 (i.e. CPT/COWLY/WCO) between Options 5 and 6.
- If there is a meaningful difference in noise levels between the "heavy" aircraft types and all other aircraft types, between Options 5 and 6.

The results in the tables below:

- Used actual radar data to determine mean tracks and vertical profiles.
- Are average  $L_{max}$  values

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Meer End and Fen End were chosen (based on the radar tracks) as locations that might experience a difference in noise levels from the DTY vs CPT/COWLY/WCO SIDs.

<b>Aircraft Type = B737-300 (most frequent type when proposal first submitted)</b>						
	<b>DTY</b>			<b>CPT/COWLY/WCO</b>		
	Option 5	Option 6	Difference	Option 5	Option 6	Difference
Balsall Common	71.5	62.7	-9	70.4	62.2	-8
Barston	73.5	75.5	+2	73.7	75.5	+2
Fen End	66.8	70.6	+4	69.7	70.0	0
Meer End	68.8	66.0	-3	68.6	60.6	-8

<b>Aircraft Type = B737-800 (most frequent type currently at airport)</b>						
	<b>DTY</b>			<b>CPT/COWLY/WCO</b>		
	Option 5	Option 6	Difference	Option 5	Option 6	Difference
Balsall Common	67.1	59.8	-7	66.2	59.4	-7
Barston	69.8	71.4	+2	69.9	71.4	+2
Fen End	63.2	66.0	+3	65.3	65.5	0
Meer End	64.0	61.6	-2	63.9	57.4	-7

<b>Aircraft Type = B777-300ER (noisiest type)</b>						
	<b>DTY</b>			<b>CPT/COWLY/WCO</b>		
	Option 5	Option 6	Difference	Option 5	Option 6	Difference
Balsall Common	70.2	62.6	-8	69.3	62.2	-7
Barston	73.0	74.6	+2	73.2	74.6	+1
Fen End	66.3	69.4	+3	68.7	68.9	0
Meer End	67.4	64.8	-3	67.2	60.2	-7

**Key points:**

- There is no difference between DTY and CPT/COWLY/WCO at any other of the selected locations than at Fen End (where DTY flights using Option 5 have a smaller impact than the same SID using Option 6) and at Meer End (where CPT/COWLY/WCO flights using Option 6 have a smaller impact than flights on the same SID using Option 5).

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- Balsall Common is the location that experiences the greatest benefit, and achieves this through Option 6.
- Barston does not experience a perceptible difference between Options 5 and 6, or between CPT and CPT/COWLY/WCO, including “heavy” aircraft (i.e. the B777-300ER in the table above).

### **Conclusions**

- In the same way that there is no meaningful (i.e. perceptible) difference in noise levels for Barston between Option 5 and Option 6, there would also be no difference at Barston for an option that lies somewhere between the nominal track of those two options, i.e. Option 6X. Therefore none of the Options (5, 6 or 6X) provides a benefit in terms of noise for Barston.
- Option 6 would provide a meaningful noise benefit to Balsall Common and Balsall Street East over Option 5.
- The sample sizes of noise events recorded by BAL during the trial are adequate to ensure that the average results are reasonable.
- The updated noise-modelling results are consistent with the noise-monitoring results from the trial, whilst noting that the modelling results reflect a larger benefit (at Balsall Common) than the monitoring results reflect (at Balsall Street East).