

# CAA Environmental Assessment

Title of airspace change proposal	London Heathrow - Arrival Procedures
Change sponsor	Heathrow Airport Limited (HAL)
Project no.	ACP-2017-49
Account Manager	

**Instructions**

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

- Yes
- No
- Partially
- N/A

Please highlight the 'status' cell for each question using one of the three colours to illustrate if it is:

resolved Green not resolved Amber not compliant Red

**1. Introduction**

This CAA Environmental Assessment describes the considerations relevant for Heathrow Airport Limited's (HAL) Airspace Change Proposal (ACP) for the permanent adoption of 3.2° Area Navigation (RNAV)<sup>1</sup> Slightly Steeper Approaches (SSA). The sponsor states that the permanent adoption of these steeper approaches is a "*small incremental step*" to reducing the airport's noise impact.

The sponsor's preferred option to enable the airport to operate steeper approaches is to implement 3.2° RNAV approaches which would be available for airline operators to use alongside the current conventional 3.0° Instrument Landing System (ILS) approaches, for those aircraft equipped to fly the approaches. This ACP is contained within Heathrow's existing Controlled Airspace (CAS) structures and it does not change the number of aircraft arriving at Heathrow, the way in which the airspace is used, or which airlines are able to operate to/from Heathrow.

The sponsor has previously conducted two live trials, running between 17/09/15 – 16/03/16 and 25/05/17 – 11/10/17, in order to investigate these RNAV procedures. Since the second trial in 2017, these procedures have been in operation at Heathrow as a result of the CAA permitting their use on

<sup>1</sup> For the purpose of this ACP HAL have used the term 'RNAV Global Navigation Satellite Systems (GNSS) Approaches'. The new industry standard term for these procedures is Required Navigation Performance (RNP) Approaches.

a temporary basis whilst a permanent ACP is submitted.

During the trials, no more than 2% of all arrivals operated these approaches and since the trials the number of airlines operating these approaches has reduced. 2019 data shows that usage has reduced to 0.6%. The sponsor has assumed 2019's usage for future years within the environmental assessments. The sponsor identifies that the reduction from 2% to 0.6% is most likely due to SSA being promoted during the trials to enable evidence gathering. It should be noted that due to Air Traffic Control (ATC) workload constraints, no more than 2% of arrivals operating SSA is considered likely.

2. Nature of the Proposed Change		Status
2.1	Is it clear how the proposed change will operate, and therefore what the likely environmental impacts will be?	Yes
	<p>This ACP is scaled as Level 1 as it is a change that has the potential to alter traffic patterns below 7,000 feet over an inhabited area. For a Level 1 change a sponsor is required to consider the impacts of the proposed change upon noise, local air quality, CO<sub>2</sub> emissions, tranquillity and biodiversity. If approved, this ACP would result in a change to the vertical approach profile of aircraft from 3.0° to 3.2°, leading to aircraft being slightly higher for longer. The 3.2° RNAV SSAs are currently in operation at Heathrow and data collected by HAL shows 1,378 flights out of a total 238,110 arrivals (0.6%) used the procedure in 2019. This ACP is not proposing to change existing lateral flight paths nor is it proposing to change the number of aircraft operating at the airport.</p> <p>Data collected from the trials showed an average reduction in noise of 0.51 dBA<sup>2</sup> Sound Exposure Level (SEL) per flight when compared to the conventional 3.0° approaches. In addition, the sponsor calculated a small reduction in average engine thrust, which could result in a reduction in fuel burn and hence provide CO<sub>2</sub> and local air quality benefits. However, it is considered that the environmental impact as a result of the reduced thrust is negligible. In addition, it is unlikely that this ACP will impact upon tranquillity or biodiversity, as this ACP will not introduce a change to existing lateral flight paths nor increase the number of air traffic movements.</p> <p>It is therefore considered that this ACP will provide an overall positive impact in terms of noise, however, this impact can be considered imperceptible on the ground and it is unlikely that there will be any other adverse environmental impacts as a result of this ACP.</p>	

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<sup>2</sup> Calculated by HAL using the differences in average measured aircraft SEL between approaches using the 3.2° RNAV SSA and the existing 3.0° ILS approach measured at Noise Monitoring Terminals (NMT) NMT129, NMT130 and NMT131.

3. Secretary of State Call-in Noise Criterion		Status
3.1	<p><b>Is the proposal likely to meet the Secretary of State's criterion for call-in on noise impacts? If yes, has the additional assessment on that criterion been undertaken and what are the results? If no, what is the rationale for that conclusion?</b></p> <p><i>The criterion, as set out in the DfT's Air Navigation Guidance (2017)<sup>3</sup> is that the proposed airspace change could lead to a change in noise distribution resulting in a 10,000 net increase in the number of people subjected to a noise level of at least 54 dB<sup>4</sup> <u>as well as</u> having an identified adverse impact on health and quality of life.<sup>5</sup></i></p>	No
	<p>The SSAs proposed by HAL are expected to provide noise benefits, resulting in an average SEL noise reduction of 0.51 dBA for the 0.6% of flights that operate 3.2° RNAV approaches. The ACP has been assessed to bring a net benefit reduction of 1,823 people exposed to levels of aircraft noise of at least 54 dB L<sub>Aeq, 16hr</sub>. In addition, the WebTAG noise impact assessment conducted by the sponsor indicated an overall net benefit in the number of people impacted by noise during the daytime (29,417) and night-time (11,162). Therefore, this ACP is not likely to meet the Secretary of State's criterion for call-in on noise impacts.</p>	
4. Statement of Need		Status
4.1	<b>Does the Statement of Need include any environmental factors?</b>	Yes
	<p>The purpose of this ACP is to introduce Slightly Steeper Approaches (SSA) as part of HAL's commitment to reducing their noise footprint. HAL state that no changes to lateral tracks of aircraft over the ground are intended to occur and the new Instrument Flight Procedures (IFPs) will allow participating aircraft to stay higher for longer, enabling "<i>only environmental benefit without any operational or environmental dis-benefit</i>", stating that the two operational trials from September 2015 – March 2016 and May 2017 – October 2017 have supported this.</p>	

<sup>3</sup> The DfT's call-in criteria are set out in The Civil Aviation Authority (Air Navigation) Directions 2017, Section 6, paragraph (5). These Directions are replicated in Annex D of the DfT's Air Navigation Guidance 2017,

<sup>4</sup> L<sub>Aeq,16h</sub> noise exposure.

<sup>5</sup> The assessment of the number of people affected and the associated adverse impacts on health and quality of life of the airspace change proposal should be carried out by the sponsor in accordance with the requirements set out in DfT's Guidance.

5. Design Principles		Status
5.1	Does the final set of Design Principles include any environmental objectives?	Yes
	<p>The sponsor developed a set of 8 Design Principles (DPs), 4 of which include environmental objectives:</p> <ul style="list-style-type: none"> <li>DP2: <i>"Must achieve the objective of reducing noise compared to a 3.0° approach"</i>.</li> <li>DP5: <i>"Must not change the lateral tracks of aircraft over the ground"</i>.</li> <li>DP6: <i>"Should not reduce the ability of arrivals to perform Continuous Descent Approach"</i>.</li> <li>DP7: <i>"Should maximise the number of aircraft able to fly the Slightly Steeper Approach"</i>.</li> </ul> <p>It is also considered that two other DPs have potential to influence environmental impact:</p> <ul style="list-style-type: none"> <li>DP3: <i>"Must not increase the numbers of go-arounds"</i>.</li> <li>DP4: <i>"must not reduce Heathrow's capacity"</i>.</li> </ul>	
5.2	Does the proposal explain how and to what extent the final airspace design achieves any environmental Design Principles?	Yes
	At stage 2A the sponsor evaluated the DPs against the sponsor's preferred option, Option B2. This Option met all DPs with environmental objectives, except for DP7 which aims to maximise the number of aircraft able to fly the Slightly Steeper Approach. The preferred option was evaluated to partially meet DP7 as the majority of aircraft operating at Heathrow are capable of flying an RNAV approach, however, less than 2% of approaches are expected to fly the approach due to Air Traffic Control (ATC) workload constraints.	
5.3	Were there any proposed environmental Design Principles that were rejected from the final set? If so, is the rationale for rejecting those Principles reasonable?	Yes
	<p>The following two Design Principles with environmental objectives were raised by consultees but rejected from the final set:</p> <ul style="list-style-type: none"> <li>DP11: <i>"The noise impact must be less than on a 3° approach throughout the landing approach"</i>.</li> <li>DP12: <i>"Aim to reduce the noise footprint of each individual flight arriving at Heathrow"</i>.</li> </ul> <p>Following the feedback from stakeholders, the draft DP11 and DP12 were combined with DP2 and the proposed DP2 text was reworded from: <i>"Must reduce the noise footprint of Heathrow's arrivals by enabling aircraft to stay higher for longer"</i> to <i>"must achieve the objective</i></p>	



	<p><i>of reducing noise compared to a 3.0 approach”.</i></p> <p>One stakeholder suggested the following DP: <i>“No one currently not overflowed by landing aircraft should be overflowed as a result of this change”</i>. HAL did not incorporate this DP into the final set as it was felt that the original proposed DP; <i>“should not change the lateral tracks of aircraft on the ground”</i>, fully satisfied this suggestion.</p>	
5.4	<p><b>Were there any design options during the airspace change process that might have better met the environmental Design Principles than the final proposal as submitted to the CAA? If so, is the rationale for rejecting those options set out?</b></p>	No
	<p>The sponsor initially proposed the following two concept options:</p> <ul style="list-style-type: none"> <li>• Option A: Steeper Instrument Landing System (ILS).</li> <li>• Option B: Steeper RNAV.</li> </ul> <p>Option A was rejected by HAL following the DP evaluation at Stage 2A as this option would require re-calibration of the exiting ILS or require HAL to procure additional ILS systems to work alongside the existing 3.0° ILS. For Option A, the sponsor evaluated that it met DP2; <i>“must achieve the objective of reducing noise compared to a 3.0° approach”</i> and DP7; <i>“should maximise the number of aircraft able to fly the Slightly Steeper Approach”</i>. The sponsor evaluated that Option A partially met DP3, DP5 and DP6 as no evidence was available to suggest that the option would fully meet the DPs. The sponsor evaluated these DPs to meet Option B due to evidence gathered during the trials. The sponsor evaluated that Option A did not meet DP4; <i>“must not reduce Heathrow’s capacity”</i>, as Heathrow would be unavailable during Low Visibility Procedures (LVP) if the glide slope was set to a greater angle.</p> <p>Option B was therefore investigated further by HAL for the viability of different Vertical Path Angles (VPAs) for the RNAV approaches. The following options were evaluated by HAL:</p> <ul style="list-style-type: none"> <li>• RNAV Approach Option B1: Both ILS and RNAV approaches remain at 3.0°. This is also the sponsor’s baseline option.</li> <li>• RNAV Approach Option B2: Increase VPA for all RNAV approaches to 3.2°. The ILS would remain at 3.0°.</li> <li>• RNAV Approach Option B3: Increase VPA for all RNAV approaches to 3.5°. The ILS would remain at 3.0°.</li> <li>• RNAV Approach Option B4: Increase VPA to 4.5° before the Final Approach Fix (FAF), reducing to 3.2° VPA after the FAF. The ILS would remain at 3.0°.</li> </ul>	

Option B1 was rejected by HAL for not meeting DP2 as this option would not reduce noise. The sponsor evaluated that Options B3 and B4 partially met DP2 as it is likely that these options would reduce noise at ground level, however, there is no evidence to support this. Additionally, HAL state that it is likely that landing gear and flap deployment would change in order to manage the energy of the aircraft, which could result in more noise for some parts of the approach. Option B2, was therefore the only option that fully met DP2 as trials conducted by HAL demonstrated a Sound Exposure Level (SEL) average noise reduction of 0.5 dBA for 3.2° RNAV approaches.

Option B1 and B2 both met DP5; *“must not change the lateral tracks of aircraft over the ground”* and DP6; *“should not reduce the ability of arrivals to perform Continuous Descent Approach [CDA]”*. DP5 and DP6 were partially met for Option B3 and Option B4 as HAL state there is no evidence available to support that the approaches would not result in a change to tracks over the ground or a reduction in CDA performance.

Option B1 did not meet DP7 as this option does not offer a SSA. Similarly, Option B3 did not meet DP7 due to the increased approach gradient and subsequent increased energy management for aircraft. Additionally, Option B4 did not meet DP7 as this approach would require individual crew training and increased spacing on final approach to cater for a potential increase in Vortex Wake encounters. As such, both Option B3 and Option B4 would likely result in *“significantly”* less than 2% of Heathrow’s arrivals flying the approaches. Option B2 partially met DP7 as Air Traffic Control (ATC) workload is a *“limiting factor”* on the number of RNAV approaches that can be flown at Heathrow, therefore, arrivals utilising this approach is *“unlikely”* to be in excess of 2%.

Option B1 and B2 both met DP3; *“Must not increase the numbers of go-arounds”* and DP4; *“must not reduce Heathrow’s capacity”* based on evidence from current operations and the SSA trials. Option B3 and B4 partially met DP3 as there is no evidence to support that these options would result in an increase in the number of go-arounds. It was noted that airlines advised that an increase in go-arounds is likely for angles greater than 3.2° in a high intensity operation. Similarly, Option B3 and B4 partially met DP4 as an increase in go-arounds would result in a reduction in capacity, however HAL state further evidence is required. Additionally, further evidence is required to understand the effect of segmented approaches on Heathrow’s capacity as a result of increase aircraft separation due to potential Vortex Wake encounters.

As a result of the DP Evaluation, Option B2 was accepted and taken forward to the Initial Options Appraisal. It could be argued however that Option B4 would have best met the DPs with environmental objectives, specifically DP2, as increased spacing between aircraft could introduce greater noise respite for communities on the ground. However, as stated by HAL, this option

	would require individual crew training, therefore this could result in “ <i>significantly</i> ” less than 2% of Heathrow’s arrivals flying the approaches. It is therefore considered that overall, the sponsor’s proposed option for this ACP, Option B2, best meets the DPs with environmental objectives.	
6. Options Appraisal		Status
6.1	Have environmental impacts been adequately reflected and assessed in the Options Appraisal?	Yes
	<p>This ACP has been scaled as Level 1 as it will impact airspace below 7,000 ft, therefore, as detailed in CAP1616 a sponsor is required to assess the impacts upon noise, CO<sub>2</sub> emissions, local air quality, tranquillity and biodiversity. HAL appraised Option B2; “<i>Increase RNAV VPA to 3.2°, maintain ILS VPA at 3.0°</i>” against the Baseline, Option B1; “<i>Both ILS and RNAV approach options remain at 3.0°</i>”, as part of the Options Appraisal process as all other options were discounted at Step 2A.</p> <p>HAL built upon the qualitative assessments provided within the Initial Options Appraisal (IOA) for noise during the Full Options Appraisal (FOA) at Stage 3, providing a quantitative analysis. HAL provided a qualitative assessment of the impacts upon CO<sub>2</sub> emissions and local air quality during the IOA, scoping out further assessment due to the anticipated negligible impact as a result of fewer than 2% of arrivals utilising the approach. However, a quantified assessment of the impacts was provided within the FOA. For the purpose of the FOA noise and environmental analysis, HAL utilised 2019’s actual figure of 0.6% of arrivals using SSA. A TAG noise impact assessment was also undertaken, however, HAL did not use the most up-to-date workbook for this assessment within the FOA, which was subsequently provided with the final options appraisal at Stage 4. It should be noted that the input data used for the WebTAG assessment was household data and the national average of 2.3 people per household was used. However, population data was also provided by the sponsor within the noise analysis and therefore the CAA requested clarification from the sponsor querying why the population data was not used for the purpose of the WebTAG assessment when guidance says that population should be used when it is available. HAL’s response stated this was a “<i>limitation of the workbook</i>” and “<i>given the small changes, it was considered that relying on the default average population per household was a proportionate approach in this instance</i>”. This approach is considered reasonable given the anticipated impact of this ACP, however, it should be noted that this is not a limitation of the TAG Noise Workbook as population data can be used by changing the assessment method to “individual”.</p> <p>A quantitative analysis of the impacts to Tranquillity and Biodiversity were provided by HAL for the initial, full and final options appraisal, concluding a negligible impact as a result of the proposal.</p>	

6.2	Is the final proposal as submitted to the CAA the airspace design option that also produced the best environmental impacts as assessed by the Options Appraisal? If not, does the rationale for selecting the preferred option adequately explain this choice?	Yes
	Option B2; <i>"Increase RNAV VPA to 3.2", maintain ILS VPA at 3.0"</i> , was assessed against the Baseline, Option B1, during the Full and Final Options Appraisals. All other design options proposed by HAL were discounted at Step 2A. Option B2 indicated a marginal SEL noise benefit of 0.51 dBA when compared to the baseline, however, this would only be realised for those aircraft that conduct SSA's which stood at 0.6% of arrivals as of 2019. Option B2 was assessed to provide marginal CO <sub>2</sub> and local air quality benefits. Other environmental impacts (i.e. tranquillity and biodiversity) were assessed to be similar between Option B1 and B2.	
<b>7. Noise [for Level 1 and Level M1 airspace change proposals]</b>		<b>Status</b>
7.1	Has the noise impact been adequately assessed and presented in both the consultation material and the final submission to the CAA, taking account of scalability and proportionality?	Partially
	<p>This ACP impacts airspace below 7,000 ft, therefore, CAP 1616 requires a change sponsor to assess the impacts of the change upon noise. As this ACP introduces changes to flight behaviour below 4,000 ft the following assessments are required from the sponsor:</p> <ul style="list-style-type: none"> <li>• Monetised impact of noise impacts to health and quality of life using the DfT's TAG Noise Impacts Workbook (WebTAG).</li> <li>• Nx (number above) contours.</li> <li>• Operational diagrams that portray existing and proposed traffic patterns.</li> <li>• An assessment and portrayal of noise impacts up to 4,000 ft above mean sea level (amsl) for geographic areas not contained by either the WebTAG outputs or the Nx contours.</li> </ul> <p>Longer term noise impacts over a 10-year traffic forecast are also required.</p> <p>In addition to this an assessment of 'overflight', as detailed in CAP 1498, is required by the change sponsor. Although this assessment does not reflect noise impacts, the Secretary of State has specified that overflight must be portrayed for Level 1 ACPs such as this.</p>	



HAL utilised noise monitoring data gathered from the two SSA trials, which subsequently informed the noise modelling. This noise monitoring was conducted under the approach of Runway 27L at Mogden Sewage Works (NMT129), Mid-Surrey Golf Course (NMT130), and Roehampton Golf Club (NMT131). The sponsor noted the following average differences between Sound Exposure Levels (SELs) for 3.0° ILS approaches and 3.2° RNAV SSAs.

Trial	NMT129 Mogden Sewage Works c. 3.7nm from touchdown c 78ft higher with SSA	NMT130 Mid-Surrey Golf Club c.4.7nm from touchdown c 100ft higher with SSA	NMT131 Roehampton Golf Club C7.2nm from touchdown c. 153ft higher with SSA
Average Differences in Aircraft Noise Events, Sound Exposure level (SEL dBA)			
<u>First Trial</u>	- 0.25 dB	-0.49 dB	- 0.74 dB
<u>Second Trial</u>	- 0.32dB	-0.55 dB	- 0.68 dB

The sponsor concluded that the trials demonstrated an average SEL reduction of 0.51 dBA per aircraft on a 3.2° RNAV SSA. The sponsor did caveat that this reduction would be imperceptible from the ground however the permanent adoption of 3.2° RNAV SSAs is an *“incremental step to reducing the impact of Heathrow Airport’s noise footprint on health and quality of life”*. As can be seen from the noise monitoring, the noise benefit is greater the further out the aircraft is from the touchdown point and hence the higher the aircraft is. HAL state that the trials confirmed that there would be no change to ground tracks as a result of permanently adopting 3.2° RNAV SSAs and therefore the change would *“not result in a redistribution of noise”*. As this ACP does not impact the lateral tracks of aircraft, this conclusion is reasonable. It should be noted that during the trials an average of 2% of arrivals operated the 3.2° RNAV SSAs, however, 2019 data indicated that 0.6% operated the approach. The sponsor states that the average SEL reduction of 0.51 dBA per aircraft would remain for the 0.6% of flights that operate 3.2° RNAV SSAs. This is a reasonable conclusion to reach. The sponsor states that the 2019 data, where 0.6% of aircraft operated SSAs, was used to inform the Full and Final Options Appraisal analysis.

HAL modelled noise using the Aviation Environmental Design Tool (AEDT) version 3b, producing  $L_{Aeq, 16hr}$ ,  $L_{Aeq, 8hr}$ , N65 and N60 contours for Option B1; *“Baseline (RNAV and ILS VPA at 3.0°)”*, Option B2; *“SSA (3.2° RNAV and 3.0° ILS)”*, and a 100% 3.2° RNAV SSA scenario to help distinguish the noise impacts of SSAs. The noise models took account all aircraft movements at the airport, including departures and arrivals. This ACP progressed past the Stage 2 Gateway in February 2020, therefore the requirements of CAP 2091: CAA Policy on Minimum Standards for Noise Modelling did not apply to this change. However, HAL state that the noise modelling undertaken for this ACP meets the

requirements of Category A as described within CAP 2091.

Heathrow's ANOMS Noise Track Keeping (NTK) data (Heathrow's NTK System) was used to inform the aircraft flight profiles, track centreline and track dispersion for noise modelling purposes. Each of the three options were modelled for both 2019 and 2031, with the latter scenario also taking account of fleet turnover, retirements, future aircraft types predicted to be in operation in 2031, along with how routes may be used to reflect departure destinations. Models were produced for Heathrow's actual modal split for summer 2019 of 80% Westerly and 20% Easterly operations, in addition to 100% Easterly and 100% Westerly operations to *"help further understand and articulate the proposals impacts for noise"*. HAL provided the number of dwellings/populations contained within each contour band which was obtained from CACI Ltd which is a summarised version of the latest census data adjusted for population growth. Additionally, Nx tables were produced illustrating the number of dwellings/populations experiencing noise events above 65 dB during the day and 60 dB Lmax during the night. The sponsor used Point X national Points of Interest database to calculate noise exposure at non-residential noise sensitive receptors, which included educational and healthcare settings, in addition to places of worship.

HAL conclude that a noise reduction is reflected in the noise exposure data which *"shows a reduction"* in the number of people exposed above the daytime and night-time LOAELs. Whilst this is the case for Option B2 when compared against the baseline for 80% Westerly/20% Easterly operations, 100% SSAs indicate an increase in the number of people experiencing night-time LOAELs for 2019 and 2031. This pattern is also present within some Nx tables produced, where there is an increase in the number of people experiencing noise events for Option B2 when compared to the baseline. Some tables appear to show the identical number of people/dwellings impacted. This evidence appears to undermine the sponsor's argument that noise is reducing as a result of SSA. The CAA requested further information regarding the veracity of the data presented in Annex A of the Full Options Appraisal. HAL explained that this pattern was due the method applied to decimal place rounding for the noise level grids generated from the model, which were rounded to "2 decimal places rather than 3 decimal places". This meant that differences between Option B1 and B2 *"were not apparent"* in the noise exposure statistics reported in Appendix A. HAL provided updated data tables reflecting this change.

The sponsor utilised the DfT's TAG Noise Impacts Workbook (WebTAG) which monetised the health and quality of life impacts as a result of any noise impacts associated with this ACP. The WebTAG assessment conducted by HAL inferred an overall net benefit over a 60-year period of £27,630,267 as a result of 3.2° RNAV SSAs. The workbook did indicate that some households will experience increased daytime and night-time noise as a result of the proposal. This was queried by consultees during the consultation period at Stage 3. In response to this, HAL explained that WebTAG is not designed for ACPs such as SSAs where insignificant changes in noise are realised, as WebTAG uses  $L_{Aeq}$  average 92-day noise levels in 1dB increments rather than SEL single sound events. HAL provided the following example to demonstrate why some households have moved into a higher dB band; *"if the change in noise within the model is, for example, just 0.06dB (i.e.*

	<p><i>imperceptible, and therefore of no impact to an individual), it has been rounded to 0.1dB for WebTAG analysis in the workbook, which is enough for a household in a 50.9dB band to move from the 50-51dB band into the 51dB-52dB band. This is categorised as an increase within the WebTAG workbook. The same is true for decreases in noise". Whilst this explanation is considered reasonable at explaining why some households might move into a higher dB band, HAL have not explained why some households will experience an increase in noise, such as the 0.06 dB increase mentioned. The CAA requested for further clarification on this point. HAL explained that the flight procedure requires a slight increase in an idle step in order to start the 3.2° descending step from 4,000 ft. This idle step requires the engine to burn more fuel producing very slightly higher noise levels. HAL explained that they undertook a conservative assessment and the model assumed this idle step for all the steeper approaches and most aircraft won't require this level portion of flight.</i></p> <p>The sponsor has not however provided an assessment of overflight which is a requirement of a Level 1 ACP, therefore, the response to this question refers to overflight.</p>	
7.2	<p><b>If a noise assessment has not been undertaken by the sponsor, has this decision been adequately explained and evidenced in both the consultation material and the final submission to the CAA, and is the rationale reasonable?</b></p>	No
	<p>The sponsor has provided an assessment of noise and all required noise metric. However, it should be noted that an assessment of overflight has not been provided which is a requirement for a Level 1 ACP. These are a means of defining and portraying the pattern and dispersion of aircraft below 7,000 feet, and the frequency that they occur. Overflight is based upon a perception of overflight and are not strictly a noise metric, however, the response to this question refers to overflight.</p> <p>The CAA queried why the overflight metric has not been provided within the submission. HAL's rationale for not providing an assessment of overflight incorrectly referred to difference contours and not overflight. However, as the airspace change is not expected to change existing lateral flight tracks nor increase the number of aircraft operating at Heathrow, the level of analysis provided by the sponsor, which included Nx contours, is considered reasonable.</p>	
7.3	<p><b>Summary of anticipated noise impacts for the final proposed airspace change.</b></p>	
	<p>It is unlikely that this ACP will result in any adverse noise impacts as the WebTAG assessment provided by HAL illustrate a net benefit in terms of health and quality of life. As calculated by the sponsor during the trials, an average SEL reduction of 0.51 dB can be expected for aircraft utilising the 3.2° RNAV SSA. The noise measurements provided by the sponsor show that the greatest noise reductions are achieved the further from the runway the aircraft is. The TAG outcome reported by the sponsor resulted in an overall net benefit in the</p>	

	number of people impacted by noise during the daytime (29,417) and night-time (11,162). As only 0.6% of aircraft operated this procedure in 2019, any noise benefits can be perceived as negligible as these would be imperceptible to someone on the ground, thus HAL's statement that 3.2° RNAV SSAs are an <i>"incremental step to reducing the impact of Heathrow Airport's noise footprint on health and quality of life"</i> is reasonable.	
8. CO <sub>2</sub> Emissions		Status
8.1	<b>Has the impact on CO<sub>2</sub> emissions been adequately assessed and presented in both the consultation material and the final submission to the CAA, taking account of scalability and proportionality?</b>	Yes
	<p>The sponsor provided a qualitative description of CO<sub>2</sub> impacts at Stage 2, scoping out further assessment during the Initial Options Appraisal (IOA) due to the anticipated negligible impact as a result of fewer than 2% of arrivals utilising the approach. However, HAL did provide a quantified assessment during the Full Options Appraisal (FOA) at Stage 3 and Final Options Appraisal at Stage 4. Within the final submission HAL state that there will be no change to existing lateral flight paths, track length and no increase in aircraft movements or holding as a result of the ACP. Further analysis conducted during the FOA indicated a <i>"negligible"</i> reduction in CO<sub>2</sub> emissions compared to 3.0° approach.</p> <p>The CO<sub>2</sub> emissions were calculated for the Airbus A320, the most common aircraft variant in operation at Heathrow Airport, using the Aviation Environmental Design Tool (AEDT) version 3b. The model suggested a 1.3% reduction in average engine thrust between 10,000 ft and touchdown, resulting in a 3% reduction in fuel burn and subsequent carbon emissions. Further analysis by the sponsor showed that the majority of reduced thrust and fuel burn occurred in the final approach between 4,500 ft and touchdown, resulting in a 9.8% reduction in thrust and subsequent 7.4% reduction in fuel burn and CO<sub>2</sub> emissions for this flight segment. The sponsor identifies that this effect on thrust and fuel burn is likely to be similar for other aircraft variants which should therefore achieve a CO<sub>2</sub> benefit.</p> <p>It should be noted that the sponsor states within the document, <i>"Slightly Steeper Approaches Formal Airspace Change Proposal"</i>, that the CO<sub>2</sub> assessment in the FOA was included within the consultation material, however, a qualitative statement of the impacts has been provided within the consultation material, indicating a <i>"reduction"</i> which can be considered <i>"negligible"</i>. Similarly, within the consultation material the sponsor states <i>"positive impact (marginal)"</i> for the ACP's greenhouse gas impact.</p> <p>The sponsor's conclusion of an overall negligible reduction in CO<sub>2</sub> emissions is considered reasonable given 0.6% of arrivals which currently operate SSA's into Heathrow Airport. However, the sponsor does state that the benefits of SSA could be <i>"slightly improved"</i> if more than 0.6% of aircraft operate SSA in future.</p>	



8.2	<b>If an assessment of the impact on CO<sub>2</sub> emissions has not been undertaken by the sponsor, has this decision been adequately explained and evidenced in both the consultation material and the final submission to the CAA, and is the rationale reasonable?</b>	Yes
	<p>CAP1616 requires a sponsor of a Level 1 ACP to provide an assessment of fuel and CO<sub>2</sub> impacts of the proposed change using WebTAG. This is to include the total annual and per flight fuel burn/mass of CO<sub>2</sub> in metric tonnes emitted for the current situation, the situation immediately following the airspace change and the situation 10 years after implementation.</p> <p>Although this ACP impacts airspace below 7,000 ft the sponsor has adequately explained that this proposal impacted 0.6% of arrivals into Heathrow Airport as of 2019. In addition, stating that this ACP will not result a change to existing lateral flight paths, track length nor increase aircraft movements or holding. Therefore, the level of analysis provided by the sponsor, which was calculated for the Airbus A320, the most common aircraft variant in operation at Heathrow Airport, is considered reasonable.</p>	
8.3	<b>Summary of anticipated impact on CO<sub>2</sub> emissions for the final proposed airspace change.</b>	
	<p>Based on the information provided by the sponsor, if this ACP were approved, it is likely there will be a minor positive impact upon CO<sub>2</sub> emissions per aircraft operating a SSA due to the anticipated 3% reduction in fuel burn. The majority of reduced thrust and fuel burn is anticipated to occur in the final approach between 4,500ft and touchdown, anticipated to result in a 9.8% reduction in thrust and subsequent 7.4% reduction in fuel burn and CO<sub>2</sub> emissions for this flight segment. However, as this ACP is expected to be flown by fewer than 2% of arrivals any benefit to CO<sub>2</sub> emissions can be considered negligible.</p>	
<b>9. Local Air Quality [for Level 1 and Level M1 airspace change proposals]</b>		<b>Status</b>
9.1	<b>Has the impact on Local Air Quality been adequately assessed and presented in both the consultation material and the final submission to the CAA, taking account of scalability and proportionality?</b>	Yes
	<p>The sponsor states that Heathrow Airport is located within the Hillingdon Air Quality Management Area (AQMA), designated for NO<sub>2</sub>, and is located adjacent to other AQMAs. Within the IOA, the sponsor provided rationale to scope out the requirement to further assess air quality as only a small portion of aircraft will operate the approach, in addition to there being no changes to lateral flight paths nor the number of aircraft movements. As the change is expected to impact less than 2% of arrivals, and will not change lateral flight paths, the sponsor states that this ACP will <i>“not lead to changes to ground-level NO<sub>2</sub> concentrations averaged over the calendar year”</i>.</p>	

	<p>However, the sponsor did provide a further quantified assessment during the Full Options Appraisal and Final Options Appraisal. HAL simulated the 3.2° approach for the Airbus A320, the most common aircraft variant in operation at Heathrow Airport, using the EUROCONTROL BADA Aircraft Performance Model<sup>6</sup> as implemented within the Aviation Environmental Design Tool (AEDT) version 3b. The model predicted a 1.3% reduction in average engine thrust between 10,000 ft and touchdown when compared to a 3.0° approach. The sponsor states that the reduction in thrust and fuel flow required for the 3.2° approach will result in “<i>lower</i>” overall emissions of NO<sub>x</sub>, Particulate Matter (PM) and hydrocarbons. Additionally, stating that the steeper VPA maintains the aircraft at a slightly higher altitude above ground for longer, thus “<i>reducing</i>” the contribution of emissions to ground level air quality. This conclusion is considered reasonable.</p> <p>The sponsor concludes an overall marginal positive impact to air quality due to the 0.6% of aircraft that operated SSA in 2019. However, the sponsor does state that the benefits of SSA could be improved if more than 0.6% of aircraft operate SSA in future.</p>	
9.2	<p><b>If an assessment of the impact on Local Air Quality has not been undertaken by the sponsor, has this decision been adequately explained and evidenced in both the consultation material and the final submission to the CAA, and is the rationale reasonable?</b></p>	Yes
	<p>CAP1616 requires a sponsor of a Level 1 ACP to provide an assessment of the impacts to local air quality as a result of the proposed change. An assessment using WebTAG is only required to be undertaken when the proposed change has potential to impact on emissions below 1,000 ft and in the vicinity of a designated AQMA.</p> <p>The sponsor has not provided a WebTAG assessment of the impacts to local air quality, however, HAL have adequately explained that this proposal is expected to be flown by “<i>fewer than 2% of arrivals</i>” (0.6% of arrivals in 2019), in addition to there being no change to lateral flight paths, resulting in “<i>no changes to ground-level NO<sub>2</sub> concentrations averaged over the calendar year</i>”. Given the number of aircraft this ACP is anticipated to impact, in addition to the overall marginal positive impact, the level of analysis provided by the sponsor is considered reasonable.</p>	
9.3	<p><b>Summary of anticipated impact on Local Air Quality for the final proposed airspace change.</b></p>	
	<p>Based on the information provided by the sponsor, if this ACP were approved, it is likely that there will be a negligible positive impact upon local air quality due to the anticipated 1.3% reduction in average engine thrust and steeper VPA which will keep aircraft slightly higher for longer. As this ACP is expected to be flown by “<i>fewer than 2% of arrivals</i>” any benefit to local air quality can be considered negligible.</p>	

<sup>6</sup> EUROCONTROL, (2011) Base of Aircraft Data Aircraft Performance Model version 3.9.

10. Tranquillity [for Level 1 and Level M1 airspace change proposals]		Status
10.1	<b>With specific reference to Areas of Outstanding Natural Beauty and National Parks - Has the impact on tranquillity been adequately considered and presented in both the consultation material and the final submission to the CAA, taking account of scalability and proportionality?</b>	Yes
	<p>The sponsor provides a qualitative description of the impacts upon Tranquillity within both the consultation material and final proposal, stating as there will be no change to existing lateral flight paths and no increase in the number of air traffic movements, the nationally protected landscapes of National Parks and Areas of Outstanding Natural Beauty (AONBs) as sensitive receptors will not be impacted by this airspace change.</p> <p>The sponsor refers to the noise assessment with respect to tranquillity, stating that any noise decrease as a result of SSAs will be <i>"imperceptible on the ground"</i>, therefore concluding that any effects on sensitive biodiversity or tranquillity receptors as a result of permanently adopting SSAs or reverting back to 3.0° approaches will be <i>"negligible"</i>.</p>	
10.2	<b>If consideration of the impact on tranquillity has not been undertaken by the sponsor, has this decision been adequately explained and evidenced in both the consultation material and the final submission to the CAA, and is the rationale reasonable?</b>	N/A
	<p>The sponsor provides a high-level qualitative assessment of the impacts upon tranquillity for the purpose of this ACP. This is considered reasonable as HAL adequately explain within the document; <i>"Heathrow Slightly Steeper Approaches: Initial Options Appraisal CAP1616 Stage 2B"</i>, that the impact on tranquillity can be considered to be <i>"negligible"</i> in terms of visual amenity and noise impact with <i>"no measurable change"</i> to National Parks and AONBs. As no change to existing lateral flight paths and no increase in the number of air traffic movements is expected as a result of this ACP, it is considered reasonable that HAL did not provide a further detailed assessment of the impacts upon tranquillity.</p>	
10.3	<b>Summary of anticipated impact on tranquillity for the final proposed airspace change.</b>	
	<p>As there will be no change to existing lateral flight paths and no increase in the number of air traffic movements it is considered unlikely that there will be any adverse impacts to tranquillity with specific reference to National Parks and AONBs. The sponsor's conclusion that any effects on sensitive tranquillity receptors are negligible as a result of the proposal is therefore reasonable.</p>	



11. Biodiversity [for Level 1 and Level M1 airspace change proposals]		Status
11.1	Has the impact on biodiversity been adequately assessed and presented in both the consultation material and the final submission to the CAA, taking account of scalability and proportionality?	Yes
	<p>Within the document <i>"Slightly Steeper Approaches Final Options Appraisal"</i> the sponsor states that the effects on biodiversity as a result of this ACP are restricted to those associated with disturbance created (noise and visual intrusion) by aircraft landing and the potential effects of air quality on habitats. A qualitative assessment provided by the sponsor states that NOx emissions are <i>"marginally reduced"</i> when compared to a 3.0° approach. In addition, aircraft will be higher for longer when conducting an SSA. Similarly, regarding noise, the sponsor states that noise levels as a result of aircraft operating SSAs decrease. HAL state that the decrease in NOx emissions and noise will be <i>"imperceptible"</i> on the ground and therefore <i>"negligible"</i>, thus the sponsor concludes that there is <i>"no potential"</i> for any negative impacts on sensitive biodiversity receptors to arise. As per CAP1616 [pg. 162] <i>'Most airspace change proposals are unlikely to have an effect upon biodiversity and therefore the inclusion within the design principles is expected to be the full extent of any consideration in most instances'</i>.</p>	
11.2	If assessment of the impact on biodiversity has not been undertaken by the sponsor, has this decision been adequately explained and evidenced in both the consultation material and the final submission to the CAA, and is the rationale reasonable?	N/A
	<p>The sponsor has provided an assessment of the impact on biodiversity concluding no negative impacts on sensitive biodiversity receptors. Given the nature of the changes being proposed, this is a reasonable conclusion to reach. As per CAP1616 [pg. 162] <i>'Most airspace change proposals are unlikely to have an effect upon biodiversity and therefore the inclusion within the design principles is expected to be the full extent of any consideration in most instances'</i>. No specific biodiversity receptors were identified to be avoided during the development of DPs.</p>	
11.3	Summary of anticipated impact on biodiversity for the final proposed airspace change.	
	<p>This ACP is considered unlikely to impact upon biodiversity as it is not proposing to change existing lateral flight paths nor increase the number of air traffic movements. Any impacts to noise and local air quality which may subsequently impact upon biodiversity can be considered overall positive, however the magnitude of any such impacts are likely to be negligible. As per CAP1616 [pg. 162] <i>'Most airspace change proposals are unlikely to have an effect upon biodiversity and therefore the inclusion within the design principles is expected to be the full extent of any consideration in most instances'</i>. No specific biodiversity receptors were identified to be avoided during the development of DPs.</p>	



12. Traffic Forecasts		Status
12.1	Have traffic forecasts been provided, are they reasonable, and have these been used to reflect the anticipated environmental impacts of the proposal?	Yes
	<p>CAP1616 requires a change sponsor for permanent ACPs to provide traffic forecasts for at least 10 years from the intended year of implementation, including all intermediate years. HAL's planned date for implementation of this ACP is 2021. Due to the impact of COVID-19 on the aviation industry, HAL used 2019 traffic data to inform the baseline assessment for the environmental analysis in the FOA. This was selected as Heathrow Airport was operating close to its capped traffic movements of 480,000 per year. HAL expects demand to recover and to be operating close to its movement cap again before 2031.</p> <p>The traffic forecast provided by HAL has therefore not considered a change in the number of movements. However, HAL has considered fleet turnover, retirements, future aircraft types predicted to be in operation in 2031, along with how routes may be used to reflect departure destinations. The forecast therefore provided by the sponsor is considered reasonable given the uncertainty in how air traffic will be impacted in the long-term, and that Heathrow was operating near its capped traffic movements in 2019.</p>	
13. Consultation		Status
13.1	Has the sponsor taken account of any environmental factors (noise, CO2 emissions, Local Air Quality, tranquillity, or biodiversity) raised by consultees or has evidence been provided to indicate why this has not been possible?	Partially
	<p>Environmental factors raised by consultees referenced the following themes, however, the sponsor determined that these factors did not impact the final design:</p> <p><b>Noise Metrics:</b> Respondents referenced the ease of understanding the noise metrics provided by HAL. In response, HAL stated that these met the CAA's requirements as part of the CAP1616 process. Additionally stating that metrics outside of CAP 1616's requirements were also presented which were based on "actual data" rather than noise modelling. HAL stated that they "endeavoured to simplify and explain the information provided" whilst still meeting the requirements of CAP1616, continuing to state that this feedback will be considered for future ACP submissions.</p> <p><b>WebTAG:</b> Respondents raised queries regarding the WebTAG workbook which showed some increases in the number of households experiencing an increase in noise as a result of SSAs. HAL stated that the use of WebTAG is required as part of the CAP1616 process,</p>	

however stating that WebTAG is not designed for ACPs such as SSAs where small changes in noise are realised as WebTAG uses  $L_{Aeq}$  average 92-day noise levels in 1dB increments rather than SEL single sound events. HAL provided the following example to demonstrate why some households have moved to a higher dB band; *“if the change in noise within the model is, for example, just 0.06dB (i.e. imperceptible, and therefore of no impact to an individual), it has been rounded to 0.1dB for WebTAG analysis in the workbook, which is enough for a household in a 50.9dB band to move from the 50-51dB band into the 51dB-52dB band. This is categorised as an increase within the WebTAG workbook. The same is true for decreases in noise”*. Whilst this explanation is considered reasonable at explaining why some households might move into a higher dB band, HAL have not explained why some households will experience an increase in noise, such as the 0.06 dB increase mentioned. The CAA requested for further clarification on this point. HAL explained that the flight procedure requires a *“slight increase”* in an idle step in order to start the 3.2° descending step from 4,000 ft. This *“requires the engine to burn fuel”* to maintain the idle step *“producing the very slightly higher noise”*. HAL continued to explain that the model assumed *“all arrivals perform this short level segment, whereas [...] most aircraft don’t require this level portion of flight”*. HAL confirmed that this difference in noise is *“imperceptible”* from the ground and *“no household will ‘experience’ a perceptible increase in noise as a result of SSA”*. This explanation is considered reasonable.

**Flight Behaviour:** Respondents commented that landing gear would need to be deployed earlier on the approach and that airspeed would be reduced earlier in the approach causing an increase in noise. HAL had an FAQ regarding this point, stating there was no evidence from the trials that landing gear needs to be deployed earlier on an SSA. Additionally stating that on average, for medium aircraft the landing gear was deployed at the same distance from the runway but the aircraft was higher. For larger aircraft the landing gear was deployed *“slightly closer”* to the runway and the aircraft were at a *“similar height”* to the standard approaches. The sponsor concluded that the data gathered during the trials demonstrated a *“very small noise benefit”* of 0.51 dBA SEL when aircraft operate SSA.

**Increase use of SSAs:** Consultation responses requested that SSAs could be incentivised to encourage airlines to use the procedure, requesting HAL to investigate this in the future. Similarly, some responses suggested that SSA be made compulsory during the night hours. HAL stated it will continue to monitor the use of SSAs and *“consider ways, where possible, to incentivise”* the use of SSAs to maximise benefits whilst maintaining a safe operation. It was noted that the current ATC limitations on the number of aircraft able to perform SSAs will remain.

**Fleet Mix:** Respondents queried the fleet mix and future fleet mix used within the Full Options Appraisal. HAL provided a table detailing the percentage fleet mix changes that were used when undertaking the environmental assessments, however it is not apparent how HAL concluded these changes. The CAA requested further clarification regarding this. HAL explained that the fleet mix for 2031 have been derived from a forecast schedule prepared by Heathrow.

	<p><b>Increased Approach Angle:</b> Consultees raised feedback regarding increasing the approach angle more than 3.2° or increasing the approach angle as part of future projects. Two FAQs were added to the consultation website in response to feedback concerning slightly steeper approach angles. HAL stated that approaches steeper than 3.2° were considered earlier in the process and discounted due to technical constraints. HAL continued to state that as part of the wider UK Airspace Modernisation, the application of SSA will be considered within the context of investigating the feasibility of increasing the angle of decent for the ILS.</p>	
13.2	Has the sponsor taken account of any consultation response submitted by ICCAN? If so, what are the outcomes?	N/A
	ICCAN did not provide a consultation response for this ACP.	
<b>14. Public Evidence Session (if held)</b>		<b>Status</b>
14.1	If a Public Evidence Session has been held, was any new evidence on potential environmental impacts presented?	N/A
	No public evidence session was held for this ACP.	
14.2	If so, was the new evidence relevant and material to the CAA's consideration of the environmental impacts of the submitted airspace change proposal?	N/A
	No public evidence session was held for this ACP.	
<b>15. Compliance with policy and guidance from Government, ICCAN or the CAA</b>		<b>Status</b>
15.1	Has the sponsor satisfied all relevant policy and/or guidance from either the Government, ICCAN or the CAA, with regards to environmental impacts of the proposed airspace change?	Yes
	<p>This ACP is concerned with airspace design below 7,000 ft and has been accordingly considered as a Level 1 ACP. The change sponsor has complied with the majority of relevant requirements as listed within CAP 1616 for a Level 1 ACP. The sponsor did not however provide the overflight metric, as detailed in CAP1498. The CAA queried why the overflight metric has not been provided within the submission. HAL's response referred to 'difference contours' in CAP1616a. It should be noted that these are not the same as the 'overflight' metric (as detailed in CAP1498). However, as the airspace change is not expected to change existing lateral flight tracks nor increase the number of aircraft operating at Heathrow, the level of analysis provided by the sponsor, which included Nx contours, is considered reasonable.</p>	

	<p>CAP1616 requires a sponsor of a Level 1 ACP to provide an assessment of fuel and CO<sub>2</sub> impacts of the proposed change using WebTAG. This is to include the total annual and per flight fuel burn/mass of CO<sub>2</sub> in metric tonnes emitted for the current situation, the situation immediately following the airspace change and the situation 10 years after implementation. This was not provided by the sponsor, however, HAL has adequately explained that this proposal impacted 0.6% of arrivals into Heathrow Airport as of 2019. In addition, stating that this ACP will not result in a change to existing lateral flight paths, track length nor increase aircraft movements or holding. Therefore, the level of analysis provided by the sponsor, which concluded an overall negligible reduction in CO<sub>2</sub> emissions, is considered reasonable.</p> <p>In addition to this, CAP1616 requires a sponsor of a Level 1 ACP to provide a WebTAG assessment of the impacts upon Local Air Quality when the proposed change has potential to impact on emissions below 1,000 ft and in the vicinity of a designated AQMA. The was not provided within the submission, however, HAL have adequately explained that this proposal is expected to be flown by fewer than 2% of arrivals (0.6% of arrivals in 2019), in addition to there being no change to lateral flight paths, resulting in <i>“no changes to ground-level NO<sub>2</sub> concentrations averaged over the calendar year”</i>. Given the number of aircraft this ACP is anticipated to impact, in addition to the overall marginal positive impact, the level of analysis provided by the sponsor is considered reasonable.</p>	
15.2	Has the sponsor adequately considered the DfT’s Altitude-Based Priorities <sup>7</sup> ?	Yes
	<p>The sponsor has taken into account the DfT’s Altitude-Based Priorities, in so far that it prioritised noise below 7,000 ft. The WebTAG assessment undertaken by the sponsor indicates a net benefit in terms of noise impacts as a result of this ACP which aligns with the government’s environmental priority to limit and, where possible, reduce the total adverse effects on people from the ground to 4,000 ft. Regarding airspace at or above 4,000 feet to below 7,000 feet, the noise impacts continue to be prioritised and there is no disproportionate increase in CO<sub>2</sub>. The ACP proposes to replicate the current tracks over the ground and therefore there is no change to airspace routes below 7,000 feet over Areas of Outstanding Natural Beauty (AONB) and National Parks. In addition, as per altitude-based priority F, the sponsor has taken account of local circumstances, including the actual height of the ground by using terrain data within the modelling. Community engagement and consultation was also undertaken.</p>	

<sup>7</sup> Paragraph 3.3, DfT’s Air Navigation Guidance 2017



16. Other aspects		Status
16.1	Are there any other aspects of the airspace change proposal that have not already been addressed in this report but that may have a bearing on the environmental impact?	No
	None.	
17. Recommendations/Conditions/PIR Data Requirements		Status
17.1	Are there any environmental recommendations which the change sponsor should address either before or after implementation?	Yes
	Where practicable, it is recommended that the sponsor promotes the use of SSA to operators in order for greater environmental benefits to be realised.	
17.2	Are there any environmental conditions which the change sponsor must fulfil either before or after implementation?	No
	None.	
17.3	Are there any environmental requirements in terms of the data to be collected by the change sponsor for the Post Implementation Review?	Yes
	<p>For this ACP it is recommended that the sponsor starts to collect the following information from the date of implementation for the Post Implementation Review:</p> <ul style="list-style-type: none"> <li>• Monitor the flight behaviour and volume of traffic operating 3.2° RNAV SSA.</li> <li>• Monitor and report the noise impact of aircraft operating RNAV 3.2° approaches compared to the 3.0° ILS approaches for all runways.</li> <li>• Liaise with aircraft operators to understand any changes in fuel burn, in addition to any changes in CDA, between the RNAV 3.2° approaches and the 3.0° ILS approaches.</li> </ul>	

18. Summary of Assessment of Environmental Impacts & Conclusions	
<p>If approved, this ACP would result in a change to the vertical approach profile of aircraft from 3.0° to 3.2°, leading to aircraft being slightly higher for longer. The 3.2° RNAV SSAs are currently in operation at Heathrow and data collected by HAL shows 1,378 flights out of a total 238,110 arrivals (0.6%)</p>	

used the procedure in 2019. This ACP is not proposing to change existing lateral flight paths nor is it proposing to change the number of aircraft operating at the airport.

Data collected from the trials showed an average reduction in noise of 0.51 dBA<sup>8</sup> Sound Exposure Level (SEL) per flight when compared to the conventional 3.0° approaches, with the greatest noise reductions achieved further away from the runway. In addition, the sponsor calculated a small reduction in average engine thrust, which could result in a reduction in fuel burn and hence provide CO<sub>2</sub> and local air quality benefits. However, it is considered that the environmental impact as a result of the reduced thrust is negligible. In addition, it is unlikely that this ACP will impact upon tranquillity or biodiversity, as this ACP will not introduce a change to existing lateral flight paths nor increase the number of air traffic movements.

Environmental Assessment Sign-off and Review			
	Name	Signature	Date
Environmental Assessment completed by Airspace Regulator (Environment)			21/07/21
Environmental Assessment reviewed by Airspace Regulator (Environment)			21/07/21
Environmental Assessment Approval			
	Name	Signature	Date
Environmental Assessment approved by Manager Airspace Regulation			29/07/21

Please see accompanying CAA Operational Assessment for Final Regulatory Decision made by Head of Airspace, ATM and Aerodromes

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<sup>8</sup> Calculated by HAL using the differences in average measured aircraft SEL between approaches using the 3.2° RNAV SSA and the existing 3.0° ILS approach measured at Noise Monitoring Terminals (NMT) NMT129, NMT130 and NMT131.