



# AIRSPACE MODERNISATION AIRSPACE CHANGE PROPOSAL

# STEP 2B **INITIAL OPTIONS APPRAISAL**

**APPENDIX B** 

**PBN ARRIVALS** Version 2 Runway 27L - Part 1





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**Revision History** 

Version	Date	Amendment	Author
1.0	28 <sup>th</sup> July 2023	Initial issue	Heathrow Airport Ltd
2.0	07 <sup>th</sup> June 2024	All option outcome statements amended following the revision of the shortlisting methodology to remove reference to AONB's and Richmond Park.	Heathrow Airport Ltd

All airspace design options in this document are subject to change throughout the airspace change process, as options are matured in detail and refined in accordance with safety requirements, design principles, appraisals and stakeholder engagement and consultation.

# **Initial Options Appraisal**

# **PBN Arrivals**

Runway 27L



All airspace design options in this document are subject to change throughout the airspace change process, as options are matured in detail and refined in accordance with safety requirements, design principles, appraisals and stakeholder engagement and consultation.

Version 2.0 (June 2024)





# PBN Arrivals – Runway (RWY) 27L Baseline 'Do Nothing'

# **Option Description**

This represents the baseline for Doing Nothing with 27L arrivals in the 0430-0600 period. The image represents the areas overflown at least once per day on average by 27L arrivals in 2019, 0430-0600.



### Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	642,300	N/A
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	1,131,900	N/A

#### **Communities - Air Quality**

As this is the Baseline 'Do Nothing', there is no change to Air Quality.

Wider Society – Greenhouse Gas Impact						
Metric Option Value Difference to Baseline						
Overall Track Miles (nm) of all routes	427	N/A				

Wider Society – Tranquillity & Biodiversity						
Metric	Option Value	Difference to Baseline				
Total Area of AONBs/National Parks (NPs) overflown between 0- 7000ft once a day on average (night-time)	0km <sup>2</sup>	N/A				
Total Area of AONBs/NPs overflown experiencing at least one event of N60 on average (night-time)	0km <sup>2</sup>	N/A				
Total Area of Richmond Park overflown between 0-7000ft at least once a day on average (night-time)	0km <sup>2</sup>	N/A				
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0- 1640ft which observe a potential change in location overflown	N/A	N/A				
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown between 0- 3000ft which observe a potential change in location overflown	N/A	N/A				

#### Wider Society – Capacity/Resilience

Arrival throughput is not a concern 0430-0600.

Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.

## **General Aviation (GA) – Access**

No additional Controlled Airspace (CAS) required. Option would not facilitate the release of CAS. Option not expected to impact existing helicopter routes.



General Aviation / Commercial Airlines – Economic impact from increased effective capacity	General Aviation / Commercial Airlines – Fuel Burn
As this is the Baseline 'Do Nothing' there is no economic effect expected on GA or Commercial Airline operations. Arrival delay is not an issue during the 0430-0600 period.	Change in Fuel Burn (annual - tonnes) No change
Commercial Airlines – Training costs	Commercial Airlines – Other costs None identified.
Option does not require any re-equipage or upgrade costs for airlines. No training costs required for airlines.	Airport/ANSP – Operational costs
Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs	Doing nothing means no change to operational costs.
Doing nothing means no changes to infrastructure costs.	
Airport/ANSP – Deployment costs	
Doing nothing mean no deployment costs.	
Safety Doing nothing means no Instrument Fight Procedure (IFP) design considerations.	Adherence to Airspace Modernisation Strategy (AMS) Doing nothing with Westerly arrivals will not align with the AMS. It will not enable environmental benefits, increase airspace capacity, reduce noise impacts or maximise benefits from NERL's re- design of the London Terminal
Option may result in conflicts/interdependencies with Gatwick Airport's options.	Manoeuvring Area (LTMA). No change and therefore no ACP submission will not enable enhancements to safety, enhanced integration or reductions in the volume of CAS.

#### Outcome of PBN Arrival RWY27L Baseline 'Do Nothing'

The Baseline (Do Nothing) Option was discontinued during the Design Principles Evaluation (DPE) phase of Stage 2, owing to the option not meeting the objectives set by the Airspace Modernisation Strategy (AMS).

## **OPTION DISCONTINUED (During DPE)**





# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Do Nothing (Night)

		C	Overflight
Data	Populatio	n Overflown	Overflight (0-7000 ft) contour map
Rate	Baseline	Do Nothing	
≥1	873,200	873,200	
≥ 5	297,500	297,500	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
100	0	0	The Part of the State
200	0	0	

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## **Aircraft Noise Events**

Pata		ing noise events above ach day
Rate	Baseline	Do Nothing
≥1	1,131,900	1,131,900
≥ 5	420,500	420,500
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

#### **Noise Exposures**

Population count	Baseline	Do Nothing	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	1,283,300	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	642,300	

#### **Noise Exposure Change**

Change in Noise	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of	Population experiencing no change in noise exposure within	Population experiencing at least 1 dB increase within partial LOAEL or brought into	Change in noise exposure map
Exposure	partial LOAEL	partial LOAEL	partial LOAEL	
Partial LOAEL	<b>0</b> (0 brought out of Partial LOAEL by Option)	0	0 (0 brought into Partial LOAEL by Option)	



# PBN Arrivals – RWY 27L Option A

#### **Option Description**

This option was developed to address DP2. This option assumes a single PBN arrival track used for all RWY27L arrivals capable of RNP-AR during the 0430-0600 period from BEDEK, TOBID, LOGAN & BEGTO.



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## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	257,500	-384,800
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	486,500	-645,400

#### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline
Track Miles of the routes used (nm)	-23

Wider Society – Tranquillity & Biodiversity								
Metric		Option Value	Difference to Baseline					
Total Area of AONBs/National Parks (NPs) overflown betwee 7000ft once a day on average (night-time)	0km <sup>2</sup>	No change						
Total Area of AONBs/NPs overflown experiencing at least one of N60 on average (night-time)	0km <sup>2</sup>	No change						
Total Area of Richmond Park overflown between 0-7000ft at l once a day on average (night-time)	Less than 1km <sup>2</sup>	Less than 1km <sup>2</sup>						
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflow	0	No change						
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 3000ft which observe a potential change in location overflow	n 0-	5	+5					
Wider Society – Capacity/Resilience		General Aviation – Access						
Arrival throughput not of concern 0430-0600. A single		No a	quired.					
or multiple PBN route could handle the low number of arrivals in this period if required.		Optio CAS	cilitate the release of					
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to rely on.			Option may impact existing helicopter routes, further work is required to understand if there is an impact on route H3.					
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.								



#### General Aviation / Commercial Airlines – Economic impact from increased effective capacity

No economic effect expected on GA operations.

Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any option regards arrival delay.

#### **Commercial Airlines – Training costs**

This option would require RNP-AR capability and approvals. This can come with significant costs for airlines, however, it is unknown at this time whether RNP-AR route options would be progressed in isolation i.e. without other arrival procedures being available. Should an RNP-AR arrival be mandatory, there may be additional costs for some operators. This will be quantified in Stage 3.

#### Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

## Airport/ANSP – Deployment costs

There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.

#### Safety

There are no IFP design issues identified with this option however, there are no RNP-AR arrivals published in the UK at this time. Therefore additional considerations may arise through the regulatory approval process.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Interdependencies, Conflicts & Trade-Offs

Option not expected to interact with other airports' options.

#### General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline annual - tonnes) Not able to quantify at this time, owing to uncertainty in new stack locations

#### **Commercial Airlines – Other costs**

None identified.

## Airport/ANSP – Operational costs

This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.

Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in operational costs for the airport.

## Adherence to AMS

Supports the AMS through increased systemisation and meeting the Governments key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety, efficiency and resilience enhancements and/or provide respite opportunities.

## Outcome of PBN Arrival RWY27L Option A

Option A provides reductions against all the noise metrics. It indicates a decrease in track miles when compared with the Baseline.

The option indicates a number of biodiversity sites between 0-3000ft that may experience a change in location overflown. This option will be explored further in Stage 3.





# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option A (Night)

		C	Overflight
Data	Population	Overflown	Overflight (0-7000 ft) contour map
Rate	Baseline	Option A	
≥1	873,200	375,200	
≥ 5	297,500	133,400	
10	0	0	
0	0	0	
50	0	0	
00	0	0	President Part Cart State
200	0	0	

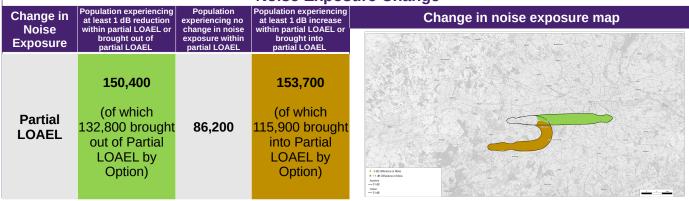
## **Aircraft Noise Events**

Pata		ng noise events above Ich day
Rate	Baseline Option A	
≥1	1,131,900	486,500
≥ 5	420,500	220,000
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

#### Noise Exposures

Population count	Baseline	Option A	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	516,900	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	257,500	

#### **Noise Exposure Change**





# PBN Arrivals – RWY 27L Option B

## **Option Description**

This option was developed to address DP2. This option assumes a single PBN arrival track used for all RWY27L arrivals capable of RNP-AR during the 0430-0600 period from ALESO.



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## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	260,200	-382,100
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	428,700	-703,200

## **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline
Track Miles of the routes used (nm)	+11

Wider Society – Tranquillity & Biodiversity								
Metric	Option Value	Difference to Baseline						
Total Area of AONBs/National Parks (NPs) overflown betwee 7000ft once a day on average (night-time)	49km <sup>2</sup>	+49km <sup>2</sup>						
Total Area of AONBs/NPs overflown experiencing at least one of N60 on average (night-time)	2km <sup>2</sup>	+2km <sup>2</sup>						
Total Area of Richmond Park overflown between 0-7000ft at once a day on average (night-time)	4km <sup>2</sup>	4km <sup>2</sup>						
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflow	0	No change						
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 3000ft which observe a potential change in location overflow	6	+6						
Wider Society – Capacity/Resilience		General Aviation – Access						
Arrival throughput not of concern 0430-0600. A single		No additional CAS required. Option would not facilitate the release or CAS.						
or multiple PBN route could handle the low number of arrivals in this period if required.								
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to ely on.			Option may impact existing helicopter routes, further work is required t understand if there is an impact on rout H3/H7.					
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.		. 10/1						



#### General Aviation / Commercial Airlines – Economic impact from increased effective capacity

No economic effect expected on GA operations.

Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any option regards arrival delay.

#### **Commercial Airlines – Training costs**

This option would require RNP-AR capability and approvals. This can come with significant costs for airlines, however, it is unknown at this time whether RNP-AR route options would be progressed in isolation i.e. without other arrival procedures being available. Should an RNP-AR arrival be mandatory, there may be additional costs for some operators. This will be quantified in Stage 3.

#### Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

## **Airport/ANSP – Deployment costs**

There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.

#### Safety

There are no IFP design issues identified with this option however, there are no RNP-AR arrivals published in the UK at this time. Therefore additional considerations may arise through the regulatory approval process.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

# Interdependencies, Conflicts & Trade-Offs

Option may result in conflicts/interdependencies with Gatwick's options.

## General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline annual - tonnes) Not able to quantify at this time, owing to uncertainty in new stack locations

### **Commercial Airlines – Other costs**

None identified.

# Airport/ANSP – Operational costs

This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.

Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in operational costs for the airport.

## Adherence to AMS

Supports the AMS through increased systemisation and meeting the Governments key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety, efficiency and resilience enhancements and/or provide respite opportunities.

# Outcome of PBN Arrival RWY27L Option B

Option B reduces the population above the Partial LOAEL (night) and the population experiencing at least one N60 (night) noise event when compared to the Baseline.

The option indicates a number of biodiversity sites between 0-3000ft may experience a change in location overflown. It indicates an increase in track miles. This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option B (Night)

		0
Rate	Population Overflown	
Rale	Baseline	Option B
≥1	873,200	135,800
≥ 5	297,500	119,100
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

# **Aircraft Noise Events**

Pata		ng noise events above Ich day	
Rate	Baseline	Baseline Option B	
≥1	1,131,900	428,700	
≥ 5	420,500	214,300	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

## Noise Exposures

Population count	Baseline	Option B	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	477,800	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	260,200	

#### Noise Exposure Change

	Noise Exposure Change						
Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map			
Partial LOAEL	<b>258,300</b> (of which 242,800 brought out of Partial LOAEL by Option)	107,800	<b>136,900</b> (of which 115,700 brought into Partial LOAEL by Option)				



# PBN Arrivals – RWY 27L Option C

## **Option Description**

This option was developed to address DP2. This option assumes a single PBN arrival track used for all RWY27L arrivals during the 0430-0600 period from ALESO, BEDEK, TOBID, LOGAN & BEGTO.



## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	471,000	-171,300
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	816,200	-315,700

#### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline
Track Miles of the routes used (nm)	+3

Wider Society – Tranquillity	y & B	Biodiversity	
Metric		Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 7000ft once a day on average (night-time)	0-	15km <sup>2</sup>	+15km <sup>2</sup>
Total Area of AONBs/NPs overflown experiencing at least one e of N60 on average (night-time)	vent	6km <sup>2</sup>	+6km <sup>2</sup>
Total Area of Richmond Park overflown between 0-7000ft at lea once a day on average (night-time)	ast	0km <sup>2</sup>	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflown		0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 3000ft which observe a potential change in location overflowr		0	No change
Wider Society – Capacity/Resilience		General Avia	tion – Access
Arrival throughput not of concern 0430-0600. A single or multiple PBN route could handle the low number of arrivals in this period if required.			quired. acilitate the release of
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to rely on.	Opti		d to impact existing
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.			
13			Heathrow

General Aviation / Commercial Airlines – Economic impact from increased effective capacity	General Aviation / Commercial Airlines – Fuel Burn
No economic effect expected on GA operations.	Change in FuelNot able to quantifyBurn (comparedat this time, owing
Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay	to the Baseline - to uncertainty in annual - tonnes) new stack locations
performance. There is no distinguishing difference between any option regards arrival delay.	Commercial Airlines – Other costs
Commercial Airlines – Training costs	None identified.
Option does not require any re-equipage or upgrade costs for airlines. No training costs required for airlines.	Airport/ANSP – Operational costs
	This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.
Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs	Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in
Option may require re-location and/or addition of Noise Monitoring Terminals.	operational costs for the airport.
Airport/ANSP – Deployment costs	
There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.	
Safety	Adherence to AMS
There are already PBN to ILS procedures published in the UK. No IFP design issues are anticipated with this option.	Supports the AMS through increased systemisation and meeting the Governments
Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.	key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety,
Interdependencies, Conflicts & Trade-Offs	efficiency and resilience enhancements and/or provide respite opportunities.
Option may result in conflicts/interdependencies with Gatwick's options.	

# Outcome of PBN Arrival RWY27L Option C

Option C reduces the population above the Partial LOAEL (night) and the population experiencing at least one N60 (night) noise event when compared to the Baseline. It indicates no biodiversity sites between 0-3000ft may experience a change in location overflown.

The option indicates a small increase in track miles. This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option C (Night)

		Ov	erflight
Rate	Population Overflown		Overflight (0-7000 ft) contour map
Rale	Baseline	Option C	
≥1	873,200	374,100	
≥ 5	297,500	323,000	
10	0	0	
20	0	0	
50	0	0	
.00	0	0	
00	0	0	

## **Aircraft Noise Events**

Data		ng noise events above Ich day
Rate	Baseline	Option C
≥1	1,131,900	816,200
≥ 5	420,500	394,800
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

## Noise Exposures

Population count	Baseline	Option C	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	877,500	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	471,000	

#### **Noise Exposure Change**

			Noise Expos	
Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	<b>328,400</b> (of which 310,700 brought out of Partial LOAEL by Option)	225,100	<b>228,200</b> (of which 201,300 brought into Partial LOAEL by Option)	A definition of the second sec



# PBN Arrivals – RWY 27L Option D

#### **Option Description**

This option was developed to address DP4. This option assumes a single PBN arrival track used for all RWY27L arrivals capable of of RNP-AR during the 0430-0600 period from BEDEK.



## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	260,600	-381,700
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	477,800	-654,100

### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline
Track Miles of the routes used (nm)	-37

Wider Society – Tranquilli	ty & I	Biodiversity	
Metric		Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown betwee 7000ft once a day on average (night-time)	n 0-	0km <sup>2</sup>	No change
Total Area of AONBs/NPs overflown experiencing at least one of N60 on average (night-time)	event	0km <sup>2</sup>	No change
Total Area of Richmond Park overflown between 0-7000ft at loonce a day on average (night-time)	east	Less than 1km <sup>2</sup>	Less than 1km <sup>2</sup>
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflow		0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwe 3000ft which observe a potential change in location overflow		5	+5
Wider Society – Capacity/Resilience		General Avia	tion – Access
Arrival throughput not of concern 0430-0600. A single	No	additional CAS re	quired.
or multiple PBN route could handle the low number of arrivals in this period if required.	Opt CAS		acilitate the release of
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to rely on.	rout	es, further w	ct existing helicopter ork is required to is an impact on route
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.			



General Aviation / Commercial Airlines –
Economic impact from increased effective
capacity

No economic effect expected on GA operations.

Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any option regards arrival delay.

#### **Commercial Airlines – Training costs**

This option would require RNP-AR capability and approvals. This can come with significant costs for airlines, however, it is unknown at this time whether RNP-AR route options would be progressed in isolation i.e. without other arrival procedures being available. Should an RNP-AR arrival be mandatory, there may be additional costs for some operators. This will be quantified in Stage 3.

#### Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

#### Airport/ANSP – Deployment costs

There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.

#### Safety

There are no IFP design issues identified with this option however, there are no RNP-AR arrivals published in the UK at this time. Therefore additional considerations may arise through the regulatory approval process.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Interdependencies, Conflicts & Trade-Offs

Option not expected to interact with other airports' options.

## General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline annual - tonnes) Not able to quantify at this time, owing to uncertainty in new stack locations

#### **Commercial Airlines – Other costs**

None identified.

#### Airport/ANSP – Operational costs

This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.

Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in operational costs for the airport.

## Adherence to AMS

Supports the AMS through increased systemisation and meeting the Governments key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety, efficiency and resilience enhancements and/or provide respite opportunities.

#### Outcome of PBN Arrival RWY27L Option D

Option D reduces the population above the Partial LOAEL (night), the population experiencing at least one N60 (night) noise event and the track miles.

The option indicates a significant number of biodiversity sites between 0-3000ft may potentially experience a change in location overflown. This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option D (Night)

		C	verflight
Data	Population Overflown		Overflight (0-7000 ft) contour map
Rate	Baseline	Option D	
≥1	873,200	210,100	
≥ 5	297,500	133,400	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	The second s
≥ 200	0	0	

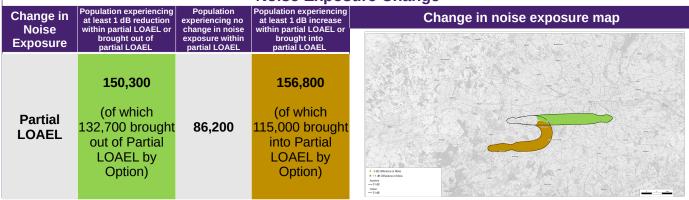
## **Aircraft Noise Events**

Pata	Population experiencing noise events above N60 each day		
Rate	Baseline	Baseline Option D	
≥1	1,131,900	477,800	
≥ 5	420,500	224,900	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

#### Noise Exposures

Population count	Baseline	Option D	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	508,600	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	260,600	

#### **Noise Exposure Change**







# PBN Arrivals – RWY 27L Option E

#### **Option Description**

This option was developed to address DP4. This option assumes a single PBN arrival track used for all RWY27L arrivals capable of of RNP-AR during the 0430-0600 period from BEGTO.



## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	241,700	-400,600
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	380,900	-751,000

### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

#### Wider Society – Greenhouse Gas Impact

Metric	Difference to Baseline
Track Miles of the routes used (nm)	-21

Wider Society – Tranquilli	ty &	Biodiversity		
Metric	Option Value	Difference to Baseline		
Total Area of AONBs/National Parks (NPs) overflown betwee 7000ft once a day on average (night-time)	45km <sup>2</sup>	+45km <sup>2</sup>		
Total Area of AONBs/NPs overflown experiencing at least one of N60 on average (night-time)	0km <sup>2</sup>	No change		
Total Area of Richmond Park overflown between 0-7000ft at I once a day on average (night-time)	Less than 1km <sup>2</sup>	Less than 1km <sup>2</sup>		
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflow	0	No change		
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 3000ft which observe a potential change in location overflow	5	+5		
Wider Society – Capacity/Resilience		General Avia	tion – Access	
Arrival throughput not of concern 0430-0600. A single	No additional CAS required.			
or multiple PBN route could handle the low number of arrivals in this period if required.		Option would not facilitate the release of CAS.		
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to rely on.	rou	tes, further w lerstand if there	ct existing helicopter ork is required to is an impact on route	
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.				



General Aviation / Commercial Airlines –			
Economic impact from increased effective			
capacity			

No economic effect expected on GA operations.

Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any option regards arrival delay.

## **Commercial Airlines – Training costs**

This option would require RNP-AR capability and approvals. This can come with significant costs for airlines, however, it is unknown at this time whether RNP-AR route options would be progressed in isolation i.e. without other arrival procedures being available. Should an RNP-AR arrival be mandatory, there may be additional costs for some operators. This will be quantified in Stage 3.

#### Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

#### Airport/ANSP – Deployment costs

There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.

#### Safety

There are no IFP design issues identified with this option however, there are no RNP-AR arrivals published in the UK at this time. Therefore additional considerations may arise through the regulatory approval process.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Interdependencies, Conflicts & Trade-Offs

Option may result in conflicts/interdependencies with Gatwick's options.

#### General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline annual - tonnes) Not able to quantify at this time, owing to uncertainty in new stack locations

#### **Commercial Airlines – Other costs**

None identified.

#### Airport/ANSP – Operational costs

This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.

Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in operational costs for the airport.

#### Adherence to AMS

Supports the AMS through increased systemisation and meeting the Governments key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety, efficiency and resilience enhancements and/or provide respite opportunities.

#### Outcome of PBN Arrival RWY27L Option E

Option E reduces the population above the Partial LOAEL (night), the population experiencing at least one N60 (night) noise event and track miles.

The option a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown. This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option E (Night)

		C	Overflight
Rate	Population	Overflown	Overflight (0-7000 ft) contour map
Rale	Baseline	Option E	
≥1	873,200	181,900	
≥ 5	297,500	133,700	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	and the part of the
≥ 200	0	0	

## **Aircraft Noise Events**

Pata	Population experiencing noise events above N60 each day		
Rate	Baseline	Option E	
≥1	1,131,900	380,900	
≥ 5	420,500	208,400	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	
≥ 200	0	0	

#### Noise Exposures

Population count	Baseline	Option E	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	416,300	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	241,700	

#### **Noise Exposure Change**

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	<b>147,300</b> (of which 129,700 brought out of Partial LOAEL by Option)	85,900	<b>138,100</b> (of which 110,900 brought into Partial LOAEL by Option)	A defense me A



# PBN Arrivals – RWY 27L Option F

### **Option Description**

This option was developed to address DP4. This option assumes a single PBN arrival track used for all RWY27L arrivals during the 0430-0600 period from BEGTO.



### Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	561,800	-80,500
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	975,100	-156,800

#### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline
Track Miles of the routes used (nm)	-12

Wider Society – Tranquillity	/ & B	iodiversity	
Metric		Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown between 7000ft once a day on average (night-time)	0-	52km <sup>2</sup>	+52km <sup>2</sup>
Total Area of AONBs/NPs overflown experiencing at least one ev of N60 on average (night-time)	vent	8km <sup>2</sup>	+8km²
Total Area of Richmond Park overflown between 0-7000ft at lea once a day on average (night-time)	ast	0km <sup>2</sup>	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betweer 1640ft which observe a potential change in location overflown		0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betweer 3000ft which observe a potential change in location overflown		0	No change
Wider Society – Capacity/Resilience		General Avia	tion – Access
Arrival throughput not of concern 0430-0600. A single	No a	dditional CAS re	quired
or multiple PBN route could handle the low number of arrivals in this period if required.	Optio	on would not fa	cilitate the release of
	Optio CAS Optio	on would not fa	
arrivals in this period if required. There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to	Optio CAS Optio	on would not fa on not expecte	acilitate the release of



General Aviation / Commercial Airlines – Economic impact from increased effective capacity	General Aviation / Commercial Airlines – Fuel Burn
No economic effect expected on GA operations.	Change in Fuel Not able to quantify Burn (compared at this time, owing
Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any	to the Baseline - annual - tonnes) new stack locations
option regards arrival delay.	Commercial Airlines – Other costs
Commercial Airlines – Training costs	None identified.
Option does not require any re-equipage or upgrade costs for airlines. No training costs required for airlines.	Airport/ANSP – Operational costs
	This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.
Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs	Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in
Option may require re-location and/or addition of Noise Monitoring Terminals.	operational costs for the airport.
Airport/ANSP – Deployment costs	
There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.	
Safety	Adherence to AMS
There are already PBN to ILS procedures published in the UK. No IFP design issues are anticipated with this option.	Supports the AMS through increased systemisation and meeting the Governments
Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.	key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety,
Interdependencies, Conflicts & Trade-Offs	efficiency and resilience enhancements and/or provide respite opportunities.
Option may result in conflicts/interdependencies with Gatwick's options.	

# Outcome of PBN Arrival RWY27L Option F

Option F reduces the population above the Partial LOAEL (night) and the population experiencing at least one N60 (night) noise event. It indicates a decrease in track miles, and that no biodiversity sites between 0-3000ft should experience a change in location overflown.

This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option F (Night)

		C	Overflight
Rate	Population	Overflown	Overflight (0-7000 ft) contour ma
Rale	Baseline	Option F	EANS LABOR FOR
≥1	873,200	497,100	
≥ 5	297,500	434,800	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	And the second second
≥ 100	0	0	The state of the state of the
≥ 200	0	0	

# **Aircraft Noise Events**

Pata	Population experienci N60 ea	ng noise events above Ich day
Rate	Baseline	Option F
≥1	1,131,900	975,100
≥ 5	420,500	450,000
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

## Noise Exposures

Population count	Baseline	Option F	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	1,054,200	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	561,800	

#### **Noise Exposure Change**

Change in Noise Exposure	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of partial LOAEL	Population experiencing no change in noise exposure within partial LOAEL	Population experiencing at least 1 dB increase within partial LOAEL or brought into partial LOAEL	Change in noise exposure map
Partial LOAEL	<b>341,600</b> (of which 299,100 brought out of Partial LOAEL by Option)	257,600	<b>261,700</b> (of which 239,800 brought into Partial LOAEL by Option)	<ul> <li>A definition of the second seco</li></ul>



# PBN Arrivals – RWY 27L Option G

#### **Option Description**

This option was developed to address DP4. This option assumes a single PBN arrival track used for all RWY27L arrivals capable of RNP-AR during the 0430-0600 period from ALESO.



Heathrow

## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	361,700	-280,600
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	564,700	-567,200

#### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline
Track Miles of the routes used (nm)	-5

Wider Society – Tranquill	ity	• & B	iodiversity	
Metric			Option Value	Difference to Baseline
Total Area of AONBs/National Parks (NPs) overflown betwee 7000ft once a day on average (night-time)	en	0-	55km <sup>2</sup>	+55km <sup>2</sup>
Total Area of AONBs/NPs overflown experiencing at least one of N60 on average (night-time)	ev	ent	15km <sup>2</sup>	+15km <sup>2</sup>
Total Area of Richmond Park overflown between 0-7000ft at I once a day on average (night-time)	lea	ist	3km <sup>2</sup>	+3km <sup>2</sup>
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflow		י 0-	0	No change
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 3000ft which observe a potential change in location overflow		ר 0-	6	+6
Wider Society – Capacity/Resilience			General Avia	tion – Access
Arrival throughput not of concern 0430-0600. A single		No a	dditional CAS re	quired.
or multiple PBN route could handle the low number of arrivals in this period if required.		Optio CAS		acilitate the release of
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to rely on.		route	es, further w	ct existing helicopter ork is required to is an impact on route
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.				



General Aviation / Commercial Airlines –
Economic impact from increased effective
capacity

No economic effect expected on GA operations.

Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any option regards arrival delay.

#### **Commercial Airlines – Training costs**

This option would require RNP-AR capability and approvals. This can come with significant costs for airlines, however, it is unknown at this time whether RNP-AR route options would be progressed in isolation i.e. without other arrival procedures being available. Should an RNP-AR arrival be mandatory, there may be additional costs for some operators. This will be quantified in Stage 3.

#### Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs

Option may require re-location and/or addition of Noise Monitoring Terminals.

#### Airport/ANSP – Deployment costs

There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.

#### Safety

There are no IFP design issues identified with this option however, there are no RNP-AR arrivals published in the UK at this time. Therefore additional considerations may arise through the regulatory approval process.

Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.

## Interdependencies, Conflicts & Trade-Offs

Option may result in conflicts/interdependencies with Gatwick's options.

#### General Aviation / Commercial Airlines – Fuel Burn

Change in Fuel Burn (compared to the Baseline annual - tonnes) Not able to quantify at this time, owing to uncertainty in new stack locations

#### **Commercial Airlines – Other costs**

None identified.

#### Airport/ANSP – Operational costs

This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.

Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in operational costs for the airport.

#### Adherence to AMS

Supports the AMS through increased systemisation and meeting the Governments key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety, efficiency and resilience enhancements and/or provide respite opportunities.

#### Outcome of PBN Arrival RWY27L Option G

Option G reduces the population above the Partial LOAEL (night) and the population experiencing at least one N60 (night) noise event. It indicates a decrease in track miles compared to the Baseline.

The option indicates a significant number of biodiversity sites between 0-3000ft that may experience a change in location overflown. This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option G (Night)

		0	verflight
Rate	Population	Overflown	Overflight (0-7000 ft) contour map
Rale	Baseline	Option G	EANSTAL LAND FOR
≥1	873,200	236,400	
≥ 5	297,500	218,900	
≥ 10	0	0	
≥ 20	0	0	
≥ 50	0	0	
≥ 100	0	0	The second se
200	0	0	

## **Aircraft Noise Events**

Rate		ng noise events above Ich day
Rale	Baseline	Option G
≥1	1,131,900	564,700
≥ 5	420,500	291,700
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

#### Noise Exposures

Population count	Baseline	Option G	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	624,200	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	361,700	

#### **Noise Exposure Change**

Change in Noise	Population experiencing at least 1 dB reduction within partial LOAEL or brought out of	Population experiencing no change in noise exposure within	Population experiencing at least 1 dB increase within partial LOAEL or brought into	Change in noise exposure map	
Exposure	partial LOAEL	partial LOAEL	partial LOAEL		
Partial LOAEL	<b>379,000</b> (of which 360,200 brought out of Partial LOAEL by Option)	85,500	<b>257,400</b> (of which 232,900 brought into Partial LOAEL by Option)	<ul> <li>4. Other the first state of the first</li></ul>	



# PBN Arrivals – RWY 27L Option H

## **Option Description**

This option was developed to address DP4. This option assumes a single PBN arrival track used for all RWY27L arrivals during the 0430-0600 period from ALESO.



## Communities – Noise impact on health & quality of life

Metric	Option Value	Difference to Baseline
Population above Partial LOAEL (daytime, LA <sub>eq</sub> , 16h)	N/A	N/A
Population above Partial LOAEL (night-time, LA <sub>eq</sub> , 8h)	581,800	-60,500
Population experiencing at least one event of N65 (daytime)	N/A	N/A
Population experiencing at least one event of N60 (night-time)	959,800	-172,100

#### **Communities - Air Quality**

As there is no change to track distribution below 1000ft, there is no effect on Air Quality from this option.

Metric	Difference to Baseline		
Track Miles of the routes used (nm)	-4		

Wider Society – Tranquillity & Biodiversity							
Metric	Option Value	Difference to Baseline					
Total Area of AONBs/National Parks (NPs) overflown betwee 7000ft once a day on average (night-time)	44km <sup>2</sup>	+44km <sup>2</sup>					
Total Area of AONBs/NPs overflown experiencing at least one of N60 on average (night-time)	1km <sup>2</sup>	+1km <sup>2</sup>					
Total Area of Richmond Park overflown between 0-7000ft at I once a day on average (night-time)	0km <sup>2</sup>	No change					
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 1640ft which observe a potential change in location overflow	0	No change					
Number of sites (RAMSAR, SAC, SPA, SSSI) overflown betwee 3000ft which observe a potential change in location overflow	0	No change					
Wider Society – Capacity/Resilience		General Avia	tion – Access				
Arrival throughput not of concern 0430-0600. A single	No a	additional CAS re	quired.				
or multiple PBN route could handle the low number of arrivals in this period if required.		Option would not facilitate the release of CAS.					
There is no distinguishing difference between any option regards arrival throughput. Any aircraft not RNP-AR equipped would have another PBN route to rely on.	Opti	Option not expected to impact existing helicopter routes.					
Heathrow's capacity for this ACP is limited by the existing 480,000 movement cap.							
28							



General Aviation / Commercial Airlines – Economic impact from increased effective capacity	General Aviation / Commercial Airlines – Fuel Burn		
No economic effect expected on GA operations.	Change in FuelNot able to quantifyBurn (comparedat this time, owing		
Arrival delay is not an issue during the 0430-0600 period. Use of PBN arrivals during this time would be for noise mitigation purposes only. PBN arrivals in this time will not affect delay performance. There is no distinguishing difference between any	to the Baseline - annual - tonnes) new stack locations		
option regards arrival delay.	Commercial Airlines – Other costs		
Commercial Airlines – Training costs	None identified.		
Option does not require any re-equipage or upgrade costs for airlines. No training costs required for airlines.	Airport/ANSP – Operational costs		
	This option is not anticipated to change airport nor ANSP operational costs. Heathrow will continue to require ILS and other ground based infrastructure even with the implementation of PBN arrival procedures.		
Airport/Air Navigation Service Provider (ANSP) – Infrastructure costs	Option may lead to a change in the number of properties eligible for the noise insulation scheme) which could lead to a change in		
Option may require re-location and/or addition of Noise Monitoring Terminals.	operational costs for the airport.		
Airport/ANSP – Deployment costs			
There will be considerable costs associated with deployment in terms of operational training and system upgrades which will be quantified in Stage 3. However, there is not expected to be any differences in these costs between the different options.			
Safety	Adherence to AMS		
There are already PBN to ILS procedures in the UK. No IFP design issues are anticipated with this option.	Supports the AMS through increased systemisation and meeting the Governments		
Although new or revised safety assurances may be needed, an acceptable safety argument is envisaged to be achievable.	key environmental objectives by utilising PBN. The use of PBN arrivals has been appraised at this stage during periods where the landing rate is less critical. PBN arrivals in a system design might enable simplification, safety,		
Interdependencies, Conflicts & Trade-Offs	efficiency and resilience enhancements and/or provide respite opportunities.		
Option may result in conflicts/interdependencies with Gatwick's options.			

## Outcome of PBN Arrival RWY27L Option H

Option H reduces the population above the Partial LOAEL (night), the population experiencing at least one N60 (night) noise event and the track miles when compared to the Baseline. It indicates that no biodiversity sites between 0-3000ft should experience a change in location overflown.

This option will be explored further in Stage 3.



# CAP1616 - INITIAL OPTIONS APPRAISAL – SUPPLEMENTARY METRICS PBN Arrivals – RWY 27L Option H (Night)

	Overflight			
Rate	Population	Overflown	Overflight (0-7000 ft) contour map	
Rale	Baseline	Option H		
≥1	873,200	447,000		
≥ 5	297,500	407,200		
≥ 10	0	0		
≥ 20	0	0		
≥ 50	0	0		
≥ 100	0	0	and the second of the	
≥ 200	0	0		

## **Aircraft Noise Events**

Pata	Population experiencing noise events above N60 each day	
Rate Baseline Option H		
≥1	1,131,900	959,800
≥ 5	420,500	471,800
≥ 10	0	0
≥ 20	0	0
≥ 50	0	0
≥ 100	0	0
≥ 200	0	0

#### **Noise Exposures**

Population count	Baseline	Option H	Partial LOAEL contour map
Estimated total population above 40 dB L <sub>Aeq,1.5h</sub>	1,283,300	1,061,400	
Total population within Partial LOAEL (>45 dB L <sub>Aeq,1.5h</sub> )	642,300	581,800	

#### **Noise Exposure Change**

	Noise Exposure onange					
Change in Noise	Population experiencing at least 1 dB reduction within partial LOAEL or	experiencing no change in noise	Population experiencing at least 1 dB increase within partial LOAEL or	Change in noise exposure map		
Exposure	brought out of partial LOAEL	exposure within partial LOAEL	brought into partial LOAEL			
Partial LOAEL	<b>358,300</b> (of which 316,400 brought out of Partial LOAEL by Option)	260,100	<b>279,800</b> (of which 255,900 brought into Partial LOAEL by Option)	<ul> <li>A second sec econd second sec</li></ul>		

