Aberdeen International Airport

FASI-N Airspace Change Proposal

Step 2B
Initial Options Appraisal

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	V1.1 Gateway Action Updates following CAA Feedback

CAA Feedback	Aberdeen Airport Response	Document Updates
CAP 2091 category: The CAA requires that the sponsor confirm the CAP 2091 category at the beginning of Stage 3 with the CAA being notified of the category, and for the category to be based on the higher of the daytime and night time categories over the 92-day summer period and over the 10-year forecast period, including intermediate years, and taking account of any population increases as result of identified developments [CAP 2091 para 5.10].	Aberdeen Airport will submit details of the CAP2091 category before commencing the Full Options Appraisal at Stage 3.	n/a
Discounting of options based on overflight: The CAA requires the sponsor to confirm and evidence that the discounting of options using their overflight methodology is consistent with the altitude-based priority of reducing the total adverse effects on people below 4,000ft, given that total adverse impacts are measured using TAG and therefore based on the LAeq exposure metric and therefore the frequency of flights. If the sponsor is unable to evidence that the discounting of options is consistent with the altitude-based priorities then the CAA recommends that discounted options are reinstated into the list of options [Para 40, B29].	The Initial Options Appraisal (IOA) considered altitude based priorities with the first line of each noise assessment detailing any expected impacts to the L_{Aeq} 16hr (day) and 8hr (night) contours. As noted in the IOA assessments, none of the options are expected to change the L_{Aeq} 16hr (day) and 8hr (night) contours as Aberdeen's contours only extend partially along the final approach and are therefore outside of the scope of the changes associated with this ACP. The conclusion and discounting methodology explained that as part of the table we summarised ***the main categories that differentiate the options*** and we referred readers to the full IOA tables for assessments against all the IOA categories as required by CAP1616. No reference was made to L_{Aeq} within the conclusion as none of the options are expected to alter the L_{Aeq} metrics (and therefore the associated TAG outcomes). Given that the options could not be differentiated by total adverse impacts, we therefore looked to the secondary overflight metrics, as well as the Design Principles when considering which options to progress into Stage 3. This was detailed within the discounting methodology.	Additional text added to Page 59 highlighted in blue.

Contents

1. Introduction

Following the publication of the strategic rationale for airspace modernisation[1], the Government directed the Civil Aviation Authority (CAA) to "prepare and maintain a coordinated strategy and plan for the use of UK airspace up to 2040, including its modernisation". As a result, in 2018 the CAA published the Airspace Modernisation Strategy (AMS)[2], which replaced the earlier 2011 Future Airspace Strategy. The AMS sets out the initiatives required to modernise the existing Airspace System by upgrading the airspace design, technology, and operations. The CAA recently consulted on a draft, refreshed AMS and is considering the responses prior to publishing an updated version of the strategy.

One of the most important initiatives required to achieve the AMS objective is known as FASI (Future Airspace Strategy Implementation). 22 airports in the UK comprise FASI and Aberdeen Airport is one of them. This FASI initiative is considered the UK's Airspace Change National Infrastructure Programme (the Programme). The Programme encompasses the requirement to fundamentally redesign the National Airspace System at lower altitudes and in the terminal airspace that serves commercial air transport across the busiest regions of the UK, making the most of the capabilities of modern aircraft and satellite-based navigation technology. These airspace design projects are sponsored by the 22 airports (for the local arrival and departure routes below 7000ft) and by NERL (for the airspace structures and route network above 7000ft).

Performance Based Navigation (PBN)

Today's national route network is designed with reference to a grid of ground navigation beacons distributed across the UK. Some of these beacons are outdated and reaching their end of life. Meanwhile, 99% of the current commercial air transport fleet operates almost exclusively using avionics that rely on satellite navigation. Aircraft are able to follow routes designed to satellite navigation standards (known as Performance-based Navigation or PBN) with greater precision than conventional ground navigation.

PBN is being introduced across the world and Aberdeen Airport are required to consider implementing it as part of meeting the requirements of the Airspace Modernisation Strategy. PBN improves the accuracy of where aircraft fly and offers opportunities for different flight path locations by moving away from the constraints of outdated conventional navigation using ground-based beacons. This helps improve operational performance, reduce delays, and improves resilience.

[1] Upgrading UK Airspace Strategic Rationale
[2] UK Airspace Modernisation Strategy, CAA CAP1711, 2018

Airspace Change Organising Group (ACOG) and the Masterplan

The number, complexity and overlapping scope of the individual Airspace Change Proposals (ACPs) needed to deliver the Programme requires a strategic coordination mechanism in the form of a single joined up implementation plan or Masterplan.

Given the large number of organisations involved (22 airports and NATS EnRoute Limited (NERL)), the CAA and Department for Transport (DfT) also required NERL to set up an impartial body, The Airspace Change Organising Group[3] (ACOG) to develop a Masterplan, coordinate the Programme and lead the necessary engagement with external stakeholders. In this context, ACOG was established in 2019 as a unit within NERL, separate and impartial from the organisation's other functions.

Masterplan Iteration 2[4] was accepted by the CAA on 27th January 2022. The purpose of Iteration 2 is to provide a system-wide view of the scope of the constituent ACPs and identify the potential interdependencies between the proposals. Collectively, the ACPs that are included in the Masterplan are referred to as the 'constituent airspace change proposals'. Each individual ACP is developed following the same detailed process steps laid out in the CAA's guidance for changing the airspace design – known as CAP1616[5]. The CAA evaluates the progress of every ACP through each stage of the process, via a series of (seven) regulatory gateways and make decisions on whether to approve further development and ultimately the implementation of the proposed changes. A summary of the CAP1616 process is available in the next section.

Iteration 2 places Aberdeen International Airport Ltd (AIAL) in the 'STMA regional cluster' alongside Edinburgh and Glasgow Airports and the NATS Scottish TMA.

[3] ACOG Website
[4] Link to Iteration 2
[5] CAA CAP 1616, edition 4, March 2021

Our Airspace Change

AIAL began their ACP to modernise their airspace in November 2019 and passed through Stage 1 of CAP1616 in March 2020. Shortly after this, the project and much of the wider Programme was paused due to COVID-19 pandemic whilst the aviation industry focussed on managing the pandemic and its recovery from it. The Programme was remobilised in March 2021 following the provision of DfT grant funding, allowing AIAL to recommence their ACP in May 2021.

This document forms part of the AIAL Stage 2 submission to the CAA. It sets out how Aberdeen International Airport has developed its Comprehensive List of Options for the ACP and how it tested those options and their development with their stakeholders. It then explains the methodology used to evaluate the options against the Design Principles as well as containing a summary of that evaluation.

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, our design principles, our appraisals and stakeholder engagement and consultation with all our stakeholders.

The CAP1616 Airspace Change Process

In December 2017 the Civil Aviation Authority (CAA) published CAP1616[6] Airspace Design: Guidance on the regulatory process for changing airspace design, including community engagement requirements. The guidance sets out the process for the airspace change process, which a change sponsor of any permanent change to the published airspace design must follow. The airspace change process is split into 7 Stages;

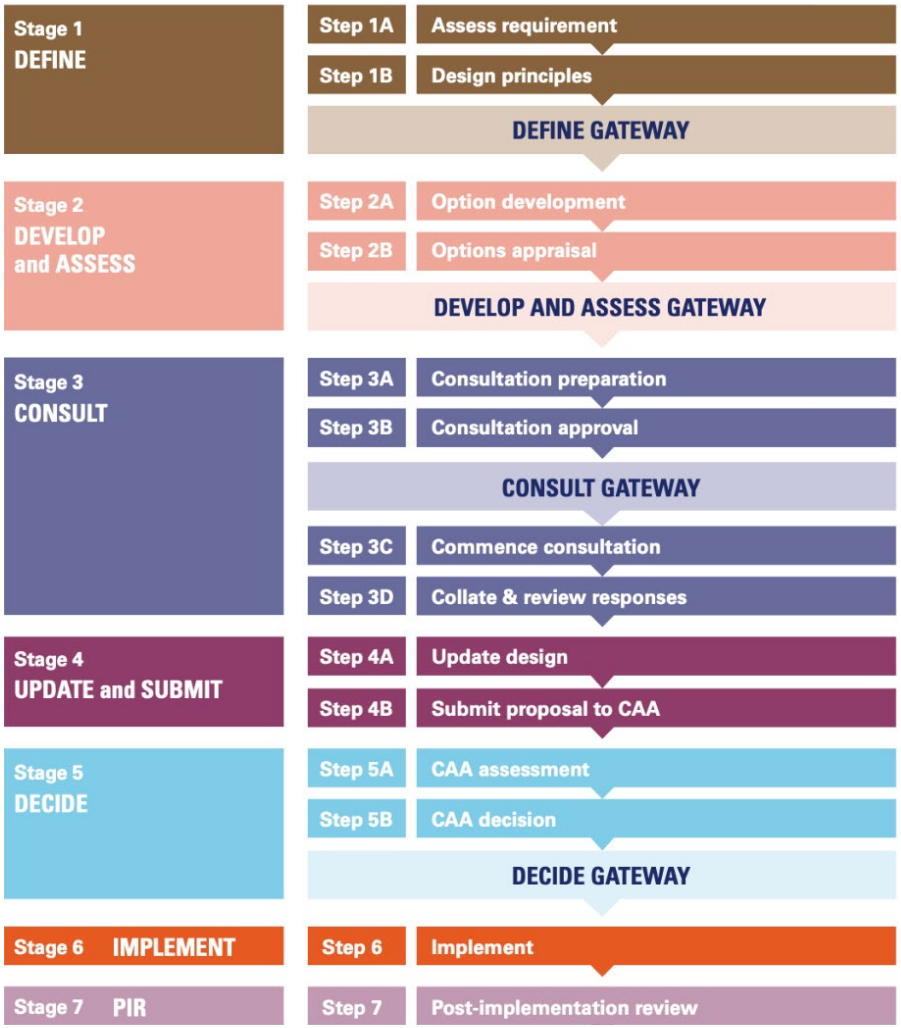


Figure 1 CAP1616 Process

[6] CAP1616

Aberdeen Airport Airspace Change Proposal

This Airspace Change Proposal is required to follow the CAP1616 process detailed in the section above. Table 1 below summarises the CAP1616 stages already undertaken for this ACP and the stage where we are at now, providing links to previous submission documents with further information.

Airspace Change Stage	Summary	Link to Documents (Also available on the ACP portal)
Stage 1A	In November 2019, AIAL submitted their following statement of need (SoN) to the CAA	Statement of Need on CAA's Airspace Change Portal
	AIAL participated in an assessment meeting with the CAA on the 19th November 2019 as part of Step 1A of the CAP1616 process. The purpose of the assessment meeting is for the change sponsor to present and discuss their SoN and to enable the CAA to consider whether the proposal falls within the scope of the formal airspace change process.	Assessment meeting minutes
Stage 1B	At Stage 1B AIAL developed a set of design principles with identified Stakeholders. The aim of the design principles is to provide high-level criteria that the proposed airspace design options should meet. They also provide a means of analysing the impact of different design options and a framework for choosing between or prioritising options. The final design principles outlined within the Stage 1B submission, are also shown here in this document.	Stage 1B Design Principle Submission Report
Stage 2A	Stage 2A requires change sponsors to develop and assess options for the airspace change. In Stage 2A, the change sponsor develops a comprehensive list of options that address the Statement of Need and that align with the design principles from Stage 1. We then share those options with our Stakeholder representatives (the same ones engaged with on the Design Principles). Feedback from the engagement may then be used to refine and/or generate further options where feasible at this stage or later in the process. Finally, we qualitatively assess all options developed against the Design Principles and produce a Design Principle Evaluation (DPE). Our comprehensive list of options is then shortlisted before progressing to Stage 2B. Our Stage 2A document provides details of this process, and our shortlisted options following the DPE. Our shortlist is also shown in the 'Overview of options under assessment' part of this document.	Stage 2A DPE Submission Document
Stage 2B	At Stage 2B an Airspace Change Sponsor is required to undertake an Initial Options Appraisal (IOA) of the airspace change options which proceed from Stage 2A. This is where we are now. The following sections of the document initially describe the options under assessment and the baseline option, followed by explaining the methodology used to assess each option, and then the IOA outcome. At the end of the document we explain, based on the IOA, the options which we intend to take forward to Stage 3 and our preferred option(s).	This document

Table 1: AIAL ACP to date

Understanding Performance Based Navigation (PBN)

Performance based navigation (PBN) improves the accuracy of where aircraft fly by using modern satellite navigation rather than outdated, less accurate, ground-based navigation aids (conventional navigation). This means that when aircraft fly PBN routes, they are typically more concentrated over a narrower area compared to when they are tactically controlled (vectored) by ATC.

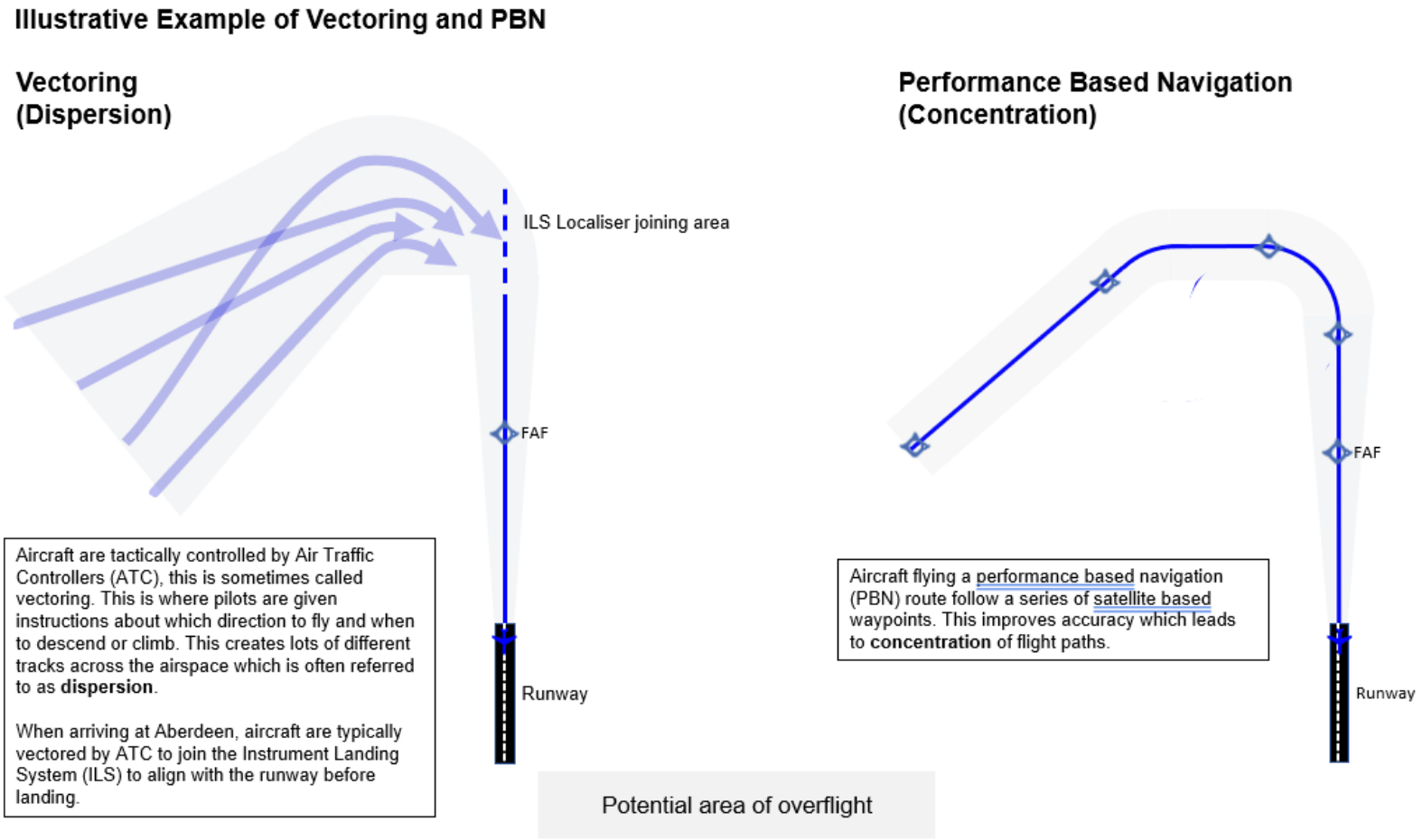


Figure 2 Illustrative Example of Vectoring and PBN

PBN Approaches

Required Navigation Performance (RNP) approaches use a series of satellite-based waypoints which aircraft follow to fly the overall Instrument Approach Procedure (IAP). Aircraft join the IAP at the Initial Approach Fix (IAF) waypoint before proceeding to the Intermediate Fix (IF). Aircraft then turn to the final approach fix (FAF) and descend to either land or undertake a missed approach.

PBN offers different types of waypoint which mean that sometimes aircraft predict the turn (flyby) before a waypoint rather than navigating directly overhead the waypoint before turning (fly over).

When designing RNP approaches, certain layouts of the waypoints are considered in order to optimise arrivals. They can be designed to continue to rely on vectors to final approach, or they can have PBN paths prior to final approach, referred to as T-bars. The 'bars' of these layouts can be designed to suit the requirements of the approach and they do not have to be symmetrical, although the layouts do have to follow the rules contained within PANS-OPs[7].

An illustrative example of a T-Bar layout is shown in the figure above. The light blue semi circles show the directions from which aircraft can be vectored to join the Initial Approach Fix (IAF). Aircraft then follow the waypoints which are designed, where possible, to allow for continuous descent before landing.

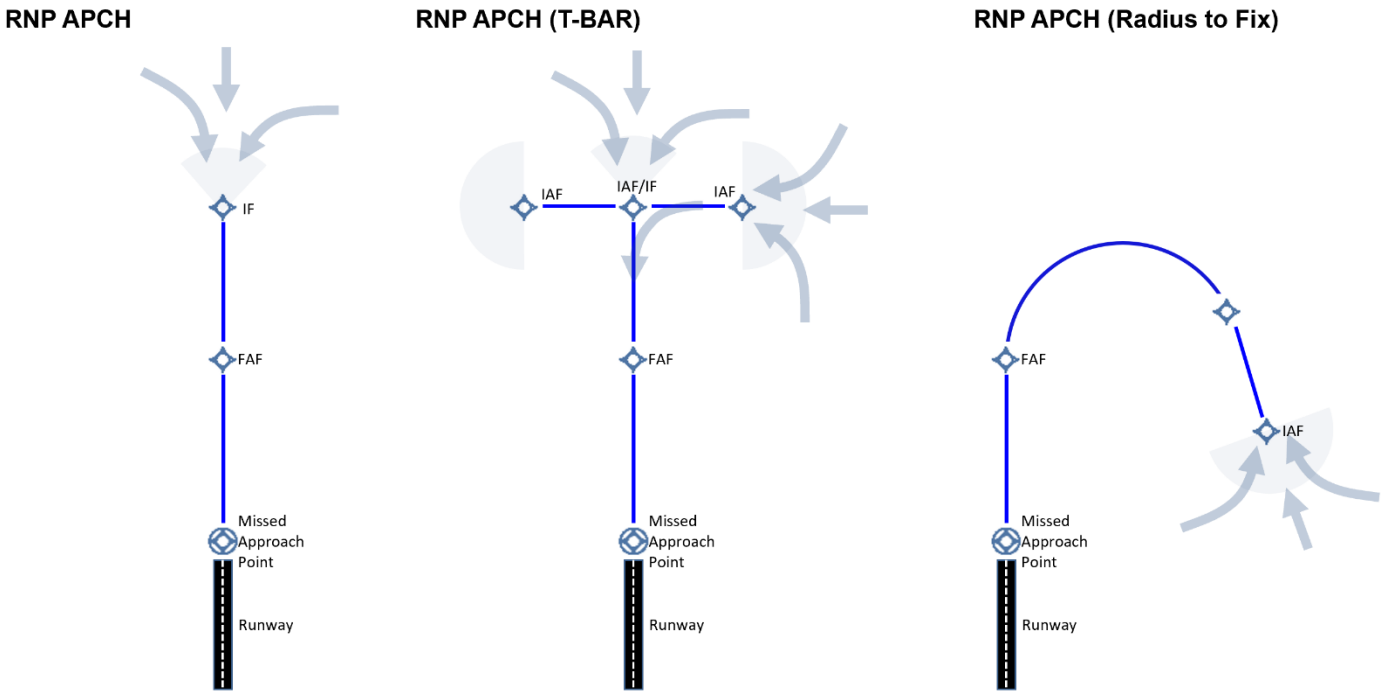


Figure 3 Illustrative Examples of RNP APCH, T-Bar and RNP APCH RF

[7] International Civil Aviation Organisation (ICAO) rules used for designing instrument approach and departure routes

There is also an illustrative example of an RNP APCH Radius to Fix (RF); The RF allows aircraft to very accurately fly in an arc of fixed radius around a point, direct to the Final Approach Fix (FAF). This type of approach can reduce track mileage and improve the accuracy of centreline adherence around the turn. The majority of aircraft are equipped to fly RNP APCH but not all aircraft are equipped to fly RF procedures. RNP APCH RF are sometimes referred to as 'curved approaches' within this document.

2. Overview of Options under assessment

Our comprehensive list of options included 10 arrivals options (3 options for runway 34 and 5 options for runway 16, and 2 baseline 'do nothing' options) and an option for reducing the volume of Controlled Airspace alongside a CAS 'do nothing' baseline scenario. As part of Stage 2A, we undertook a Design Principle Evaluation (DPE) where we evaluated each option against each Design Principle. The DPE is the first opportunity within the CAP1616 process to shortlist options before progressing to the IOA. The outcome of our Stage 2A Design Principle Evaluation was that we chose to take forward all of the options on the comprehensive list, with the exception of the two baseline 'do nothing' scenarios. The baseline scenarios were discounted as they did not align with the AMS, address the Statement of Need or provide AIAL with any additional resilience.

Although the 2 baseline 'do nothing' scenarios (Runway 16 arrivals 'do nothing', and runway 34 arrivals 'do nothing') did not progress as options, CAP1616 requires the baseline scenario to be appraised in this IOA as it provides a means of testing the options against the current day operations to better understand and highlight the benefits and impacts of each new option. The baseline will also continue to be appraised as part of the Full Options Appraisal and Final Options Appraisal at Stage 3 and Stage 4.

The following sections summarise the airspace change options we have taken through to this IOA. More information about how we have developed and evaluated these options is available in our Stage 2A submission document on the CAA Airspace Change Portal. The Initial Options Appraisal section of this document also contains images and more details of each option.

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, our design principles, our appraisals and stakeholder engagement and consultation.

Options under assessment	
Runway 16	**Runway 34**
Runway 16 Arrival Option 1 – Vectors to Final Approach	Runway 34 Arrival Option 1 – Vectors to Final Approach
Runway 16 Arrival Option 2 – Inner T Bar	Runway 34 Arrival Option 2 – T Bar
Runway 16 Arrival Option 3 – Outer T Bar	Runway 34 Arrival Option 3 – Curved Approach from the East*
Runway 16 Arrival Option 4 – Curved Approach from the West*	**Controlled Airspace**
Runway 16 Arrival Option 5 – Curved Approach from the East*	Existing CAS 'Do nothing'
	CAS Option 1 Raise portion of CTA 3 to 4500ft

***** Runway 16 option 4 and 5, and runway 34 option 3 use a type of PBN capability called RF (Radius to Fix) however not all airlines are able to fly these curved approaches. If these curved approaches are favourable, in order to achieve full resilience and fully modernise the airspace Aberdeen would look to implement an alternative PBN approach, which is available to all operators, alongside the curved approaches. For runway 16, this could be option 1, 2 or 3, and for runway 34 this could be option 1 or option 2. For the purposes of this IOA we have assessed each option individually. This allows us to clearly identify the benefits/impacts of each option and avoids a high number of permutations.

Technical note: PANS OPS requires the intermediate segment of a curved approach procedure to have a minimum distance between the Intermediate Fix (IF) and Final Approach Fix (FAF) of 2NM and a maximum distance of 10NM. The procedure images shown in our Stage 2A document and in this IOA show these minimum and maximum IFs. For the purposes of this IOA, we have assumed the IF will be at 5000ft. If these options progress to Stage 3 they will undergo detailed design work and the exact IF for each procedure will be determined.

Steeper Approach Angles

Aircraft arriving at Aberdeen fly a 3.0˚ approach. The Stage 1 Design Principles include DP4, *Design options should investigate the feasibility of steeper approaches for PBN arrivals to reduce the noise footprint of Aberdeen Airport's operation*.

In preparation for the Initial Options Appraisal, we investigated slightly steeper approach angles to understand whether it would be feasible for these to be implemented and the benefits and impacts if they were. Based on precedent within the UK[8] , we reviewed the possibility of increasing the approach options to 3.2˚ rather than the standard 3.0˚ approach angle. This results in a height difference of approximately 210ft when an aircraft is 10nm from touchdown between a 3.2˚ and a 3.0˚ approach.

We know from analysis undertaken in the precedent ACP that there are some noise and environmental benefits when aircraft fly a 3.2˚ approach however these benefits are disproportionately small and require a large number of flights to operate in order for any the benefits to be materially realised. In the case of Aberdeen, a very low number of aircraft are anticipated to fly the PBN approaches. The estimates used within this IOA represent a low number with <5% of aircraft expected to fly the approaches, although the curved approach options are expected to be operated for c.10% of arrivals. These use a type of PBN specification called RNP-RF (Radius Fix). There are potential issues with 3.2˚ approaches whilst the Precision Approach Path Indicators (PAPIs) are set to 3.0˚ and therefore it is anticipated that additional safety work would be required in order to obtain regulatory approval to fly a slightly steeper curved approach. It is therefore highly unlikely that any material noise benefits would be recognised from introducing steeper approaches at Aberdeen.

As the conventional 3.0˚ ILS procedures will remain, there would be no benefit to controlled airspace or other airspace users from increased approach angles. Therefore when considering noise and airspace benefits overall, any benefits would be so negligible compared against the additional costs that the project would incur in being able to demonstrate whether 3.2˚ approaches were operationally safe and acceptable. On balance, it was therefore concluded the possibility of increasing the approach angle from 3.0˚ would not be continued into Stage 3 of this ACP.

[8] ACP-2017-49

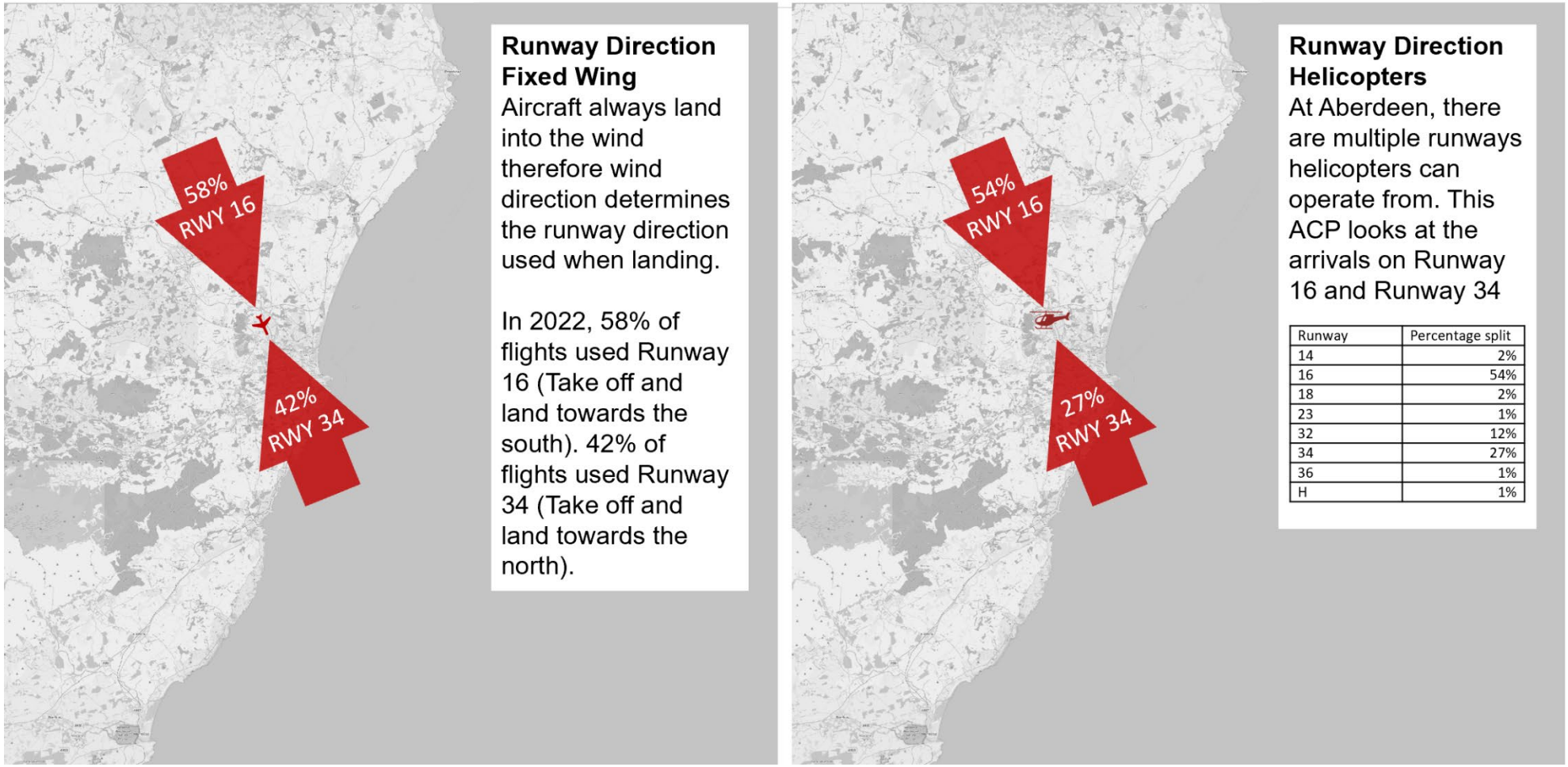
3. Initial Options Appraisal Methodology

Baseline Inputs

As part of this IOA, CAP1616 requires airspace change sponsors to set a baseline which is used for environmental evaluation of the options. CAP1616 explains that this will be a 'do nothing' scenario and will largely reflect the current-day scenario, although taking due consideration of known or anticipated factors that might affect that baseline, for example a planned housing development close to an airport, forecast growth in air traffic, or expected changes in airlines' fleet mix.

At Step 2B, the IOA is required to be a minimum of a qualitative appraisal and all environmental assessments must illustrate the difference between a pre-implementation ('do nothing') scenario and a post-implementation scenario, ensuring that the periods are comparable.

Movement Information



Runway	Percentage split
14	2%
16	54%
18	2%
23	1%
32	12%
34	27%
36	1%
H	1%

Figure 4 Modal split and Helicopter usage of Runway 16/34

Aberdeen Airport has four runways for helicopters and when reviewing the usage, runway 16 and runway 34, which are within the scope of this ACP, are used for the majority of helicopter arrivals.

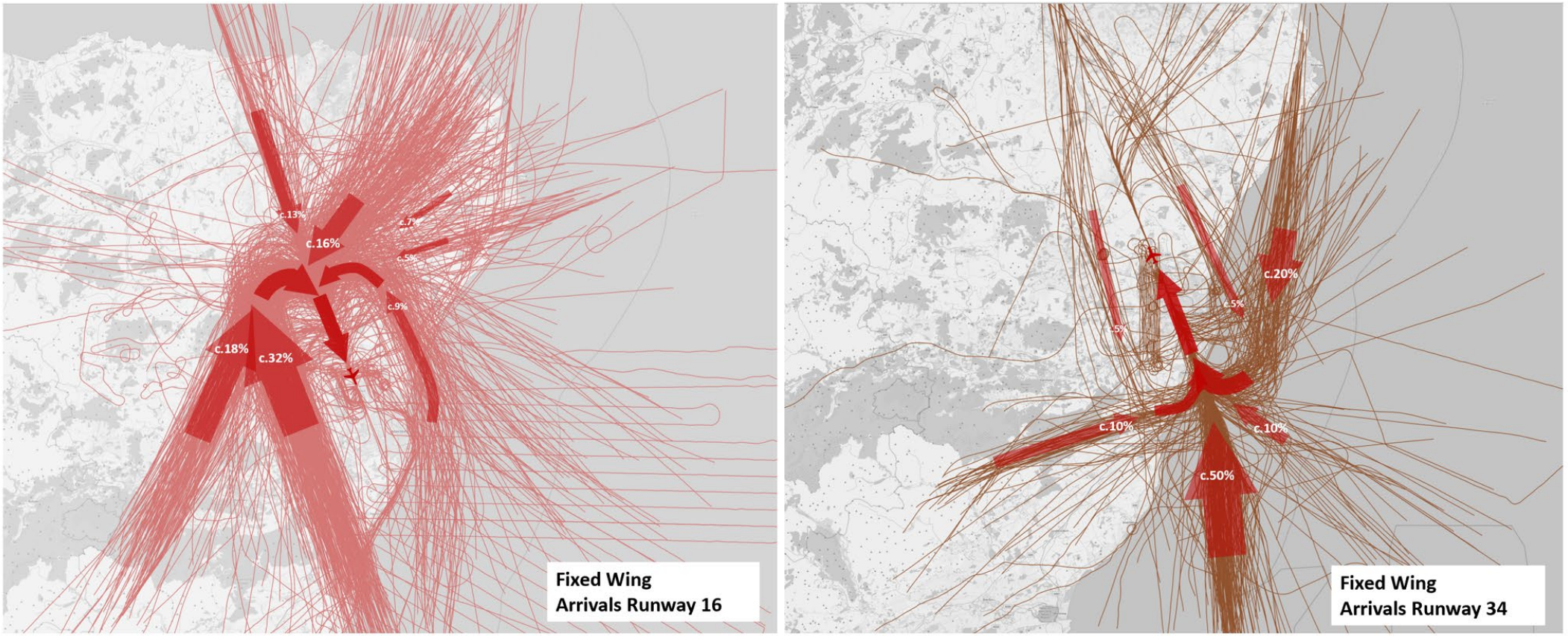


Figure 5 Broad directions and % of fixed wing arrivals

Figure 6 Broad directions and % of Helicopter arrivals

Traffic Forecast and Expected PBN Usage

- The options within the ACP do not seek to increase movements at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and meet the requirements of the Airspace Modernisation Strategy. Therefore, the traffic forecast applied 'without ACP' will remain the same 'with ACP'.
- At present the exact implementation date for the FASI-N airspace changes is unknown as the timeline for implementation will be dependent on a number of factors. Current deployments of the Scottish-TMA within Masterplan Iteration 2 suggest to expect an implementation date of around 2025, however this will be subject to alignment with masterplan iteration 3.
- This IOA will qualitatively describe the baseline and the anticipated factors that are expected to impact it, such as any forecast growth, fleet mix changes and planned developments based on implementation in 2025.
- CAP1616 also requires airspace change sponsors to forecast growth 10 years following the year of implementation. Forecasts 13 years into the future are not yet available and owing to the impacts of COVID-19, it is very difficult at this stage to forecast growth. For the purposes of this Initial Options Appraisal, we have reviewed the forecast growth in line with Aberdeen Airport's 5-year traffic predictions and applied the average growth to movement numbers between 2025 and 2035. As part of Stage 3 we will revisit this forecast when more information about Aberdeen's recovery from COVID-19 is available.
- The PBN procedures proposed as part of this ACP are intended to be operated alongside the existing approaches at Aberdeen and we expect the vast majority of arrivals will continue to be vectored to the ILS, as they do today. The RNP Approaches are required largely for resilience purposes to cover the eventuality of loss of the ILS due to fault or maintenance however some pilots may elect to fly an RNP Approach for training purposes even with a serviceable ILS.
- We expect c.1-5% of arrivals into Aberdeen could elect to fly the RNP approaches for training purposes however from experience at other airports, RNP Approach uptake is likely to be closer to the lower end of this assumption given the ILS will remain available. For this IOA, we will assess using a conservative 'worst cast' estimate of 5% of arrivals.
- Owing to the shorter track mileage and associated fuel burn savings, we anticipated that more operators would elect to fly the RNP APCH (RF) curved approaches if available. For this IOA we have estimated this as up to 10% of arrivals could elect to fly a curved approach.
- Feedback from Helicopter operators has suggested that the PBN procedures would only be used for training purposes and therefore in the table below we have optimistically estimated c.5% of helicopter flights could use these procedures. The anticipated use is however dependent on the configuration of each option and therefore we have included further information about expected usage as part of each option's description in the IOA section.
- Table 2 Traffic Forecast and Estimated PBN UsageTable 2 below provides an overview of these forecast movement numbers:

Table 2 Traffic Forecast and Estimated PBN Usage

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Per year											
Total Movements	84,363	85,507	85,691	86,034	86,378	86,723	87,070	87,419	87,768	88,119	88,472
Total Arrivals	42,182	42,753	42,845	43,017	43,189	43,362	43,535	43,709	43,884	44,060	44,236
Average per day											
Total Arrivals	116	117	117	118	118	119	119	120	120	121	121
Fixed Wing (c.60%)	69	70	70	71	71	71	72	72	72	72	73
Runway 16 (58%)	40	41	41	41	41	41	42	42	42	42	42
Runway 16 RNP APCH (5%) (Fixed Wing)	2	2	2	2	2	2	2	2	2	2	2
Runway 16 RNP APCH (RF) (10%) (Fixed Wing)	4	4	4	4	4	4	4	4	4	4	4
Runway 34 (42%)	29	30	30	30	30	30	30	30	30	30	31
Runway 34 RNP APCH (5%) (Fixed Wing)	1	1	1	1	1	1	2	2	2	2	2
Runway 34 RNP APCH (RF) (10%) (Fixed Wing)	3	3	3	3	3	3	3	3	3	3	3
Helicopters (c.40%)	46	47	47	47	47	48	48	48	48	48	48
Runway 16 (54%)	24	25	25	25	26	26	26	26	26	26	26
Runway 34 (27%)	12	12	13	13	13	13	13	13	13	13	13
Runway 16 RNP APCH or RF (5%) (Helicopter)	1	1	1	1	1	1	1	1	1	1	1
Runway 34 RNP APCH or RF (5%) (Helicopter)	1	1	1	1	1	1	1	1	1	1	1

Fleet Mix

Aberdeen's fleet is expected to see increases in the number of A320, B737-700, Dash-8, Saab 340 and similar sized fixed wing aircraft. There is expected to be decreased use of Embraers and ATR-42. In Stage 3 we will quantify the changes to the baseline as a result of the expected fleet mix at the year of implementation.

Planned developments

As part of our preparation of the baseline, we have identified planned developments in the area surrounding Aberdeen airport so that these can be considered as part of appraisal of the benefits and impacts of each option:

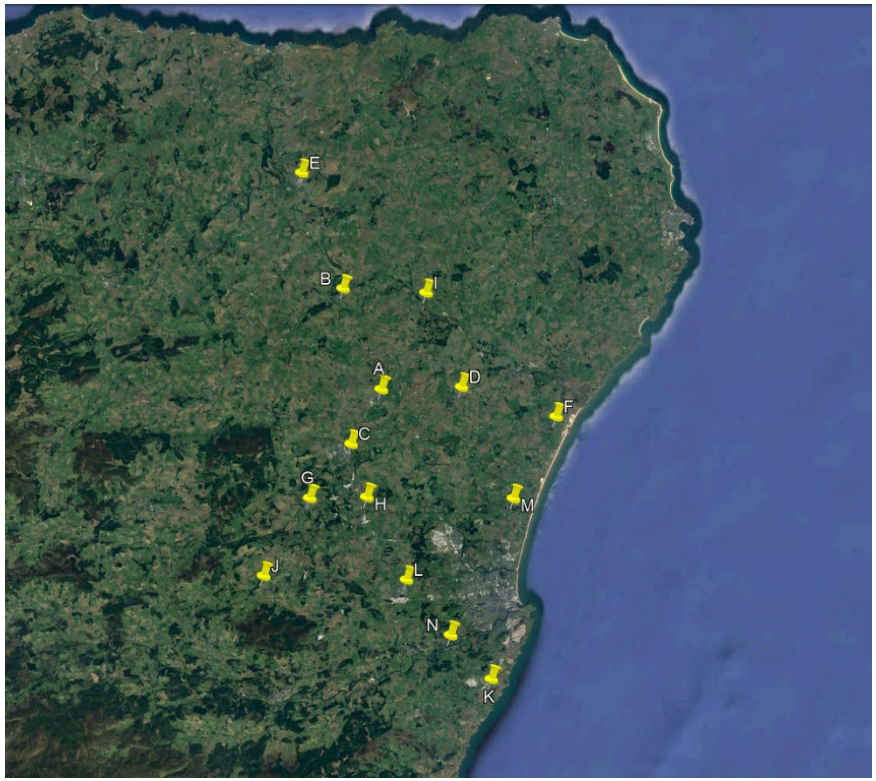


Figure 7 Planned Developments around Aberdeen Airport

Table 3 Planned Developments around Aberdeen Airport

Reference	Location	Type of Development	Size of Development	Status	Anticipated Completion	Additional Information/Links
A	Oldmeldrum	Housing	164	Decided (June 2022)	Unknown	Planning Portal
B	Fyvie	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
C	Inverurie	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
D	Pitmedden	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
E	Turriff	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
F	Foveran	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
G	Kemnay	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
H	Kintore	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
I	Methlick	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
J	Midmar	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
K	Portlethen	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
L	Potterton	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
M	Westhill	Housing	Unknown	Unknown	Unknown	Opportunity identified in Aberdeenshire Local Plan
N	AB12 5YQ	Residential/Golf Course/Equestrian Centre	280	Awaiting Decision	Unknown	Planning Portal

Initial Options Appraisal Methodology

At Stage 2B CAP1616 requires sponsors to carry out an initial qualitative assessment of the benefits and impacts of each option, tested against the 'do nothing' baseline scenario. The purpose of this initial appraisal is to highlight the change to sponsors, stakeholders and the CAA and the relative differences between the impacts, both positive and negative, of each option.

Our assessment criteria shown in Table 4 below have been categorised based on the example in CAP1616 Appendix E, however we have added an additional category called 'Interdependencies, conflicts and trade-offs' to satisfy the requirements to outline potential interdependencies with other FASI-N ACPs, and 'Airspace Modernisation Strategy' to satisfy the 7 confirmed indicators that the CAA will use to assess whether this Stage 2 submission accords with the AMS including iteration 2 of the Masterplan. We will follow this table structure across the appraisal of all of our options. The table below also presents the IOA methodology that will be followed. This methodology will be used to compare the airspace change options against the baseline.

Table 4 IOA Assessment criteria and methodology

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life	Qualitative and partly quantitative

Noise: A qualitative assessment of changes to noise impacts compared with the do-nothing baseline supported by some quantitative data. This assessment will be informed by:

Overflight contours
Technical Appendix B includes images and data tables of overflight information which we have used to inform our qualitative assessment of each option. There are two types of overflight information that we have termed 'centreline' and 'vectoring'.

Centreline Data
The centreline overflight contours are based on a single event, i.e. one arrival flying a 3 degree approach using the CAA's 48.5 degree definition of overflight as defined in CAP1498. As aircraft will continue to be vectored onto the various IAP options, the overflight contours have been generated from only 5000ft to landing, to reflect the point at which any change could take place, where aircraft are anticipated to join the PBN procedure; as part of Stage 3 we will generate full overflight contours from 0-7000ft that also reflect the anticipated vectoring swathes from 7000ft prior to joining the PBN procedure.

The contours are generated using a standard AEDT (Aviation Environmental Design tool) continuous descent profile. The data-tables use the latest available CACI population data for 2021, PointX data to identify noise sensitive buildings (schools, hospitals, and places of worship).

It's important to note that the overflight contours only look at a single overflight along the PBN centreline, and therefore at this stage the data does not consider frequency of overflight. This will be qualitatively described as part of this IOA and then fully quantified at Stage 3 Full Options Appraisal.

In order to offer some data based comparison between the baseline and the options, baseline typical centreline contours have been generated. It's important to note that a centreline for the existing arrivals prior to final approach does not actually exist in reality; we created typical centrelines using radar track data based on the areas most frequently overflown by arrivals in today's airspace arrangement for comparative purposes**.**

Vectoring
Owing to the nature of vectoring, it is very complex to model and at this stage of the process, given the number of options, it is not proportionate to undertake full modelling. In order to illustrate the difference between today's baseline flight tracks over the ground (also known as a vectoring swathe) and the PBN options, we have included some information about the baseline vectoring scenario. This has been generated using noise track keeping (NTK) data for the 92-day period, and therefore is not generated in the same way as the overflight contours which use a standard vertical profile of one aircraft. We have however applied the CAA's 48.5 degree overflight cone to the NTK data. The outcome are the baseline heatmaps, which are shown in this IOA and Technical Appendix A, which help us to articulate the current vectoring swathe and any areas of concentration which occur today.

L_{Aeq} contours
The most recent available noise contours for ABZ are from their 2018 – 2023 Noise Action Plan (NAP) and represent noise exposure in 2016. The contours represent annual noise exposure and only go down to 55dBL_{Aeq},16h and 50dBL_{Aeq},8h so cannot be directly compared to the 92 day summer average 51dBL_{Aeq},16h and 45dB $L_{Aeq,8h}$ LOAEL for day and night respectively. However, they can be used to provide an indication of the potential size and shape of the noise contours around the airport compared to the arrival route options.

The 2016 55dB $L_{Aeq,16h}$ annual contour extends approximately 4-5km from either end of the runway and the 50dB $L_{Aeq,8h}$ contour extends approximately 2-3km. Given that the differences in the arrival route options only occur at more than 10km from each end of the runway, and they will only apply to a small proportion of arrivals, and departures are unchanged, it is therefore unlikely that the route options would make a significant difference to the LOAEL contours. This will be confirmed at stage 3.

CAP2091
The most recent available noise contours represent annual noise exposure and the lowest modelled noise contours were 55dB L_{Aeq},16h and 50dB L_{Aeq},8h so cannot be directly compared to the 92 day summer average 51dB L_{Aeq},16h and 45dBL_{Aeq},8h LOAEL to be able to definitively confirm the CAP2091 noise modelling category at this stage. However, they can be used to provide an indication of the potential size of the noise contours.

In the NAP the population within the daytime annual 55dB L_{Aeq},16h was noted as >10,000 with a footnote that "the 55 dB(A) contour does not close so a definitive figure cannot be given". The population within the night-time annual 50dBL_{Aeq},8h was 4,700. Whilst these numbers are substantially below the recommended minimum of 20,000 for category C, the 92 day summer average 51dBL_{Aeq},16h and 45dBL_{Aeq},8h LOAEL contours will extend further into the densely populated area of Aberdeen City and it is likely that the additional population captured in these contours could result in a population greater than 20,000. The anticipated growth based on the 10 year forecast in Table 2 is relatively small and would equate to an increase in noise contours of approximately 0.2dB, all things being equal, which is not expected to make a significant difference to population within the noise contours. It is anticipated that the CAP2091 category would therefore be C or D, but this will be confirmed in Stage 3 when updated noise modelling will be undertaken.

Tranquillity: There are no National Parks, National Scenic Areas (NSA), or Designated Quiet Areas (DQA) within the scope of the potentially impacted area of this ACP. The nearest national park is the Cairngorms which is overflown at above 7000ft. This has been checked against the Scottish Government's catalogue of spatial data (https://www.spatialdata.gov.scot/geonetwork/srv/eng/catalog.search#/home).

Biodiversity: A qualitative assessment of changes to biodiversity compared with the do-nothing baseline. Research shows Biodiversity disturbance effects associated with aircraft typically occur when an aircraft is flying at or below 500m (1,640 feet)[9]. This qualitative assessment will highlight if there could be lateral flight path changes below 1,640ft (compared to the baseline) which could therefore have an impact on Biodiversity. It will use the noise assessment as an indicator of potential impacts to biodiversity.

[9] Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature Birds Network Information Note

Communities	Air Quality	Qualitative
A qualitative assessment of changes to local air quality compared with the do-nothing baseline. Government guidance states that aircraft flying above 1,000ft are unlikely to have a significant impact on local air quality. This qualitative assessment will highlight if there could be lateral flight path changes below 1,000ft (compared to the baseline) which could therefore have an impact on Local Air Quality.		
Wider Society	Greenhouse Gas Impact	Qualitative
As emissions of greenhouse gases/CO_2 arise from the combustion of aviation fuel, and combustion of fuel is linked to track length, we will qualitatively estimate the differences between the track length of the baseline and the option, to understand if there are any anticipated advantages/disadvantages of the option. This will allow us to estimate the greenhouse gas impacts as a result of the option.		
Wider Society	Capacity/Resilience	Qualitative
The purpose of the change is to provide resilience, remove dependencies on VORs, and meet the requirements of the Airspace Modernisation Strategy. None of the options developed seek to increase capacity at the airport. The assessment will therefore qualitatively describe any benefits or impacts to resilience compared with the do-nothing baseline.		
General Aviation	Access	Qualitative
A qualitative assessment of changes to GA access to controlled airspace compared with the do-nothing baseline. Assessment will consider whether each option has potential to require more/less CAS, and/or affect existing helicopter routes. This ACP has two potential options for the CAS which are compatible with all of the approach options presented as part of this IOA. These two options, the baseline 'do nothing' for CAS and CAS Option 1, have been assessed following the same criteria in this table. For more information, please see the 'do nothing' CAS section.		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative
As fuel burn is linked to track mileage, this IOA will qualitatively describe the estimated differences in track miles between the baseline and the option, to understand if there are any anticipated advantages/disadvantages of the option. This estimation will consider whether the proposed arrival tracks could be longer or shorter than a typical flight today and will also consider the effect on continuous descent from 7000ft. The assessment will be rounded to the nearest whole nautical mile.		
Commercial airlines	Training costs	Qualitative
A qualitative assessment of changes to commercial airline training costs compared with the do-nothing baseline.		
Commercial airlines	Other costs	Qualitative
A qualitative assessment of changes to other relevant commercial airline costs compared with the do-nothing baseline.		
Airport/ANSP	Infrastructure costs	Qualitative
A qualitative assessment of changes to ANSP infrastructure costs compared with the do-nothing baseline.		
Airport/ANSP	Operational costs	Qualitative
A qualitative assessment of changes to ANSP operational costs compared with the do-nothing baseline.		
Airport/ANSP	Deployment costs	Qualitative
A qualitative assessment of ANSP deployment costs compared with the do-nothing baseline.		
All	Safety	Qualitative
A qualitative safety assessment of each option will be undertaken which compares against the baseline.		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
A qualitative assessment of how the design option strikes a balance, considering the AMS objectives of improved capacity, noise, and fuel/CO2 and reduced CAS and increased airspace integration compared with the do-nothing baseline.		
All	Interdependencies, conflicts and trade-offs	Qualitative
Aberdeen does not have any interdependencies with other airports owing to the airport's location and the scope of change within this ACP. There are interdependencies with the airspace above 7000ft, parts of which could be modernised by NATS NERL under their FASI ACP. At this stage, because as a minimum the options still will require vectoring from 7000ft to c.5000ft, NERL have confirmed that all options are expected to integrate with the airspace above 7000ft.		

Initial Options Appraisal

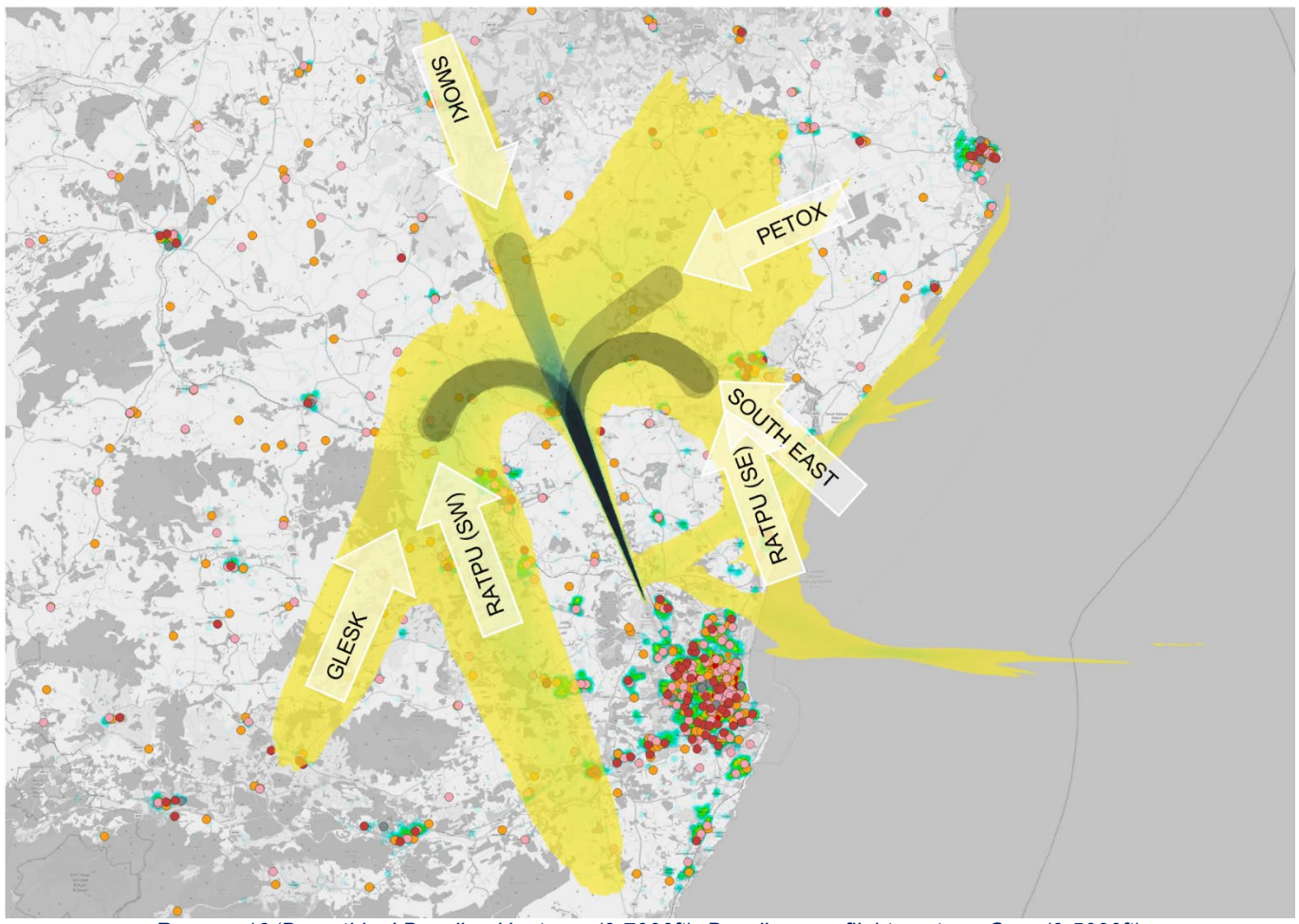
Runway 16 Arrivals Baseline 'Do nothing'

This section describes the baseline 'do-nothing' scenario for runway 16 arrivals. More detail on the baseline is described in the Stage 2A submission document, published on the CAA's Airspace Change Portal.

The figures shows the swathes of arrivals to Aberdeen's easterly runway (16). There are no published centrelines flown other than on final approach and therefore all arrivals are vectored by ATC onto a closing heading to establish on the ILS Localiser. Typically, aircraft are joining final approach between 8 and 12nm from touchdown although there are variances to this. Within the data c.32% of helicopter traffic also flies the ILS approaches[10] and join within the same swathe as fixed wing traffic, with the remaining helicopter traffic taking a more direct approach from the north east and south and south east.

No departure tracks are shown in this image as they are not within scope of the ACP

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life	Qualitative and partly quantitative



Runway 16 'Do nothing' Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft)

Table 5 Runway 16 'Do nothing' Centreline overflight data 0-5000ft

Track	Via Waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline Centreline (0-5000ft)	**SE**	38	1322	1	0	0	1
	RATPU (SOUTH EAST)	38	1309	1	0	0	1
	PETOX	38	542	0	0	0	1

[10] Note helicopter use of the ILS is very weather dependent; in clear visibility Helicopters are likely to arrive under VFR and take a more direct route to the airfield whereas in poor visibility almost all helicopters would use the ILS.

	RATPU (SOUTH WEST)	38	1533	2	0	0	3
	GLESK	38	1676	1	0	0	4
	SMOKI	38	819	0	0	0	2

Noise: Currently there are no published arrival routes at Aberdeen other than on final approach. Aircraft arriving onto runway 16 are vectored by Aberdeen ATC to join the ILS localiser. Typically, aircraft join the final approach, where they are aligned with the runway centreline, at around 8-12nm (15-22km). The vectoring by ATC creates broad dispersion across the airspace between 7000ft and joining the final approach at around 3500ft-2500ft.

This broad area of dispersion between 7000ft and around 3500-2500ft overflies the areas of Kintore, Kemnay, Inverurie, Rothienorman, Methlick, Ellon, Pitmedden. Aircraft arriving from the north overfly Turriff and Tulloch and the eastern parts of Oldmeldrum. The areas of Oldmeldrum and Tarves are located under the base leg turns. Aircraft then join the final approach where the swathe then narrows as aircraft fly the extended runway centreline before landing. There are no dense areas of population under the final approach, although there are the lower populated areas of Whiterashes, Stralock and Middleton.

The most recent available noise contours for ABZ are from their 2018 – 2023 Noise Action Plan and represent noise exposure in 2016. Appendix A includes details of these contours. The contours represent annual noise exposure and only go down to 55dBL_{Aeq},16h and 50dBL_{Aeq},8h so cannot be directly compared to the 92 day summer average 51dBL_{Aeq},16h and 45dBL_{Aeq},8h LOAEL for day and night respectively. However, they can be used to provide an indication of the potential size and shape of the noise contours around the airport compared to the arrival route options. The 2016 55dBL_{Aeq},16h annual contour extends approximately 4-5km from either end of the runway and the 50dBL_{Aeq},8h contour extends approximately 2-3km. Given that the differences in the arrival route options only occur at more than 10km from each end of the runway, and they will only apply to a small proportion of arrivals, and departures are unchanged, it is therefore unlikely that the route options would make a significant difference to the LOAEL contours. This will be confirmed at stage 3.

Tranquillity: Aircraft arriving on runway 16 do not overfly National Parks, National Scenic Areas (NSA), or Designated Quiet Areas below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. At 1640ft, aircraft arriving at Aberdeen are aligned with the runway centreline and are typically 9-10km from landing. There are no Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC) between 10km and landing.

Communities	Air Quality	Qualitative
Aircraft arriving at Aberdeen fly a standard 3-degree angle of approach and descend through 1000ft typically between 5 - 7km before the landing threshold. This is in the last stages of the final approach when aircraft are aligned with the runway centreline.		
Wider Society	Greenhouse Gas Impact	Qualitative
Emissions of greenhouse gases arise from the combustion of aviation fuel, and as the combustion of aviation fuel is linked to track length, we have initially looked at the track length for the baseline arrivals. The greenhouse gas assessment is therefore linked to the fuel burn assessment detailed in the section below. We will estimate the differences between the baseline and the option, to understand if there are any anticipated advantages/disadvantages of the option. This estimation will consider whether the aircraft tracks will be longer or shorter than a typical flight today. As CO_2 emissions are linked to the difference in aviation fuel burnt, this will allow us to qualitatively describe anticipated greenhouse gas impacts as a result of the option.		
Wider Society	Capacity/Resilience	Qualitative
Aberdeen Airport currently promulgates ILS/DME, LOC/DME and VOR/DME approaches for runway 16. These approaches are dependent on outdated conventional ground based navigation equipment. The most common approach, the ILS/DME is dependent on the ADN VOR as well as the ILS.		
General Aviation	Access	Qualitative
This baseline scenario would not offer any change from the existing Controlled Airspace (CAS) arrangements in place today. The options will be qualitatively compared against this existing scenario. (See existing CAS 'Do nothing' section for further details).		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative

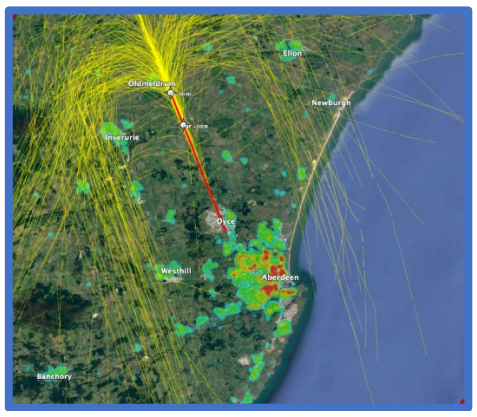
When arriving at Aberdeen, aircraft are vectored by ATC before joining the final approach. This means that track length is varied from flight to flight. For the purposes of comparing our arrival options against the baseline scenario, we have used the NTK vectoring baseline data and information from ATC to estimate arrivals centrelines from 4 main network entry points; we have then used the track mileage from this centreline as an initial indication of 'do nothing' track length.

	Network arrival points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 16 Do Nothing	43	36	40	29

Commercial airlines	Training costs	Qualitative
As this option is already in operation, there are no training costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
Commercial airlines	Other costs	Qualitative
As this option is already in operation, there are no other costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
Airport/ANSP	Infrastructure costs	Qualitative
As this option is already in operation, there are no infrastructure costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
Airport/ANSP	Operational costs	Qualitative
As this option is already in operation, there are no operational costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline. For some approaches, Aberdeen Airport is dependent on conventional ground based navigation equipment (VORs) which are currently undergoing a rationalisation programme by NATS NERL. Aberdeen is currently investigating RNAV substitution to mitigate VOR rationalisation however this is considered an interim measure and failure to implement a long term solution may result in additional operational costs.		
Airport/ANSP	Deployment costs	Qualitative
As this option is already in operation, there are no deployment costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		

All	Safety	Qualitative
The baseline is already in safe operation and there are no safety concerns raised at this time.		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
CAP1711 describes the objective as: Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. Whilst vectoring of arrivals is a perfectly reasonable option in a future operating environment, doing nothing with arrivals will not align with the AMS as it would not offer Aberdeen any modern PBN procedures.		

Runway 16 Arrival Option 1 – Vectors to Final Approach

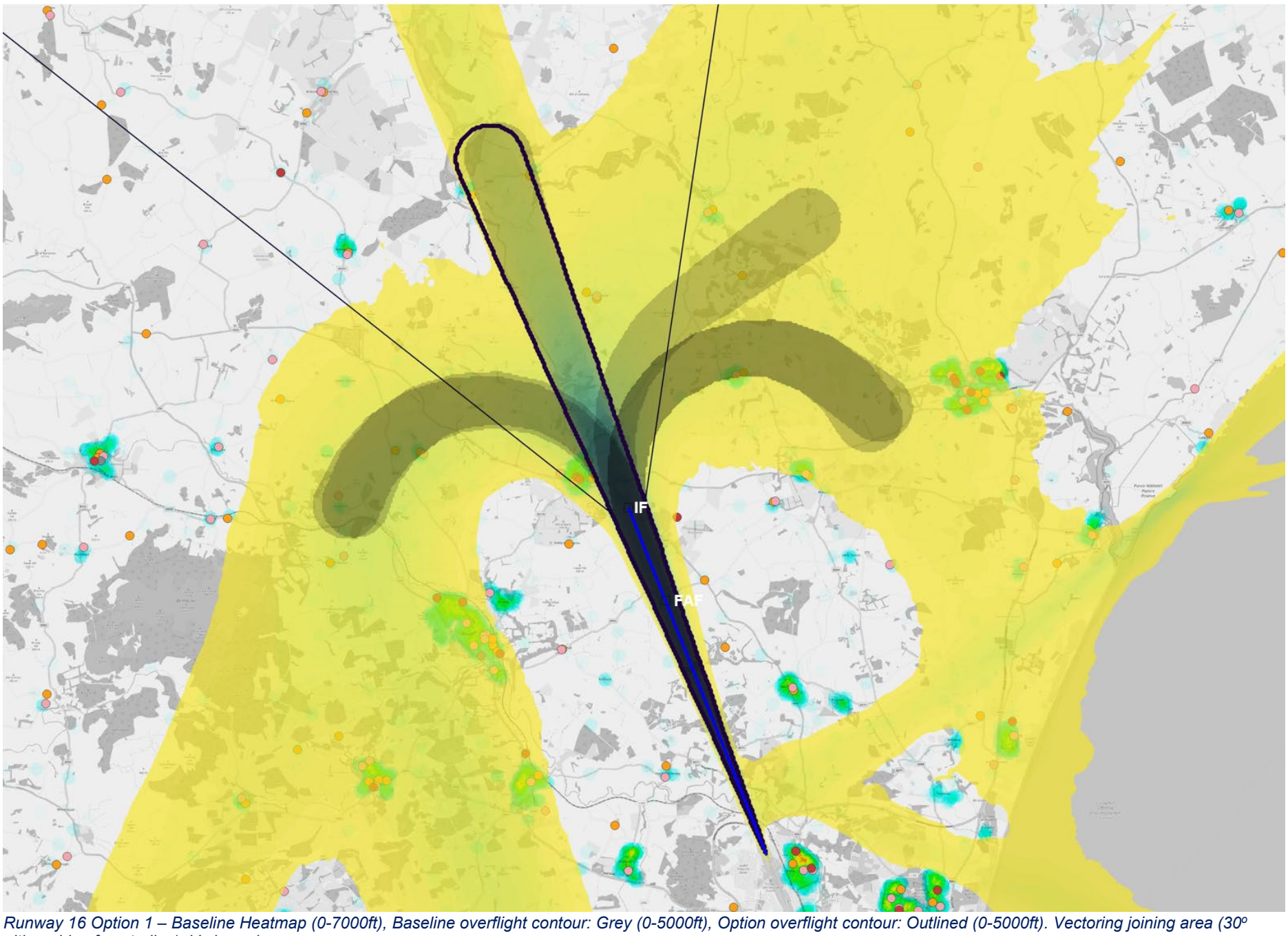


This option would continue to see those arrivals wishing to fly an RNP APCH vectored to final approach as they are today. The only difference would be whereas with the ILS, the arrivals have flexibility in where they join final approach from 8nm and beyond, RNP APCH arrivals would be vectored to join final approach in the same location, at the Initial Fix (IF), usually with a closing heading of no greater than 30˚. The IF in the illustration has been positioned so those arrivals would join final approach at approximately 8nm, keeping the vectored arrival swathes consistent with the baseline.

The exact position of the IF will be explored at Stage 3.

This RNP APCH option is expected to be adopted by c.5% of arrivals. Based on the data in our traffic forecast, this is optimistically estimated to be, on average 2 fixed wing arrivals and 1 helicopter arrivals per day. The remaining c.95% of Runway 16 arrivals will continue to operate as they do today.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 16 Option 1 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft). Vectoring joining area (30º either side of centreline): V shaped cone.

Table 6 Runway 16 Option 1 Centreline overflight data 0-5000ft

Option	Via waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	SMOKI	38	819	0	0	0	2
Option 1	SMOKI	38	906	1	0	0	3
Difference							
Option 1	SMOKI	0	+87	+1	0	0	+1

Noise: This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours as the scope of the contours falls on the final approach track where the option is the same as the baseline. When considering the overflight metrics, this option is not expected to result in any significant changes to tracks over the ground compared to the baseline; this is because aircraft will continue to be vectored onto final approach as they are today and the RNP APCH joining point has been positioned based on the existing arrivals swathe.

When operating the PBN approach, aircraft will be vectored towards a fixed waypoint (IF) rather than the ILS localiser (where there is a broader area of dispersion around joining the final approach). Aircraft will be able to join the waypoint up to 30º either side of the extended centreline which is shown as a cone shape on the image above. Joining at a fixed waypoint may lead to a small redistribution of noise which could impact the area of Oldmeldrum. However, as only c.5% of arrivals are anticipated to use the RNP APCH procedures and given they will join within the existing swathe, this is expected to result in a very small change in noise distribution and any adverse impacts of this are so marginal that they are not expected to lead to any significant effects. Beyond the IF, aircraft will fly the same final approach as they do in the baseline.

For the purposes of the data within this IOA, the overflight contour has been drawn up to 5000ft showing a route from SMOKI however in reality aircraft will be vectored, as they are today and as shown in the heatmap, to join the IF at c.8nm. Assuming a continuous descent approach, this means aircraft will be at an altitude of c.2500ft when joining the RNP APCH procedure. From 2500ft to landing, there is no change in noise data compared to the baseline.

The remaining 95% of traffic would continue to fly as they do in the baseline (as they do today). This option is not expected to impact the flight paths of aircraft departing from Aberdeen.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative

Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.

Wider Society	Greenhouse Gas Impact	Qualitative

This option is not expected to materially alter track length compared to the baseline; this is because aircraft will continue to be vectored onto final approach as they are today and the RNP APCH joining point has been positioned based on the existing arrivals swathe. As track length is typically linked to fuel burn, and subsequently CO_2 emissions, we do not expect this option to materially alter greenhouse gas emissions for the c.5% of aircraft operating PBN approaches. In addition, given that PBN approaches are estimated to be used by only c.5% of runway 16 arrivals, any marginal benefits or impacts overall will be negligible. This option is not expected to impact aircraft departing from Aberdeen.

Wider Society	Capacity/Resilience	Qualitative

The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs which are outdated, and this equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.

General Aviation	Access	Qualitative

This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS, and aircraft would continue to be vectored onto final approach as they are within the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume.

The option is not expected to impact the Helicopter routes to and from Aberdeen Airport.

General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative

This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines.

General Aviation/ commercial airlines	Fuel Burn	Qualitative

This option is not expected to materially alter track length compared to today; this is because aircraft will continue to be vectored onto final approach as they are today and the RNP APCH joining point has been positioned based on the existing arrivals swathe. As track length is typically linked to fuel burn, we do not expect this option to materially alter fuel burn for those aircraft operating PBN approaches. In addition, given that PBN approaches are estimated to be used by only c.5% of runway 16 arrivals, any marginal benefits or impacts in track length overall will be negligible. No change to the profiles of inbound or outbound aircraft is expected as a result of this option. The RNP APCH would be designed to achieve CDO.

	Network arrival points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 16 Do Nothing	43	36	40	29
RWY 16 Option 1 Vectors to final approach	43	36	40	29
Difference	**0**	**0**	**0**	**0**

This option is not expected to impact aircraft departing from Aberdeen.

Commercial airlines	Training costs	Qualitative

Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option is not anticipated to require any additional training costs for airlines.

Commercial airlines	Other costs	Qualitative

No other airline costs are foreseen.

Airport/ANSP	Infrastructure costs	Qualitative

The initial deployment phase of the ACP may require some minor ATC system engineering amendments.

Airport/ANSP	Operational costs	Qualitative

The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.

Airport/ANSP	Deployment costs	Qualitative

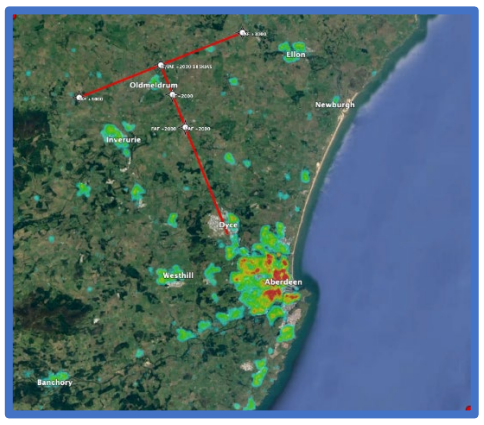
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.

All	Safety	Qualitative

This option is expected to be as safe as the baseline and no other safety concerns have been raised. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).

All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace and, whilst doing so, would have little disbenefit for other stakeholders. The noise and fuel burn/CO_2 assessments (see above) expect no material change from the baseline, and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. One of the objectives of the AMS is to increase capacity. This option does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

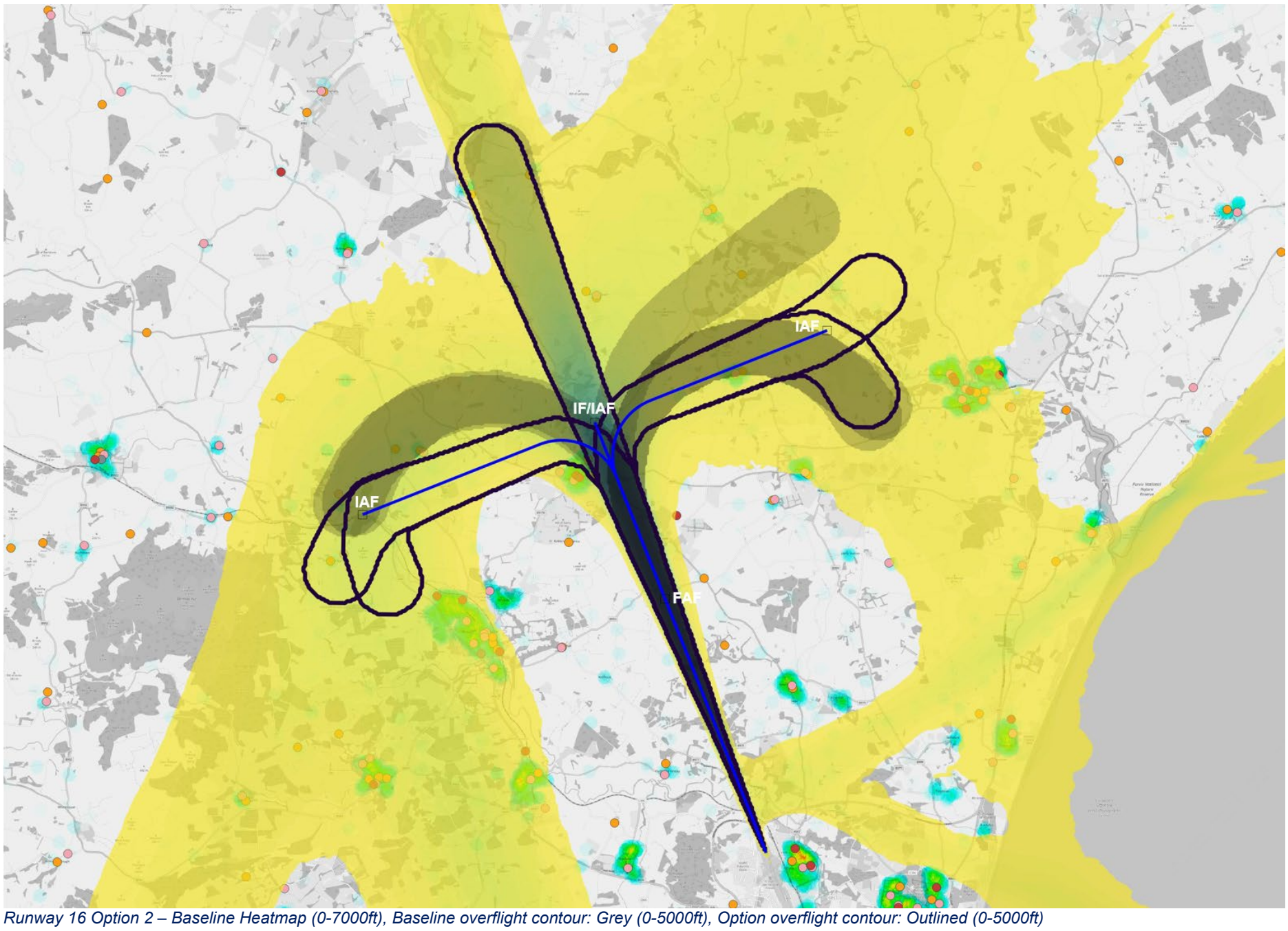
Runway 16 Arrival Option 2 – Inner T Bar



This option would see those arrivals wishing to fly an RNP APCH vectored towards an Initial Approach Fix (IAF) positioned on base-leg from either side of final approach or in the centre of the T-bar.

This RNP APCH option is expected to be adopted by c.5% of arrivals. Based on the data in our traffic forecast, this is optimistically estimated to be, on average 2 fixed wing arrivals and 1 helicopter arrivals per day. The remaining c.95% of Runway 16 arrivals will continue to operate as they do today.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 16 Option 2 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft)

Table 7 Runway 16 Option 2 Centreline overflight data 0-5000ft

Option	Via waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	RATPU (SOUTH EAST)	38	1309	1	0	0	1
	PETOX	38	542	0	0	0	1
	RATPU (SOUTH WEST)	38	1533	2	0	0	3
	GLESK	38	1676	1	0	0	4
	SMOKI	38	819	0	0	0	2
Option 2	PETOX	38	1912	1	0	0	1
	RATPU (SOUTH EAST)	38	1735	1	0	0	1
	RATPU (SOUTH WEST)	38	1572	1	0	0	2
	GLESK	38	1785	1	0	0	3
Difference							
Option 2	PETOX	0	+1370	+1	0	0	0
	RATPU (SOUTH EAST)	0	+426	0	0	0	0
	RATPU (SOUTH WEST)	0	+39	-1	0	0	-1
	GLESK	0	+109	0	0	0	-1

This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours, as the lateral changes to flight paths occur outside the scope of the contours.

When considering the overflight metrics, aircraft will initially continue to be vectored from above 7000ft until joining the IAFs of the PBN procedure at 5000ft. As aircraft will be vectored onto these fixed waypoints, this may to a small redistribution of flight tracks however as only c.5% of arrivals are anticipated to use the RNP APCH procedures, this 5% of traffic will be split between the various arrival directions, and given they will join within the existing swathe, this is expected to result in a very small change to what is shown on the heatmap, and any adverse impacts of this are so marginal that they are not expected to lead to any significant effects.

Fixed wing aircraft are expected to join the T-Bar from the east and west and may also use the centre IF/IAF, and the majority of Helicopter traffic that elects for the procedure is expected to utilise the centre IAF/IF or the eastern T-bar. Once aircraft have joined the PBN procedure at the IAF, there will be some concentration of tracks along the RNP APCH base-legs which will result in a change in noise distribution. This largely occurs over less densely populated areas with the exception for the eastern 'T' of Tarves and Craigdam and for the western 'T' this occurs over the western parts of Oldmeldrum. In the case of the western 'T', comparison against the 2022 heatmap and baseline centrelines shows this would occur slightly south of the main concentrated area of the swathe however it would still occur within an area which is overflown today. The eastern 'T' is more closely aligned with the main concentrated area of the baseline swathe however it would still be slightly south of the baseline centreline; this means that the southern parts of Tarves would fall within the overflight contour. This area is already overflown today. It should be noted that arrivals from PETOX and the NE could use the eastern T bar however based on the direction of the swathes today, they are more likely to be vectored onto the IAF/IF in the centre. This means that although when comparing centreline data to baseline centreline data, there is an increase in population overflown (due to overflight of Tarves, Ythanbank and surrounding areas), in reality overflight from NE/PETOX arrivals is likely to remain similar to today with very few of these arrivals flying the eastern T-Bar. Overall, when considering the baseline centreline data compared to the option centreline data, there is a small increase in the population overflown.

Overall, as only c.5% of arrivals are anticipated to use the RNP APCH procedures, and usage of the east/west 'T' and IAF/IF is split between various arrival directions, and given the PBN T-BARs overfly the same areas as the baseline swathe, this option is expected to result in a small impact in noise distribution which will be investigated as part of the quantified noise analysis at Stage 3, should this option progress. Beyond the turn onto the extended runway centreline (from the IF onwards) aircraft will fly the same final approach track as they do in the baseline.

The remaining 95% of traffic would continue to fly as they do in the baseline (as they do today). This option is not expected alter the flight paths of aircraft departing from Aberdeen.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative
Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.		
Wider Society	Greenhouse Gas Impact	Qualitative
This option is expected to make a small reduction in green house gas emissions compared to the baseline. When compared against typical baseline tracks from the 4 most common arrival points, this option offers a cumulative reduction of c.3nm. Track length is typically linked to fuel burn, and subsequently CO_2 emissions, and therefore, although only c.5% of runway 16 arrivals are expected to operate these RNP approaches, a marginal improvement in greenhouse gas emissions is expected. This option is not expected to impact aircraft departing from Aberdeen.		
Wider Society	Capacity/Resilience	Qualitative
The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.		
General Aviation	Access	Qualitative
This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS and aircraft would be vectored onto the RNP Approach T-Bar similar to the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume. The option is not expected to impact the Helicopter routes to and from Aberdeen Airport.		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative
This option is expected to make a small reduction in fuel burn compared to the baseline. When compared against typical baseline tracks from the 4 most common arrival points, this option offers a cumulative reduction of c.3nm. Track length is typically linked to fuel burn and therefore, although only c.5% of runway 16 arrivals are expected to operate these RNP approaches, a marginal improvement in fuel burn is expected.		

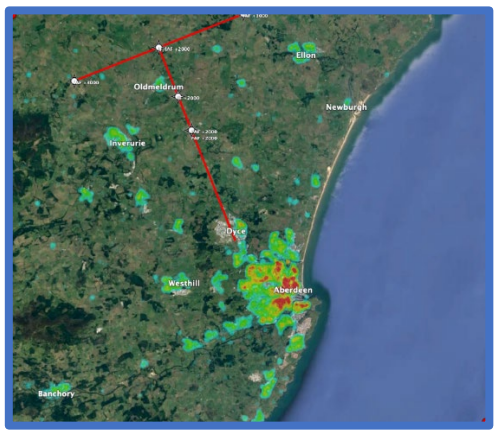
	Network arrival points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 16 Do Nothing	43	36	40	29
RWY 16 Option 2 Inner T Bar	41	36	39	29
Difference	**-2**	**0**	**-1**	**0**

This option is not expected to impact aircraft departing from Aberdeen.

Commercial airlines	Training costs	Qualitative
Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option is not anticipated to require any additional training costs for airlines.		
Commercial airlines	Other costs	Qualitative
No other airline costs are foreseen.		
Airport/ANSP	Infrastructure costs	Qualitative
The initial deployment phase of the ACP may require some ATC system engineering amendments.		
Airport/ANSP	Operational costs	Qualitative

The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.		
All	Safety	Qualitative
This option is expected to be as safe as the baseline and no other safety concerns have been raised. The T-Bar configuration offers a small reduction in workload for ATC. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace, it would also offer some marginal fuel burn and CO_2 savings (see assessment above), and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. The noise assessment has noted that there could be a change in noise distribution, particularly around the base leg section of the procedure for the 5% of traffic operating the RNP approaches. One of the objectives of the AMS is to increase capacity. This option does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

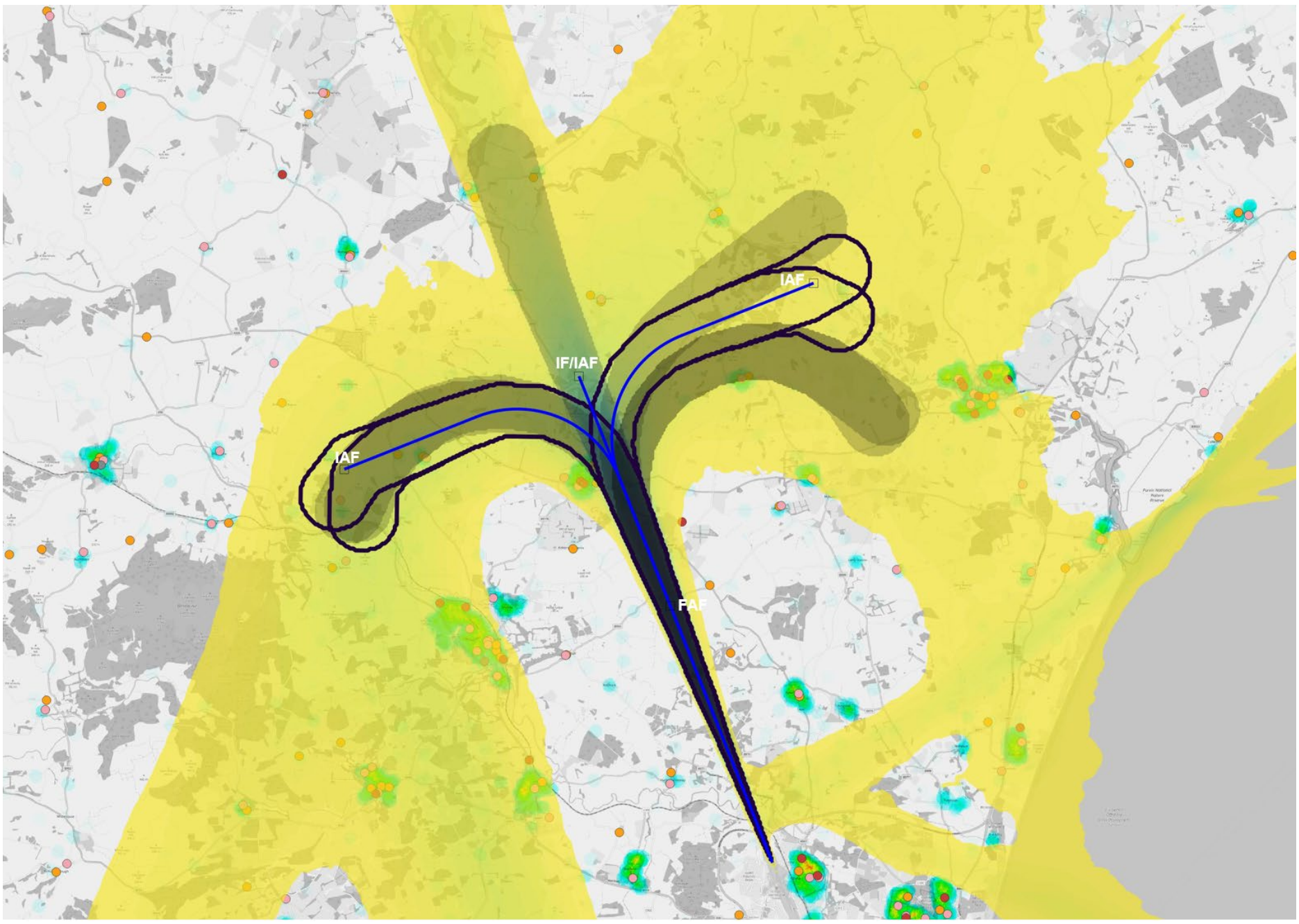
Runway 16 Arrival Option 3 – Outer T Bar



This option would see those arrivals wishing to fly an RNP APCH vectored towards an Initial Approach Fix (IAF) positioned on base-leg from either side of final approach or in the centre of the T-bar. The IAFs have been positioned to reduce overflight of the communities of Oldmeldrum and Tarves although still within the existing arrival swathe, consistent with a 9-10nm final.

This RNP APCH option is expected to be adopted by c.5% of arrivals. Based on the data in our traffic forecast, this is optimistically estimated to be, on average 2 fixed wing arrivals and 1 helicopter arrivals per day. The remaining c.95% of Runway 16 arrivals will continue to operate as they do today.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 16 Option 3 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft)

Table 8 Runway 16 Option 3 Centreline overflight data 0-5000ft

Option	Via waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	RATPU (SOUTH EAST)	38	1309	1	0	0	1
	PETOX	38	542	0	0	0	1
	RATPU (SOUTH WEST)	38	1533	2	0	0	3
	GLESK	38	1676	1	0	0	4
	SMOKI	38	819	0	0	0	2
Option 3	RATPU (SOUTH EAST)	38	698	0	0	0	0
	PETOX	38	710	0	0	0	1
	GLESK	38	1636	2	0	0	3
	RATPU (SOUTH WEST)	38	1574	2	0	0	3
	SMOKI	38	740	0	0	0	2
Difference							
Option 3	RATPU (SOUTH EAST)	0	-611	-1	0	0	-1
	PETOX	0	+168	0	0	0	0
	GLESK	0	-40	+1	0	0	-1
	RATPU (SOUTH WEST)	0	+41	0	0	0	0

	SMOKI	0	-79	0	0	0	0

This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours, as the lateral changes to flight paths occur outside the scope of the contours. When considering the overflight metrics, aircraft will initially continue to be vectored from above 7000ft until joining the IAFs of the PBN procedure at approximately 5000ft. As aircraft will be vectored onto these fixed waypoints, this may to a small redistribution of flight tracks. The western T-Bar and the northern IAF/IF are located within the concentrated parts of the existing swathe and therefore it is anticipated that any noise redistribution here would be very small. The eastern T-Bar is located slightly outside the areas of highest concentration but still within the existing arrivals swathe. As only c.5% of arrivals are anticipated to use the RNP APCH procedures, this 5% of traffic will be split between the various arrival directions, and given they will join within the existing swathe, this is expected to result in a very small change to what is shown on the heatmap, and any adverse impacts of this are so marginal that they are not expected to lead to any significant effects.

Fixed wing aircraft are expected to join the T-Bar from the east and west and may also use the centre IF/IAF, and the majority of Helicopter traffic is expected to utilise the centre IAF/IF or the eastern T-bar. Once aircraft have joined the PBN procedure at the IAF, there will be some concentration of tracks along the RNP APCH base-leg which will result in a small change in noise distribution. The IAFs have been positioned within the existing arrivals swathe which would be consistent with aircraft joining final approach between 9-10nm. Compared to Option 2, the IAFs have been positioned to try to reduce overflight of Oldmeldrum and Tarves. This means that the base-legs would be located further to the north over areas less densely populated although the option would overly Daviot, Ythanbank, Durno and Whiteford. It should be noted that arrivals from PETOX and the NE could use the eastern T bar however based on the direction of the swathes today, they are more likely to be vectored onto the IAF/IF in the centre. This means that although when comparing centreline data to baseline centreline data, there is an increase in population overflown (due to overflight of Ythanbank and surrounding areas), in reality overflight from NE/PETOX arrivals is likely to remain similar to today with very few of these arrivals flying the eastern T-Bar.

Beyond the IF, the eastern parts of Oldmeldrum would continue to be overflown when aircraft are descending straight ahead along the extended runway centreline. From the heatmap we can see that the overflight contours are located in areas that are already frequently overflown in the baseline.

Overall, as only c.5% of arrivals are anticipated to use the RNP APCH procedures, and usage of the east/west ‘T’ and IAF/IF is split between various arrival directions, and given the PBN T-BARs overfly the same areas as the baseline swathe, this option is expected to result in a small change in noise distribution which will be investigated as part of the quantified noise analysis at Stage 3, should this option progress. Beyond the turn onto the extended runway centreline (from the IF onwards) aircraft will fly the same final approach track as they do in the baseline.

The remaining 95% of traffic would continue to fly as they do in the baseline (as they do today). This option is not expected to impact flight paths from aircraft departing from Aberdeen.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative
Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.		
Wider Society	Greenhouse Gas Impact	Qualitative
This option is expected to result in a small increase in green house gas emissions compared to the baseline. When compared against typical baseline tracks from the 4 most common arrival points, this option offers a cumulative increase of c.1nm. Track length is typically linked to fuel burn, and subsequently CO_2 emissions, and therefore, although only c.5% of runway 16 arrivals are expected to operate these RNP approaches, a marginal negative impact in greenhouse gas emissions is expected. This option is not expected to impact aircraft departing from Aberdeen.		
Wider Society	Capacity/Resilience	Qualitative
The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen’s dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.		
General Aviation	Access	Qualitative
This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS and aircraft would be vectored onto the RNP Approach T-Bar similar to the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume. The option is not expected to impact the Helicopter routes to and from Aberdeen Airport.		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative
This option is expected to result in a small increase in fuel burn compared to the baseline. When compared against typical baseline tracks from the 4 most common arrival points, this option offers a small cumulative increase of c.1nm. Track length is typically linked to fuel burn and therefore, although only c.5% of runway 16 arrivals are expected to operate these RNP approaches, a marginal negative impact in fuel burn is expected. As part of Stage 3 IFP design, there may be opportunities to refine this should this option progress.		

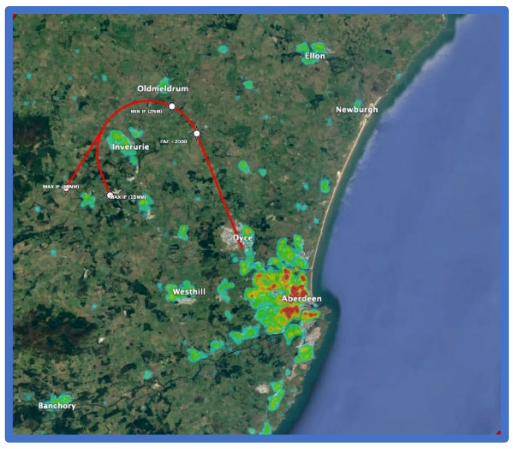
	Network arrival points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 16 Do Nothing	43	36	40	29
RWY 16 Option 3 Outer T Bar	43	36	41	29
Difference	**0**	**0**	**+1**	**0**

This option is not expected to impact aircraft departing from Aberdeen.

Commercial airlines	Training costs	Qualitative
Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option is not anticipated to require any additional training costs for airlines.		
Commercial airlines	Other costs	Qualitative

No other airline costs are foreseen.		
Airport/ANSP	Infrastructure costs	Qualitative
The initial deployment phase of the ACP may require some ATC system engineering amendments.		
Airport/ANSP	Operational costs	Qualitative
The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.		
All	Safety	Qualitative
This option is expected to be as safe as the baseline and no other safety concerns have been raised. The T-Bar configuration offers a small reduction in workload for ATC. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. The noise assessment has noted that there could be a change in noise distribution, particularly around the base leg section of the procedure for the 5% of traffic operating the RNP approaches however compared to Option 2, any increases in frequency of overflight would occur over less densely populated areas. The option does however have increased track length and subsequent fuel burn and CO_2 emissions compared to the baseline. One of the objectives of the AMS is to increase capacity. This option does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

Runway 16 Arrival Option 4 – Curved Approach from the West

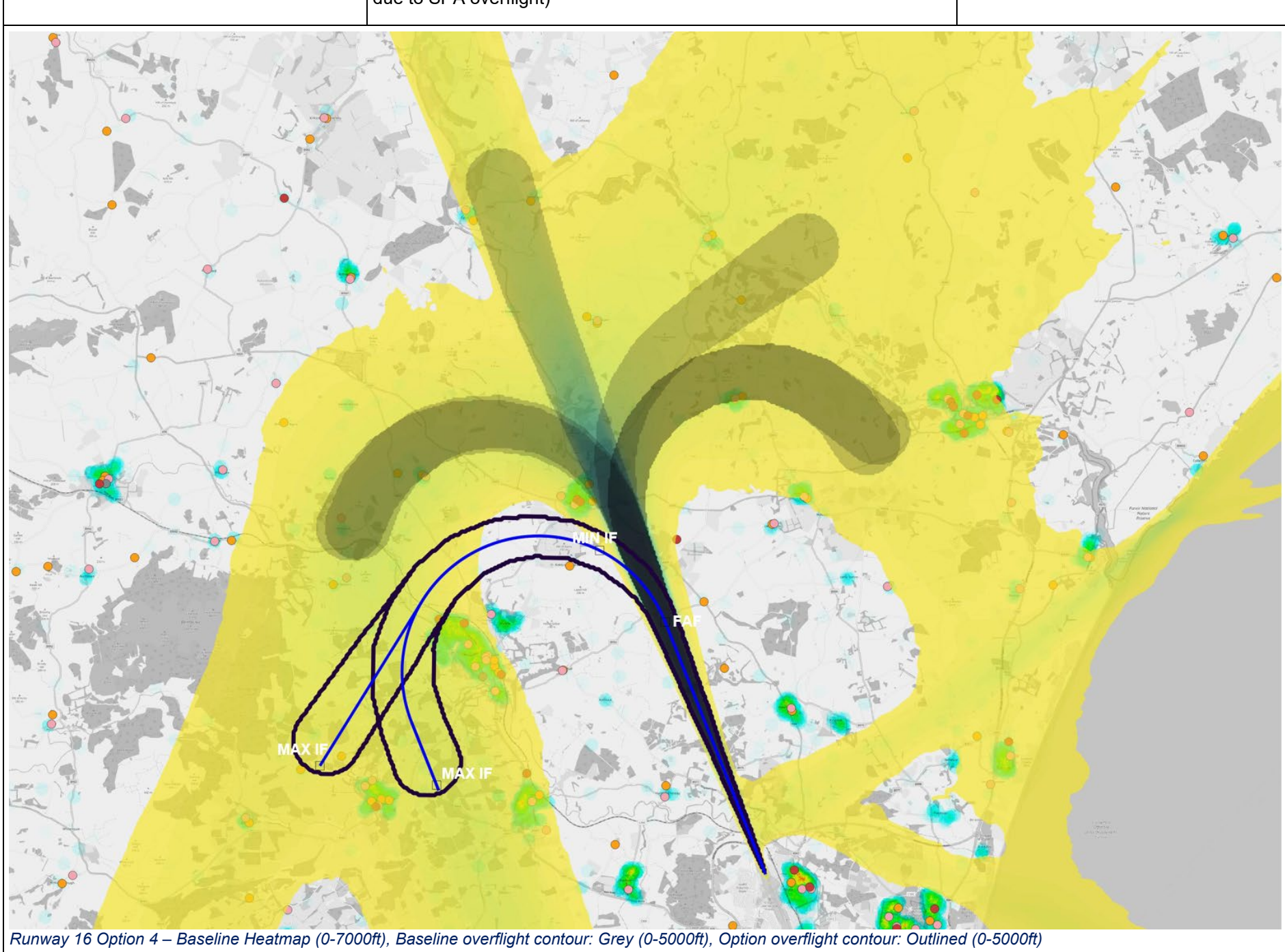


This option would see those arrivals wishing to fly an RNP APCH that were also equipped with 'Radius to Fix' (RF) functionality vectored towards an Initial Approach Fix (IAF) positioned downwind to the West of final approach. The RF allows aircraft to fly in an arc of fixed radius around a point, direct to the Final Approach Fix (FAF).

This RNP APCH RF (curved approach) option is estimated to be adopted by c.10% of runway 16 fixed wing arrivals. Based on the data in our traffic forecast, this is optimistically estimated to be, on average 4 fixed wing arrivals per day. The remaining c.90% of Runway 16 arrivals will continue to operate as they do today or possibly use an alternative PBN option (Option 1, 2 or 3).

Helicopter arrivals are only expected to use the PBN procedures introduced as part of this ACP for training purposes and therefore we have optimistically estimated that c.5% of helicopter arrivals will use the PBN approaches however it is also expected that if the curved approach procedures were introduced, they would be promulgated alongside an alternative PBN approach procedure (Option 1, 2 or 3) as not all aircraft and crews are equipped to operate RNP APCH RF. In the case of this westerly curved approach, it would introduce extra track mileage for helicopter traffic, as the majority of helicopters arrive from the east of Aberdeen Airport, and given that an alternative PBN procedure is likely to be available that would offer a more direct route when arriving, we expect use of this option by helicopters to be very minimal.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 16 Option 4 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft)

Table 9 Runway 16 Option 4 Centreline overflight data 0-5000ft

Option	Via waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	RATPU (SOUTH WEST)	38	1533	2	0	0	3
	GLESK	38	1676	1	0	0	4
Option 4	RATPU (SOUTH WEST)	38	1042	0	0	1	0
	GLESK	38	791	0	0	1	1
Difference							
Option 4	RATPU (SOUTH WEST)	0	-491	-2	0	+1	-3
	GLESK	0	-885	-1	0	+1	-3

Noise: This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours, as the lateral changes to flight paths occur outside the scope of the contours.

When considering the overflight metrics, aircraft will initially continue to be vectored from 7000ft until joining the two IAFs at c.5000ft. The IAFs are located within the existing overflight swathe shown on the heatmap however, when joining, aircraft will be c.1000-2000ft lower in altitude at that geographical location than in the baseline. The location of the IAFs are likely to result in changes in vectoring / dispersion patterns for the c.10% of fixed wing arrivals which may fly the RNP APCH-RF route between 7000-c.5000ft although this would occur in areas already overflown today.

Once established on the approach, the concentration enabled by PBN and the RF arc would mean aircraft would very accurately fly around the arc onto final approach. The overflight contours avoid the populated areas of Kemnay and Kintore however there is a small area of overflight to the north of Inverurie. These areas are overflown by arrivals today, but the RF arc would result in a change to the distribution of noise and, owing to the accuracy of PBN, an increase in frequency of overflight for those communities under the new RNP APCH RF. The overflight contours then avoid the areas of Uryside and Oldmeldrum and whilst doing so, route over an area which is not overflown by arrivals today. The population data suggests that this area is very sparsely populated. Aircraft would then turn to join the final approach extended centreline, again over sparsely populated areas, before flying the same final approach track as in the baseline. The centreline data suggests that this approach would overfly fewer population than the baseline centreline although it's important to note that this would include some areas not overflown today.

In summary, this option is estimated to be operated by 4 fixed wing flights a day on average and would result in a small redistribution of traffic between 7000-5000ft. This would occur over areas already overflown today. When flying the curved approach from c.5000ft, there is increased frequency of overflight at lower altitudes over some areas already overflown today, and there is also new overflight over areas not typically overflown. Owing to the small number of flights operating the RNP RF route, and this occurring largely over sparsely populated areas, the impacts of this are not expected to be significant (and are outside the L_{Aeq} contours), however this would require further investigation as part of the quantified noise analysis at Stage 3, should this option progress. Beyond the FAF, aircraft will fly the same final approach as they do in the baseline.

The remaining 90% of fixed wing traffic and helicopter traffic would continue to fly as they do in the baseline or alternatively may use a different PBN procedures if available. There will be very slightly reduced overflight (owing to 10% of traffic now using the RNP APCH RF) however, due to the broad dispersion this is likely to lead to very marginal noise benefits for areas, aside from those detailed above, which are currently overflown by Aberdeen Arrivals before the FAF.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

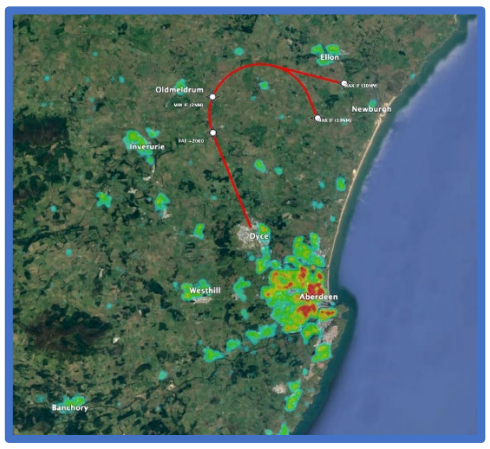
Communities	Air Quality	Qualitative
Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.		
Wider Society	Greenhouse Gas Impact	Qualitative
This option is expected to reduce track length compared to the baseline for those aircraft that elect to fly the RNP-RF approaches; based on the two existing arrivals points, a c.9nm reduction in track length is anticipated. As track length is typically linked to fuel burn and subsequently CO_2 emissions, we expect aircraft flying the RNP-RF approaches to have less Greenhouse Gas impact compared to the baseline.		
Wider Society	Capacity/Resilience	Qualitative
The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme. In the case of RNP RF procedures, not all aircraft are equipped to operate these procedures and therefore in order to offer full resilience against conventional ground based navaid outages, these procedures would need to be implemented alongside alternative PBN procedures.		
General Aviation	Access	Qualitative
This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS and aircraft would be vectored onto the RNP Approach T-Bar similar to the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume.		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines that have RNP RF capabilities.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative
This option is expected to reduce track length compared to the baseline for those aircraft that elect to fly the RNP-RF approaches; based on the two existing arrivals points, a c.9nm reduction in track length is anticipated. As track length is typically linked to fuel burn, we expect aircraft flying the RNP-RF approaches to have less fuel burn compared to the baseline.		

	Network arrival points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 16 Do Nothing	43	36.4	40	29.4
RWY 16 Option 4 Curved Approach from West	39		35	
Difference	**-4**		**-5**	

Commercial airlines	Training costs	Qualitative
Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option uses a specification of PBN called RNP APCH RF (Radius to Fix). It is expected that any airlines currently approved to fly RNP-RF approaches would use these curved approaches; airlines not approved would either continue to fly the ILS approach or may use an alternative PBN option (should multiple PBN options be implemented). Therefore, implementation of an RNP-RF is not expected to result in any additional training costs for airlines unless an airline elects to obtain approval to fly the approach.		
Commercial airlines	Other costs	Qualitative
No other airline costs are foreseen.		

Airport/ANSP	Infrastructure costs	Qualitative
The initial deployment phase of the ACP may require some ATC system engineering amendments.		
Airport/ANSP	Operational costs	Qualitative
The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.		
All	Safety	Qualitative
This option is expected to be as safe as the baseline and no other safety concerns have been raised. This option offers a curved RNP APCH with Radius to Fix, a specification of PBN which has been implemented in the UK however there are only limited examples. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace, it would also offer fuel burn and CO_2 savings (see assessment above) for c.10% of runway 16 arrivals, and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. The noise assessment has noted that there is likely to be negative noise impacts for communities not currently overflown frequently, as well as redistribution of noise for some communities currently overflown. One of the objectives of the AMS is to increase capacity. This option, and overall this ACP, does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

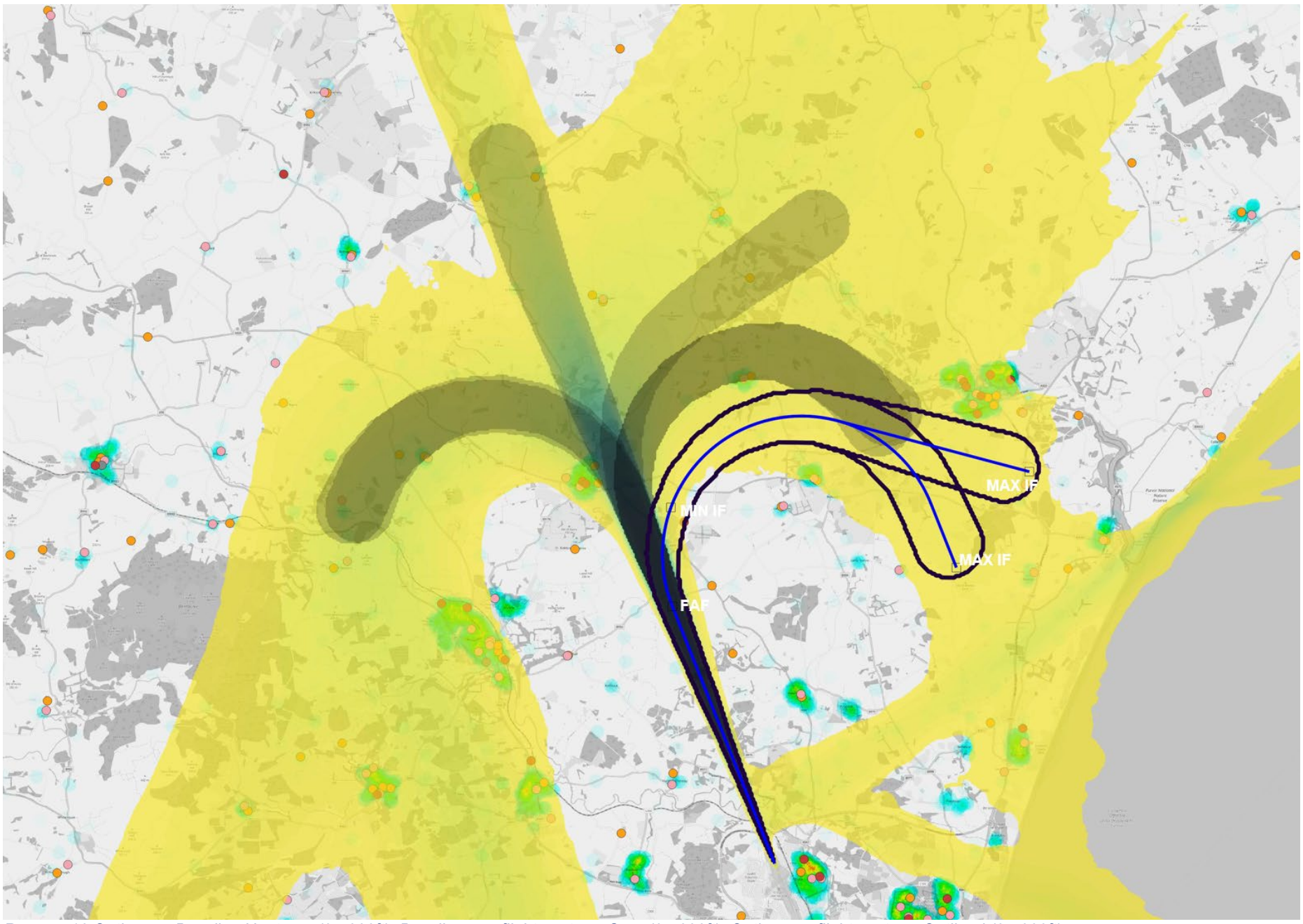
Runway 16 Arrival Option 5 – Curved Approach from the East



This option was suggested by Stakeholders during our engagement. It would see those arrivals wishing to fly an RNP APCH that were also equipped with 'Radius to Fix' (RF) functionality vectored towards an Initial Approach Fix (IAF) positioned downwind to the East of final approach. The RF allows aircraft to fly in an arc of fixed radius around a point, direct to the Final Approach Fix (FAF).

This RNP APCH RF (curved approach) option is expected to be adopted by c.10% of runway 16 fixed wing arrivals and c.5% of helicopter arrivals. Based on the data in our traffic forecast, this is estimated to be, on average, 4 fixed wing arrivals and 1 helicopter arrival per day. The remaining Runway 16 arrivals will continue to operate as they do today or possibly use an alternative PBN option (Option 1, 2 or 3).

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 16 Option 5 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft)

Table 10 Runway 16 Option 5 Centreline overflight data 0-5000ft

Track	Via Waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	SE	38	1322	1	0	0	1
	RATPU (SOUTH EAST)	38	1309	1	0	0	1
Option 5	SE	38	447	1	0	1	0
	RATPU (SOUTH EAST)	38	405	0	0	1	0
Difference							
Option 5	SE	0	-875	0	0	+1	-1
	RATPU (SOUTH EAST)	0	-904	-1	0	+1	-1

Noise: This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours, as the lateral changes to flight paths occur outside the scope of the contours.

When considering the overflight metrics, aircraft will initially continue to be vectored from above 7000ft until joining the IAF at c.5000ft. In the baseline, the majority of fixed wing aircraft (c.50%) approach from the south-west and south via a downwind leg to the west of the final approach. Around c.9% approach from the south and fly a downwind leg to the east of final approach. (See 'Movement Information' section for further details). The implementation of this option is likely to result in a redistribution of this traffic, as some aircraft which would have arrived from the south-west and south (via a waypoint called RATPU) and use the westerly downwind leg, would potentially use the easterly downwind leg owing to the reduced track mileage (see assessment below).

Therefore, it is expected that there would be reduced vectoring overflight over areas west of the final approach, and increased vectoring overflight over areas to the east of final approach such as the areas around Balmedie, Newburgh and Collieston. The IAFs are located within the existing overflight swathe however, when joining, aircraft will be c.2000-1000ft lower in altitude than in the baseline and therefore aircraft will also be lower than today. It's important to keep in mind however that this would apply to c.4 fixed wing and c1. Heli arrivals per day on average and therefore although there would be a redistribution of noise, it is not expected to lead to significant effects.

Once established on the approach, the concentration enabled by PBN and the RF arc would mean aircraft would very accurately fly around the arc onto final approach. The overflight contours show the populated areas of Ellon, Pitmedden, and Tarves avoid overflight and therefore they may experience a small decrease in overflight compared to the baseline. The latter part of the RF arc beyond Tarves and Pitmedden avoids densely populated areas, however it does overfly lower populated areas that are overflown very infrequently in the baseline.

In summary, this option is estimated to be operated by c.4 fixed wing arrivals and c.1 helicopter arrival a day on average and would result in a small redistribution of traffic between 7000-5000ft. This would occur over areas already overflown today. When flying the curved approach from c.5000ft, there is increased frequency of overflight at lower altitudes over some areas already overflown today, and a very small area newly overflown. Owing to the small number of flights operating the RNP RF route, and this occurring largely over sparsely populated areas, the impacts of this are not expected to be significant (and are outside the L_{Aeq} contours), however this would require further investigation as part of the quantified noise analysis at Stage 3, should this option progress. Beyond the FAF, aircraft will fly the same final approach as they do in the baseline.

The remaining 90% of fixed wing traffic and 95% of helicopter traffic would continue to fly as they do in the baseline or alternatively may use a different PBN procedure if available. There will be reduced overflight (owing to the traffic now using the RNP APCH RF) however, due to the number of movements and the broad dispersion of baseline traffic in the heatmap, this is likely to lead to marginal noise benefits.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative

Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.

Wider Society	Greenhouse Gas Impact	Qualitative

This option is expected to reduce track length compared to the baseline for those aircraft that elect to fly the RNP-RF approaches; based on the existing arrivals point, a c.2nm reduction in track length is anticipated. As track length is typically linked to fuel burn and subsequently CO_2 emissions, we expect aircraft flying the RNP-RF approaches to have less Greenhouse Gas impact compared to the baseline.

Wider Society	Capacity/Resilience	Qualitative

The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.
In the case of RNP RF procedures, not all aircraft are equipped to operate these procedures and therefore in order to offer full resilience against conventional ground based navaid outages, these procedures would need to be implemented alongside alternative PBN procedures.

General Aviation	Access	Qualitative

This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS and aircraft would be vectored onto the RNP Approach T-Bar similar to the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume.

General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative

This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines that have RNP RF capabilities.

General Aviation/ commercial airlines	Fuel Burn	Qualitative

This option is expected to reduce track length compared to the baseline for those aircraft that elect to fly the RNP-RF approaches; based on the existing arrivals point, a c.2nm reduction in track length is anticipated. As track length is typically linked to fuel burn, we expect aircraft flying the RNP-RF approaches to have less fuel burn compared to the baseline.

	Network arrival points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 16 Do Nothing	43	36	40	29.4
RWY 16 Option 5 Curved Approach from East	n/a	n/a	38	n/a
Difference			**-2**	

This arrival route may also be used by helicopters approaching from the SE via Hackle Head and in this circumstance, the option would save c.2.8nm compared to being vectored onto an ILS approach.

Commercial airlines	Training costs	Qualitative

Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option uses a specification of PBN called RNP APCH RF (Radius to Fix). It is expected that any airlines currently approved to fly RNP-RF approaches would use these curved approaches; airlines not approved would either continue to fly the ILS approach, or may use an alternative PBN option (should multiple PBN options be implemented). Therefore implementation of an RNP-RF is not expected to result in any additional training costs for airlines unless an airline elects to obtain approval to fly the approach.

Commercial airlines	Other costs	Qualitative

No other airline costs are foreseen.

Airport/ANSP	Infrastructure costs	Qualitative

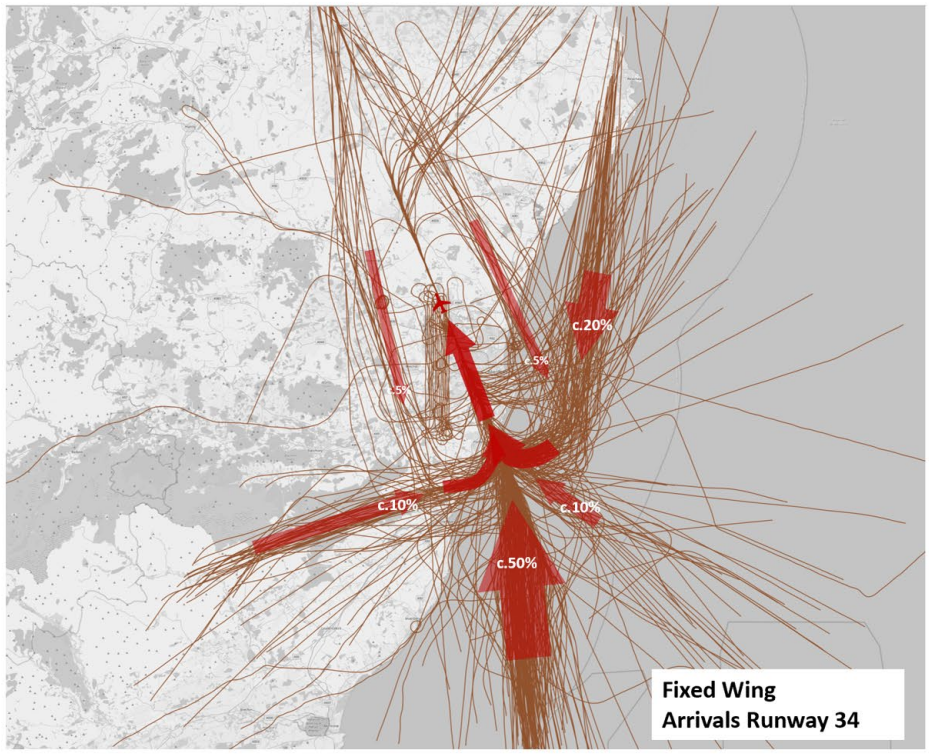
The initial deployment phase of the ACP may require some ATC system engineering amendments.

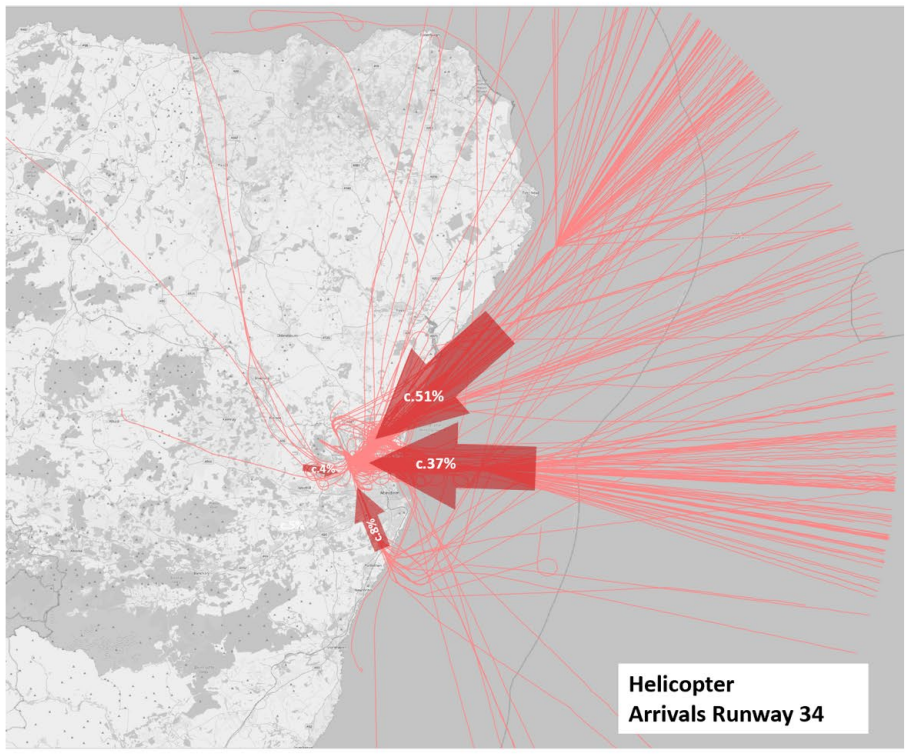
Airport/ANSP	Operational costs	Qualitative
The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.		
All	Safety	Qualitative
This option is expected to be as safe as the baseline and no other safety concerns have been raised. This option offers a curved RNP APCH with Radius to Fix, a specification of PBN which has been implemented in the UK however there are only limited examples. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace, it would also offer fuel burn and CO_2 savings (see assessment above) for c.10% of runway 16 arrivals, and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. The noise assessment has noted that there is likely to be negative noise impacts for communities not currently overflown frequently, as well as redistribution of noise for some communities currently overflown. One of the objectives of the AMS is to increase capacity. This option, and overall this ACP, does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

Runway 34 Arrivals Baseline ‘Do nothing’

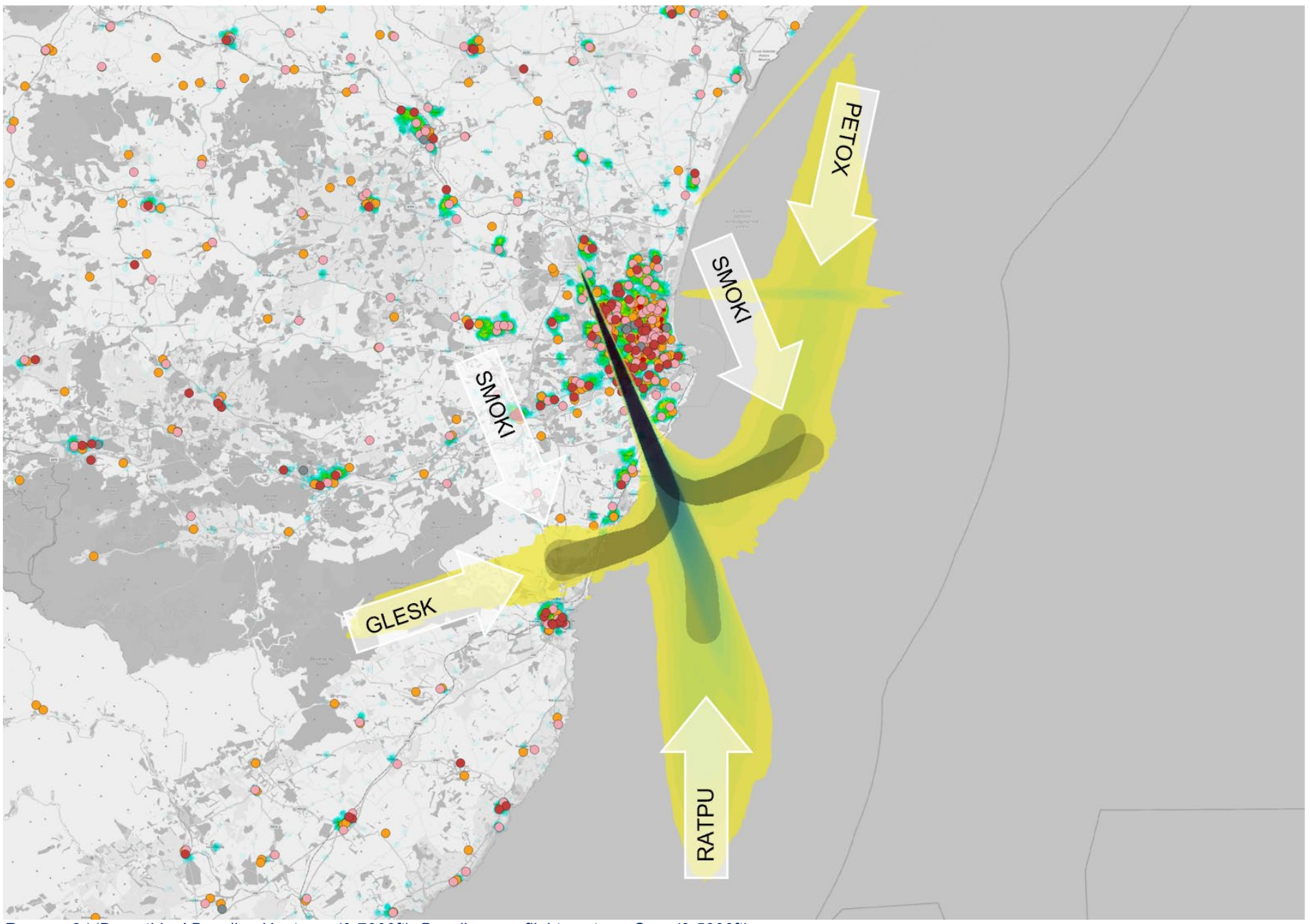
This section describes the baseline ‘do-nothing’ scenario for runway 34 arrivals. More detail on the baseline is described in the Stage 2A submission document, published on the CAA’s Airspace Change Portal.

The figures show the swathes of arrivals to Aberdeen’s westerly runway (34). There are no published centrelines flown other than on final approach and therefore all arrivals are vectored by ATC onto a closing heading to establish on the Localiser. Typically, aircraft are joining final approach between 8 and 12nm from touchdown although there are variances to this. Within the data c.8% of helicopter traffic[11] flies the ILS approaches and join within the same swathe as fixed wing traffic, with the remaining helicopter traffic taking a more direct approach from the north east, east and south east.





Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 34 ‘Do nothing’ Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft)

[11] Note helicopter use of the ILS is very weather dependent; in clear visibility helicopters are likely to arrive under VFR and take a more direct route to the airfield whereas in poor visibility almost all helicopters would use the ILS.

Table 11 Runway 34 'Do nothing' Centreline overflight data 0-5000ft

Track	Via Waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	PETOX	38	13694	7	0	5	7
	SMOKI (EAST)	38	13694	7	0	5	7
	SMOKI (WEST)	38	13905	7	0	5	7
	GLESK	38	13908	7	0	5	7
	RATPU	38	13694	7	0	5	7

Noise: Currently there are no published arrival routes at Aberdeen other than on final approach. Aircraft arriving onto runway 34 are vectored by Aberdeen ATC to join the ILS localiser. Typically, aircraft join the final approach, where they are aligned with the runway centreline, at around 8-12nm (15-22km). The vectoring by ATC creates broad dispersion across the airspace between 7000ft and joining the final approach at around 3500ft-2500ft.

This broad area of dispersion between 7000ft and around 3500-2500ft largely overflies the sea however arrivals from the west overfly the areas of Newtonhilll and the northern parts of Stonehaven. From the north, there is so little traffic that it does not show on the average heat map however the track data shows, close to 7000ft, the areas of Peterculter, Drumoak and Milltimber are overflown. Portlethen and Cove Bay are overflown as part of the base leg turns. Aircraft then join the final approach where the swathe then narrows as aircraft fly the extended runway centreline before landing. This overflies Findon, the eastern part of Cults and the western areas of Aberdeen such as the Bridge of Dee, Rubislaw, and Bucksburn.

As part of Aberdeen Airport's Noise Action Plan, L_{Aeq} 16hr (day) and 8hr (night) contours are published. These contours take into account all operations at Aberdeen (fixed wing and helicopter arrival and departures from all runways). The boundary of the 51dB L_{Aeq} contour (the largest contour) is within the area aircraft fly along the extended runway centreline of the final approach.

Tranquillity: Aircraft arriving on runway 16 do not overfly National Parks, National Scenic Areas (NSA) or Designated Quiet Areas below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. At 1640ft, aircraft arriving at Aberdeen are aligned with the runway centreline and are typically 9-10km from landing. There are no Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC) between 10km and landing.

Communities	Air Quality	Qualitative
Aircraft arriving at Aberdeen fly a standard 3-degree angle of approach and descend through 1000ft typically between 5 - 7km before the landing threshold. This is in the last stages of the final approach when aircraft are aligned with the runway centreline. Parts of Aberdeen City Centre are within an Air Quality Management Area although this is located approximately 3km east of the final approach track and approximately 7km from the landing threshold.		
Wider Society	Greenhouse Gas Impact	Qualitative
Emissions of greenhouse gases arise from the combustion of aviation fuel, and as the combustion of aviation fuel is linked to track length, we have initially looked at the track length for the baseline arrivals. The greenhouse gas assessment is therefore linked to the fuel burn assessment detailed in the section below. We will estimate the differences between the baseline and the option, to understand if there are any anticipated advantages/disadvantages of the option. This estimation will consider whether the aircraft tracks will be longer or shorter than a typical flight today. As CO_2 emissions are linked to the difference in aviation fuel burnt, this will allow us to qualitatively describe anticipated greenhouse gas impacts as a result of the option.		
Wider Society	Capacity/Resilience	Qualitative
Aberdeen Airport currently promulgates ILS/DME, LOC/DME, VOR/DME and NDB/DME approaches for runway 34. These approaches are dependent on outdated conventional ground based navigation equipment. The most common approach, the ILS/DME is dependent on the ADN VOR as well as the ILS.		
General Aviation	Access	Qualitative
This baseline scenario would not offer any change from the existing Controlled Airspace (CAS) arrangements in place today. The options will be qualitatively compared against this existing scenario. (See existing CAS 'Do nothing' section for further details).		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
Aberdeen's capacity would remain the same as today.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative

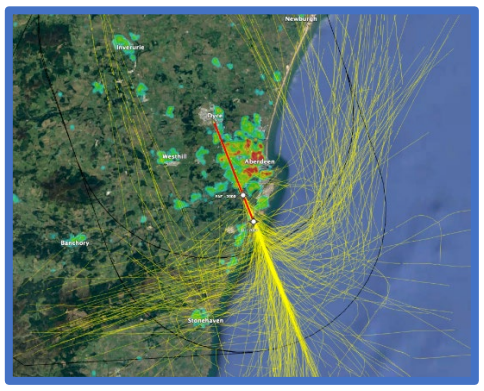
When arriving at Aberdeen, aircraft are vectored by ATC before joining the final approach. This means that track length is varied from flight to flight. For the purposes of comparing our arrival options against the baseline scenario, we have used the NTK vectoring baseline data and information from ATC to estimate an arrivals centrelines from 4 main network entry points; we have then used the track mileage from this centreline as an initial indication of 'do nothing' track length.

	Network arrival points			
	GLESK	SMOKI	RATPU	PETOX
RWY 34 Do Nothing	35	63	29	44

Commercial airlines	Training costs	Qualitative
As this option is already in operation, there are no training costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
Commercial airlines	Other costs	Qualitative
As this option is already in operation, there are no other costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
Airport/ANSP	Infrastructure costs	Qualitative
As this option is already in operation, there are no infrastructure costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
Airport/ANSP	Operational costs	Qualitative
As this option is already in operation, there are no operational costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline. For some approaches, Aberdeen Airport is dependent on conventional ground based navigation equipment (VORs) which are currently undergoing a rationalisation programme by NATS NERL. Aberdeen is currently investigating RNAV substitution to mitigate VOR rationalisation however this is considered an interim measure and failure to implement a long term solution may result in additional operational costs.		

Airport/ANSP	Deployment costs	Qualitative
As this option is already in operation, there are no deployment costs anticipated as there will be no change; later in this IOA we will estimate the difference between our options and this baseline.		
All	Safety	Qualitative
The baseline is already in safe operation and there are no safety concerns raised at this time.		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
CAP1711 describes the objective as: Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. Whilst vectoring of arrivals is a perfectly reasonable option in a future operating environment, doing nothing with arrivals will not align with the AMS as it would not offer Aberdeen any modern PBN procedures.		

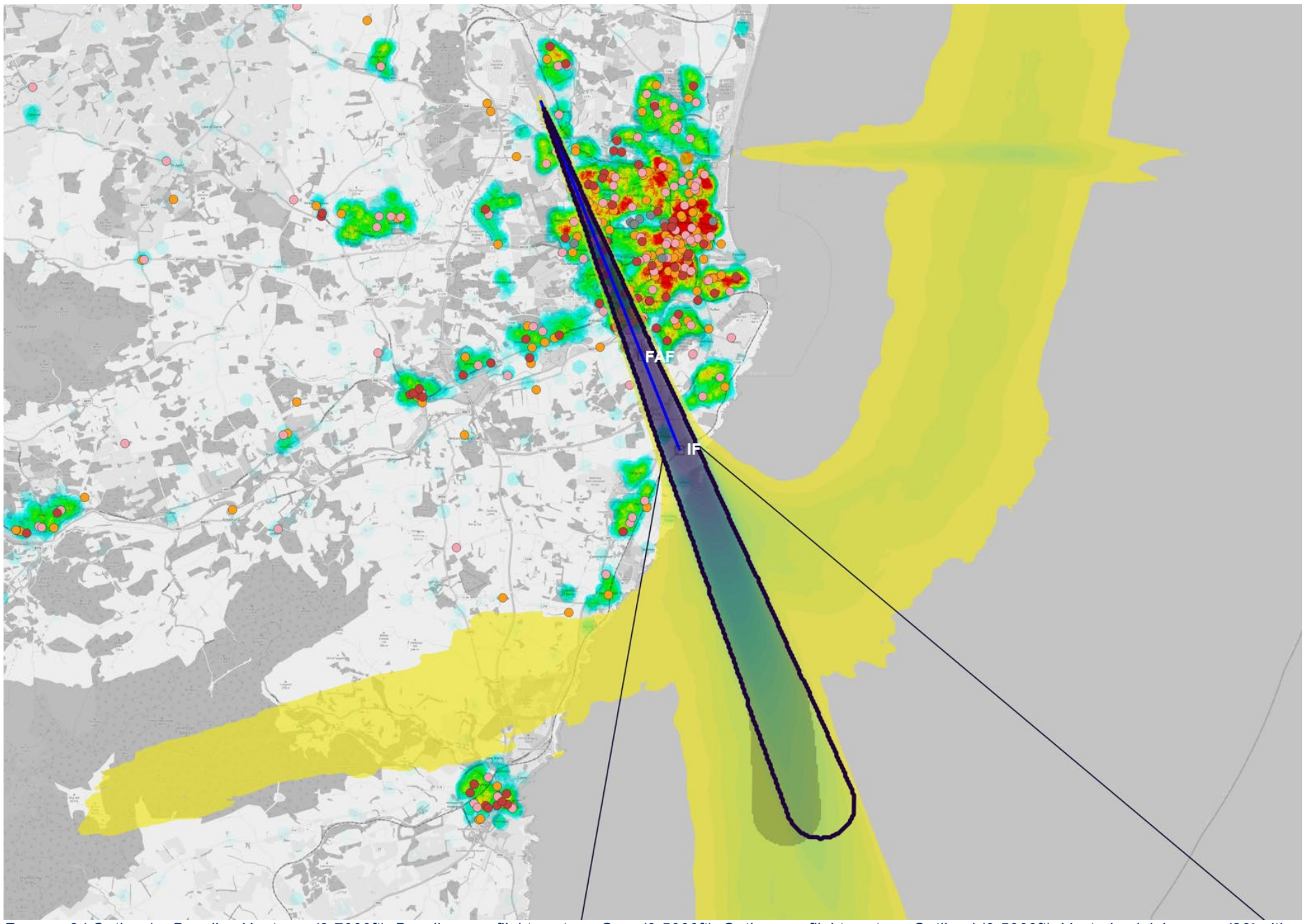
Runway 34 Arrival Option 1 – Vectors to Final Approach



This option would continue to see those arrivals wishing to fly an RNP APCH vectored to final approach as they are today. The only difference would be whereas with the ILS, the arrivals have flexibility in where they join final approach from 8nm and beyond, RNP APCH arrivals would be vectored to join final approach in the same location, at the Initial Fix (IF). The IF in the illustration has been positioned so those arrivals would join final approach at approximately 8nm, keeping the vectored arrival swathes consistent with the baseline.

This RNP APCH option is expected to be adopted by c.5% of arrivals. Based on the data in our traffic forecast, this is optimistically estimated to be, on average 2 fixed wing and 1 helicopter arrival per day. The remaining c.95% of Runway 34 arrivals will continue to operate as they do today.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 34 Option 1 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft), Vectoring joining area (30º either side of centreline): V shaped cone.

Table 12 Runway 34 Option 1 Centreline overflight data 0-5000ft

Track	Via Waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	RATPU	38	13694	7	0	5	7
Option 1	RATPU	38	13694	7	0	5	7
Difference							
Option 1	RATPU	0	0	0	0	0	0

Noise: This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours as the scope of the contours falls on the final approach track where the option is the same as the baseline. When considering the overflight metrics, this option is not expected to result in any significant changes to tracks over the ground compared to the baseline; this is because aircraft will continue to be vectored onto final approach as they are today and the RNP APCH joining point has been positioned based on the existing arrivals swathe.

When operating the PBN approach, aircraft will be vectored towards a fixed waypoint (IF) rather than the ILS localiser (where there is a broader area of dispersion around joining the final approach). This may lead to a small redistribution of noise which could impact Portlethen Village and Findon. However, as only c.5% of arrivals are anticipated to use the RNP APCH procedures and given they will join within the existing swathe, this is expected to result in a very small change in noise distribution and any adverse impacts of this are so marginal that they are not expected to lead to any significant effects. Beyond the IF, aircraft will fly the same final approach as they do in the baseline.

For the purposes of the data within this IOA, the overflight contour has been drawn up to 5000ft showing a route from the south however in reality aircraft will be vectored, as they are today and as shown in the heatmap, to join the IF at c.8nm. Assuming a continuous descent approach, this means aircraft will be at an altitude of c.2500ft when joining the PBN RNP APCH procedure. From 2500ft to landing, there is no change in noise data compared to the baseline.

The remaining 95% of traffic would continue to fly as they do in the baseline (as they do today). This option is not expected to impact the flight paths of aircraft departing from Aberdeen.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative

Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.

Wider Society	Greenhouse Gas Impact	Qualitative

This option is not expected to materially alter track length compared to the baseline; this is because aircraft will continue to be vectored onto final approach as they are today and the RNP APCH joining point has been positioned based on the existing arrivals swathe. As track length is typically linked to fuel burn, and subsequently CO_2 emissions, we do not expect this option to materially alter greenhouse gas emissions for the c.5% of aircraft operating PBN approaches. In addition, given that PBN approaches are estimated to be used by only c.5% of runway 34 arrivals, any marginal benefits or impacts overall will be negligible. This option is not expected to impact aircraft departing from Aberdeen.

Wider Society	Capacity/Resilience	Qualitative

The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.

General Aviation	Access	Qualitative

This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS, and aircraft would continue to be vectored onto final approach as they are within the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume. The option is not expected to impact the Helicopter routes to and from Aberdeen Airport.

General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative

This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines.

General Aviation/ commercial airlines	Fuel Burn	Qualitative

This option is not expected to materially alter track length compared to today; this is because aircraft will continue to be vectored onto final approach as they are today and the RNP APCH joining point has been positioned based on the existing arrivals swathe. As track length is typically linked to fuel burn, we do not expect this option to materially alter fuel burn for those aircraft operating PBN approaches. In addition, given that PBN approaches are estimated to be used by only c.5% of runway 34 arrivals, any marginal benefits or impacts in track length overall will be negligible. No change to the profiles of inbound or outbound aircraft is expected as a result of this option. The RNP APCH would be designed to achieve CDO.

	Network arrivals points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 34 Do Nothing	35	63	28	44
RWY 34 Option 1 Vectors to final approach	35	63	28	44
Difference	**0**	**0**	**0**	**0**

This option is not expected to impact aircraft departing from Aberdeen.

Commercial airlines	Training costs	Qualitative

Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option is not anticipated to require any additional training costs for airlines.

Commercial airlines	Other costs	Qualitative

No other airline costs are foreseen.

Airport/ANSP	Infrastructure costs	Qualitative

The initial deployment phase of the ACP may require some ATC system engineering amendments.

Airport/ANSP	Operational costs	Qualitative

The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.

Airport/ANSP	Deployment costs	Qualitative

This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.

All	Safety	Qualitative

This option is expected to be as safe as the baseline and no other safety concerns have been raised. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).

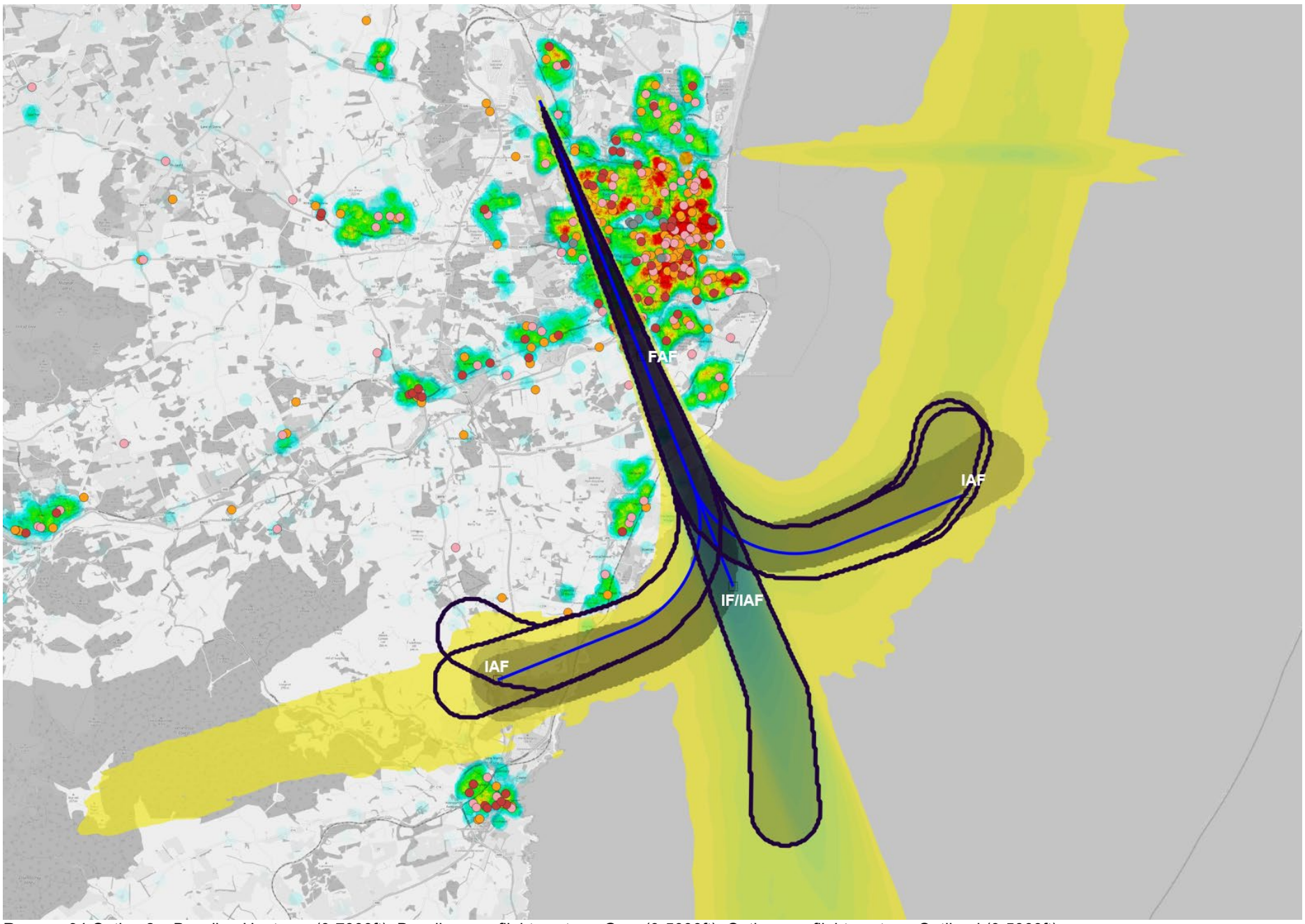
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace and, whilst doing so, would have little disbenefit for other stakeholders. The noise and fuel burn/CO_2 assessments (see above) expect no material change from the baseline, and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. One of the objectives of the AMS is to increase capacity. This option, and overall this ACP, does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

Runway 34 Arrival Option 2 – T Bar

This option would see those arrivals wishing to fly an RNP APCH vectored towards an Initial Approach Fix (IAF) positioned on base-leg from either side of final approach or in the centre of the T-bar. The IAFs in the illustration have been positioned to minimise track miles flown but still within the most frequently overflown part of the existing arrival swathe, consistent with an 8-9nm final approach joining point.

This RNP APCH option is expected to be adopted by c.5% of arrivals. Based on the data in our traffic forecast, this is optimistically estimated to be, on average 2 fixed wing and 1 helicopter arrival per day. The remaining c.95% of Runway 34 arrivals will continue to operate as they do today.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 34 Option 2 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft)

Table 13 Runway 34 Option 2 Centreline overflight data 0-5000ft

Track	Via Waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	PETOX	38	13694	7	0	5	7
	SMOKI (EAST)	38	13694	7	0	5	7
	SMOKI (WEST)	38	13905	7	0	5	7
	GLESK	38	13908	7	0	5	7
	RATPU	38	13694	7	0	5	7
Option 2	PETOX	38	13694	7	0	5	7
	SMOKI (EAST)	38	13694	7	0	5	7
	GLESK	38	14209	7	0	5	7
	SMOKI (WEST)	38	14296	7	0	5	7
	RATPU	38	13694	7	0	5	7
Difference							
Option 2	PETOX	0	0	0	0	0	0
	SMOKI (EAST)	0	0	0	0	0	0
	GLESK	0	+301	0	0	0	0
	SMOKI (WEST)	0	+391	0	0	0	0
	RATPU	0	0	0	0	0	0

This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours, as the lateral changes to flight paths occur outside the scope of the contours.

When considering the overflight metrics, aircraft will initially continue to be vectored from above 7000ft until joining the IAFs of the PBN procedure. As aircraft will be vectored onto these fixed waypoints, this may to a small redistribution of flight tracks however as only c.5% of arrivals are anticipated to use the RNP APCH procedures, this 5% of traffic will be split between the various arrival directions (two of which are over the sea), and given they will join within the existing swathe, this is expected to result in a very small change to what is shown on the heatmap, and any adverse impacts of this are so marginal that they are not expected to lead to any significant effects.

Aircraft from the south and east will join the procedure over the sea. It is anticipated that any helicopters (1 per day on average) would join the eastern T-Bar. From the south-west / west there will be some concentration of tracks along the RNP APCH base-leg which will result in a very small change in noise distribution. The IAF has been positioned within the most frequently overflown part of the existing arrival swathe, which is consistent with an 8-9nm final approach joining point. The overflight contours show that this occurs within the existing arrivals swathe and largely over areas with sparse population, with the exception of Muchalls and the southern parts of Newtonhill. Compared to the baseline centrelines, the westerly T-Bar is located slightly north of the existing swathe area of concentration and it is the overflight of Muchalls and Newton hills that leads to the small increase in population within the overflight contours for GLESK and SMOKI (West) arrivals. However, given this applies to only 1-2 fixed wing aircraft per day, and helicopters are most likely to use the other T-Bars, it is not expected to lead to any significant effects. There may be opportunities as part of IFP development in Stage 3, should this option progress, for the T-Bar to be positioned a fraction to the south to align with the existing overflight swathe more closely. Once aircraft are aligned with the runway centreline, there is not expected to be any differences compared to the baseline.

Overall, as only c.5% of arrivals are anticipated to use the RNP APCH procedures and given they will join within the existing swathe, and mostly over the water, a small change in noise distribution is expected and any adverse impacts of this are so marginal that they are not expected to lead to any significant effects. This will be investigated further as part of the quantified noise analysis at Stage 3, should this option progress. Beyond the IF, aircraft will fly the same final approach as they do in the baseline.

The remaining 95% of traffic would continue to fly as they do in the baseline (as they do today). This option is not expected to impact the flight paths of aircraft departing from Aberdeen.

Tranquillity: The option does not overfly any National Parks, National Scenic Areas (NSA) or Designated Quiet Areas (DQA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative
Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.		
Wider Society	Greenhouse Gas Impact	Qualitative
This option is expected to make a small reduction in green house gas emissions compared to the baseline. When compared against typical baseline tracks from the 4 most common arrival points, this option offers a cumulative reduction of c.2nm. Track length is typically linked to fuel burn, and subsequently CO_2 emissions, and therefore, although only c.5% of runway 34 arrivals are expected to operate these RNP approaches, a marginal improvement in greenhouse gas emissions is expected. This option is not expected to impact aircraft departing from Aberdeen.		
Wider Society	Capacity/Resilience	Qualitative
The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.		
General Aviation	Access	Qualitative
This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS and aircraft would be vectored onto the RNP Approach T-Bar similar to the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a reduction in CAS volume. The option is not expected to impact the Helicopter routes to and from Aberdeen Airport.		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative

This option is expected to make a small reduction in fuel burn compared to the baseline. When compared against typical baseline tracks from the 4 most common arrival points, this option offers a cumulative reduction of c.2nm. Track length is typically linked to fuel burn and therefore, although only c.5% of runway 34 arrivals are expected to operate these RNP approaches, a marginal improvement in fuel burn is expected.

	Network arrivals points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 34 Do Nothing	35	63	28	44
RWY 34 Option 2 T Bar	34	62	28	44
Difference	**-1**	**-1**	**0**	**0**

This option is not expected to impact aircraft departing from Aberdeen.

Commercial airlines	Training costs	Qualitative
Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option is not anticipated to require any additional training costs for airlines.		
Commercial airlines	Other costs	Qualitative
No other airline costs are foreseen.		
Airport/ANSP	Infrastructure costs	Qualitative
The initial deployment phase of the ACP may require some ATC system engineering amendments.		

Airport/ANSP	Operational costs	Qualitative
The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.		
All	Safety	Qualitative
This option is expected to be as safe as the baseline and no other safety concerns have been raised. The T-Bar configuration offers a small reduction in workload for ATC. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace, it would also offer some marginal fuel burn and CO_2 savings (see assessment above), and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. The noise assessment has noted that there could be a change in noise distribution, particularly around the base leg section of the procedure for the 5% of traffic operating the RNP approaches. This could lead to increased overflight frequency over Muchalls and Newtonhill however any adverse impacts of this are not expected to be significant. One of the objectives of the AMS is to increase capacity. This option, and overall this ACP, does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

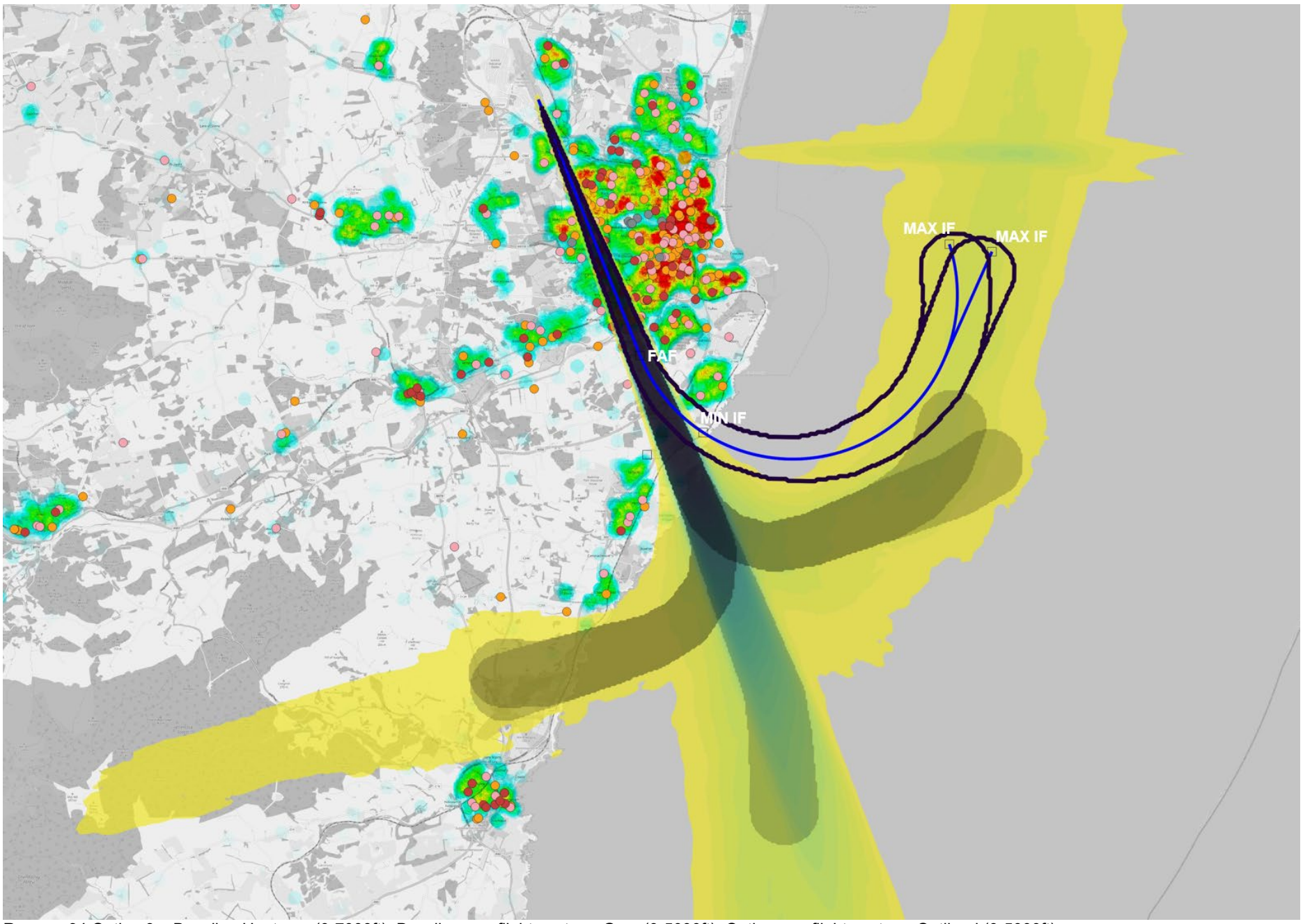
Runway 34 Arrival Option 3 – Curved Approach from the East

This option would see those arrivals wishing to fly an RNP APCH that were also equipped with 'Radius to Fix' (RF) functionality vectored towards an Initial Approach Fix (IAF) positioned downwind to the East of final approach. The RF allows aircraft to fly in an arc of fixed radius around a point, direct to the Final Approach Fix (FAF).

This RNP APCH RF (curved approach) option is expected to be adopted by c.10% of runway 34 arrivals and c.5% of helicopter arrivals. Owing to the direction of the joining points of the curved approach, this will mainly be used by traffic arriving from the north east, east and north.

Based on the data in our traffic forecast, and traffic arriving from the north/north east/east, this is optimistically estimated to be, on average less than 1 per day fixed wing and 1 helicopter arrival per day. The remaining Runway 34 arrivals will continue to operate as they do today or possibly use an alternative PBN option (Option 1 or Option 2).

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative and partly quantitative



Runway 34 Option 3 – Baseline Heatmap (0-7000ft), Baseline overflight contour: Grey (0-5000ft), Option overflight contour: Outlined (0-5000ft)

Table 14 Runway 34 Option 2 Centreline overflight data 0-5000ft

Track	Via Waypoint	Area	Population	Schools count	Hospitals count	Carehomes count	Places of worship count
Baseline	PETOX	38	13694	7	0	5	7
	SMOKI (EAST)	38	13694	7	0	5	7
Option 3	SMOKI (EAST)	38	13606	7	0	5	7
	PETOX	38	13606	7	0	5	7
Difference							
Option 3	SMOKI (EAST)	0	-88	0	0	0	0
	PETOX	0	-88	0	0	0	0

Noise: This option is not expected to impact the L_{Aeq} 16hr (day) and 8hr (night) contours, as the lateral changes to flight paths occur outside the scope of the contours.

When considering the overflight metrics, aircraft will initially be vectored from above 7000ft until joining the IAF at c. 5000ft. In the baseline, around c.20% of fixed wing flights arrive from the north-east, and c.5% of flights arrive from the north (see 'Movement Information' section for further details). It is anticipated

that the fixed wing arrivals with RF capabilities from the north and north east could elect to fly this curved approach option. The increase in track mileage for aircraft arriving from other directions means they would be more likely to use the existing ILS approach or an alternative PBN option (if multiple PBN options were implemented). The majority of helicopters arrive at Aberdeen from the north-east and east, and this curved approach is expected to be predominantly used by Helicopters arriving from the NE. For runway 34 this is estimated to be on average less than 1 fixed wing and 1 helicopter per day.

The initial parts of the approach from the IAF to the IF occur over the water. The IF has been located with the aim of avoiding the direct overflight of Cove Bay, Findon and Portlethen and the concentration enabled by PBN and the RF arc would mean aircraft would very accurately fly around the arc onto final approach. Although the centreline of the arc avoids these populated areas, the overflight contours do capture the western outskirts of Cove Bay which is very infrequently overflown in the baseline and therefore this option would create a small area of new overflight. The curved approach does however avoid the populated area of Marywell which is directly under the final approach in the baseline as well as the eastern parts of Portlethen Village and the area of Findon. In the data this results in a small decrease in population overflown compared to the baseline centrelines.

Owing to the small number of flights operating the RNP RF route, and this occurring largely over sparsely populated areas, the impacts of this are not expected to be significant (and are outside the L_{Aeq} contours), however this would require further investigation as part of the quantified noise analysis at Stage 3, should this option progress. Beyond the FAF, aircraft will fly the same final approach as they do in the baseline.

The remaining 90% of fixed wing traffic and 95% of helicopter traffic would continue to fly as they do in the baseline. There will be reduced overflight of some areas (detailed above) owing to the traffic now using the RNP APCH RF. The remaining traffic from directions other than the north and north east, would continue to fly as per the baseline or alternatively may use a different PBN procedures if available.

This option is not expected to impact the flight paths of aircraft departing from Aberdeen.

Tranquillity: The option does not overfly any National Parks or National Scenic Areas (NSA) below 7000ft.

Biodiversity: Impacts to biodiversity are considered for changes below 1640ft. This option does not change lateral flight paths below 1640ft and therefore there is no anticipated change or impact to biodiversity as a result of this option.

Communities	Air Quality	Qualitative

Impacts to air quality are considered for changes below 1000ft. This option does not change lateral flight paths below 1000ft and therefore there is no anticipated change or impact to air quality as a result of this option.

Wider Society	Greenhouse Gas Impact	Qualitative

This option is expected to reduce track length compared to the baseline for those aircraft that elect to fly the RNP-RF approaches; based on the existing arrivals points, a c.8nm reduction in track length is anticipated. As track length is typically linked to fuel burn and subsequently CO_2 emissions, we expect aircraft flying the RNP-RF approaches to have less Greenhouse Gas impact compared to the baseline. This option is not expected to impact aircraft departing from Aberdeen.

Wider Society	Capacity/Resilience	Qualitative

The introduction of PBN satellite-based approaches at Aberdeen would improve resilience in the event of ground-based navigation aid outage which may reduce delays and diversions. In addition to this, it would remove Aberdeen's dependencies on conventional VORs. This equipment is due to be decommissioned as part of a NERL UK wide programme under the Airspace Modernisation programme.

In the case of RNP RF procedures, not all aircraft are equipped to operate these procedures and therefore in order to offer full resilience against conventional ground based navaid outages, these procedures would need to be implemented alongside alternative PBN procedures.

General Aviation	Access	Qualitative

This option is not expected to directly impact General Aviation; the procedure would be contained within existing CAS and aircraft would be vectored onto the RNP Approach T-Bar similar to the baseline. If CAS Option 1 is progressed this arrival option would be compatible with it, resulting in a small reduction in CAS volume. The option is not expected to impact the Helicopter routes to and from Aberdeen Airport.

General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative

This option is not expected to alter the airspace capacity at Aberdeen; the purpose is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This is expected to enable a reduction in operational costs for airlines that have RNP RF capabilities.

General Aviation/ commercial airlines	Fuel Burn	Qualitative

This option is expected to reduce track length compared to the baseline for those aircraft that elect to fly the RNP-RF approaches; based on the existing arrivals points, a c.8nm reduction in track length is anticipated. As track length is typically linked to fuel burn, we expect aircraft flying the RNP-RF approaches to have less fuel burn compared to the baseline.

	Network arrivals points			
	GLESK	**SMOKI**	**RATPU**	**PETOX**
RWY 34 Do Nothing	35.1	63	28.7	44
RWY 34 Option 3 Curved Approach from East	n/a	59	n/a	40
Difference		**-4**		**-4**

This option is not expected to impact aircraft departing from Aberdeen.

Commercial airlines	Training costs	Qualitative

Procedures are introduced worldwide as part of an AIRAC cycle. As part of this cycle, airlines update their procedures accordingly and undertake training if required. This arrival option uses a specification of PBN called RNP APCH RF (Radius to Fix). It is expected that any airlines currently approved to fly RNP-RF approaches would use these curved approaches; airlines not approved would either continue to fly the ILS approach, or may use an alternative PBN option (should multiple PBN options be implemented). Therefore implementation of an RNP-RF is not expected to result in any additional training costs for airlines unless an airline elects to obtain approval to fly the approach.

Commercial airlines	Other costs	Qualitative

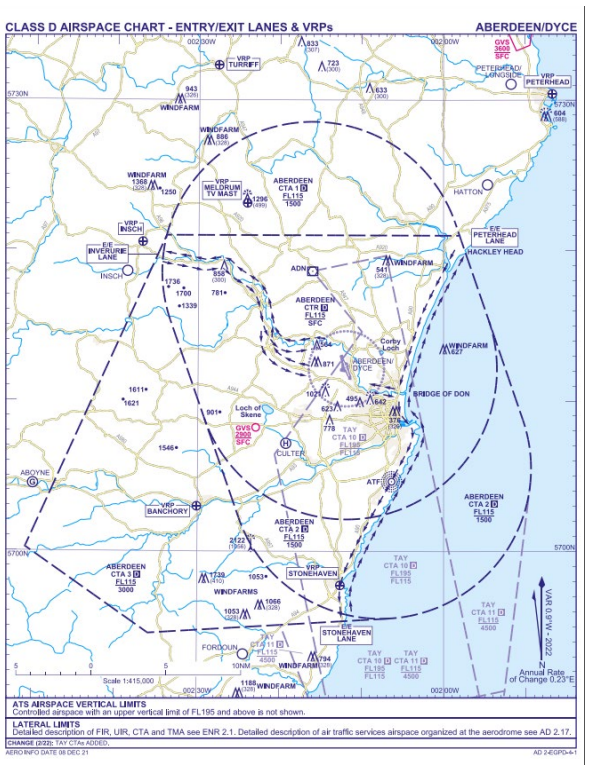
No other airline costs are foreseen.

Airport/ANSP	Infrastructure costs	Qualitative

The initial deployment phase of the ACP may require some ATC system engineering amendments.

Airport/ANSP	Operational costs	Qualitative
The introduction of PBN satellite-based approaches would remove Aberdeen's dependencies on conventional ground based navigation equipment (VORs), which contributes to a reduction in NERL's operational costs as it enables VOR rationalisation in the longer term. The availability of PBN procedures provides resilience to the loss of the ILS which should reduce the number of diversions owing to improved minima over the remaining conventional approach procedures. This may offer increased operating revenue to Aberdeen in the event of an ILS outage.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of training cost for Air Traffic Controllers at Aberdeen ATC.		
All	Safety	Qualitative
This option is expected to be as safe as the baseline and no other safety concerns have been raised. This option offers a curved RNP APCH with Radius to Fix, a specification of PBN which has been implemented in the UK however there are only limited examples. Procedures will be designed by UK Approved Procedure Design Organisation and validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs through reducing the risk of Controlled Flight Into Terrain (CFIT).		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
This option would offer the opportunity to implement PBN approaches at Aberdeen which would meet the requirements for modernising the airspace, it would also offer fuel burn and CO_2 savings (see assessment above), and the option would be compatible with the proposed reduction in CAS outlined in CAS Option 1. The noise assessment has noted that there is likely to be negative noise impacts for communities not currently overflown frequently, as well as redistribution of noise for some communities currently overflown. One of the objectives of the AMS is to increase capacity. This option, and overall this ACP, does not seek to increase capacity at Aberdeen Airport; the purpose of the change is to provide resilience, remove dependencies on VORs, and offer PBN procedures which meet the AMS. No issues are foreseen with integrating the option with the NATS NERL airspace above 7000ft.		

Existing Controlled Airspace (CAS) ‘Do nothing’ and CAS Assessment Methodology



The controlled airspace (CAS) structure will remain as it is today. Please see section AD 2 EGPD (AD 2.EGPD-4-1) of the eAIP for the Class D Airspace chart.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative
This option is the ‘do nothing’ for the existing CAS structure. Aircraft departing and arriving at Aberdeen will continue to fly as they do today; for more information, please see our Stage 2A document on the CAA Airspace Change Portal. CAS Option 1 will be compared against this baseline to understand if altering the CAS will result in any changes to tracks over the ground to and from Aberdeen Airport, and subsequently noise below 7000ft.		
Communities	Air Quality	Qualitative
This option is the ‘do nothing’ for the existing CAS structure. Aircraft departing and arriving at Aberdeen will continue to fly as they do today; for more information, please see our Stage 2A document on the CAA Airspace Change Portal. Impacts to air quality are considered for changes below 1000ft. CAS Option 1 will be compared against this baseline to understand if altering the CAS will result in any changes to tracks below 1000ft.		
Wider Society	Greenhouse Gas Impact	Qualitative
This option is the ‘do nothing’ for the existing CAS structure. Aircraft departing and arriving at Aberdeen will continue to fly as they do today; for more information, please see our Stage 2A document on the CAA Airspace Change Portal. CAS Option 1 will be compared against this baseline to understand if altering the CAS will result in any changes to track length, and subsequently to fuel burn and CO_2 emissions.		
Wider Society	Capacity/Resilience	Qualitative
The existing CAS does not constrain capacity or resilience. CAS Option 1 will be compared against this baseline to understand if altering CAS will result in any changes to capacity/resilience.		
General Aviation	Access	Qualitative

There are various GA airfields that are located close to controlled airspace, or under the base of controlled airspace.

There are also a small number of GA airfields within the control zone:

- Whiterashes: close to the ADN and the final approach track for Runway 16.
- Peterculter: helicopter training site.
- Aberdeen Royal Infirmary (ARI): located underneath the final approach track for Runway 34.
- Trump Golf Course: a helicopter landing site near Balmedie on the coast to the east of the airfield.

There is known to be a high amount of gliding traffic on the edges of controlled airspace at Aberdeen; Deeside Gliding club lays to the west of the aerodrome and is a base for extensive wave soaring both locally and throughout the Scottish Highlands. Highland Gliding club and Insch airfield lies to the north west. The dense activity around Deeside Gliding Club generates traffic that navigates around or underneath CTA3. Figure 8 shows a Gliding activity heatmap generated by Airspace4All which helps to illustrate density of Glider operations around the Aberdeen CTR/CTAs.

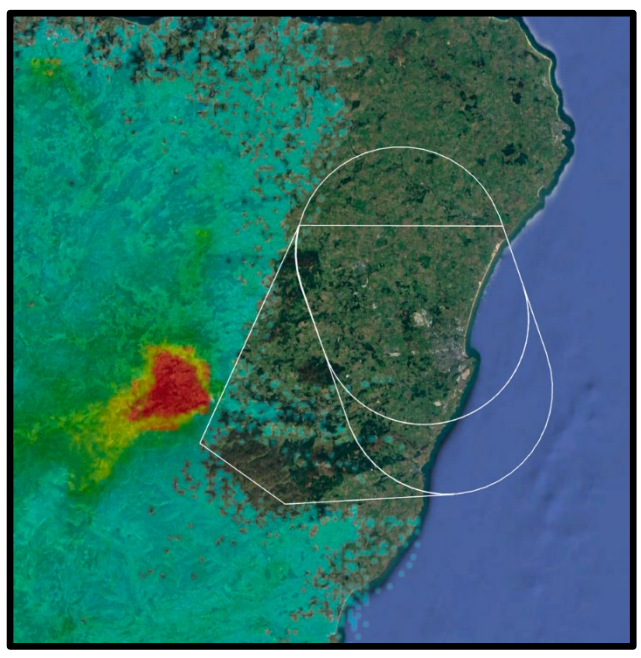


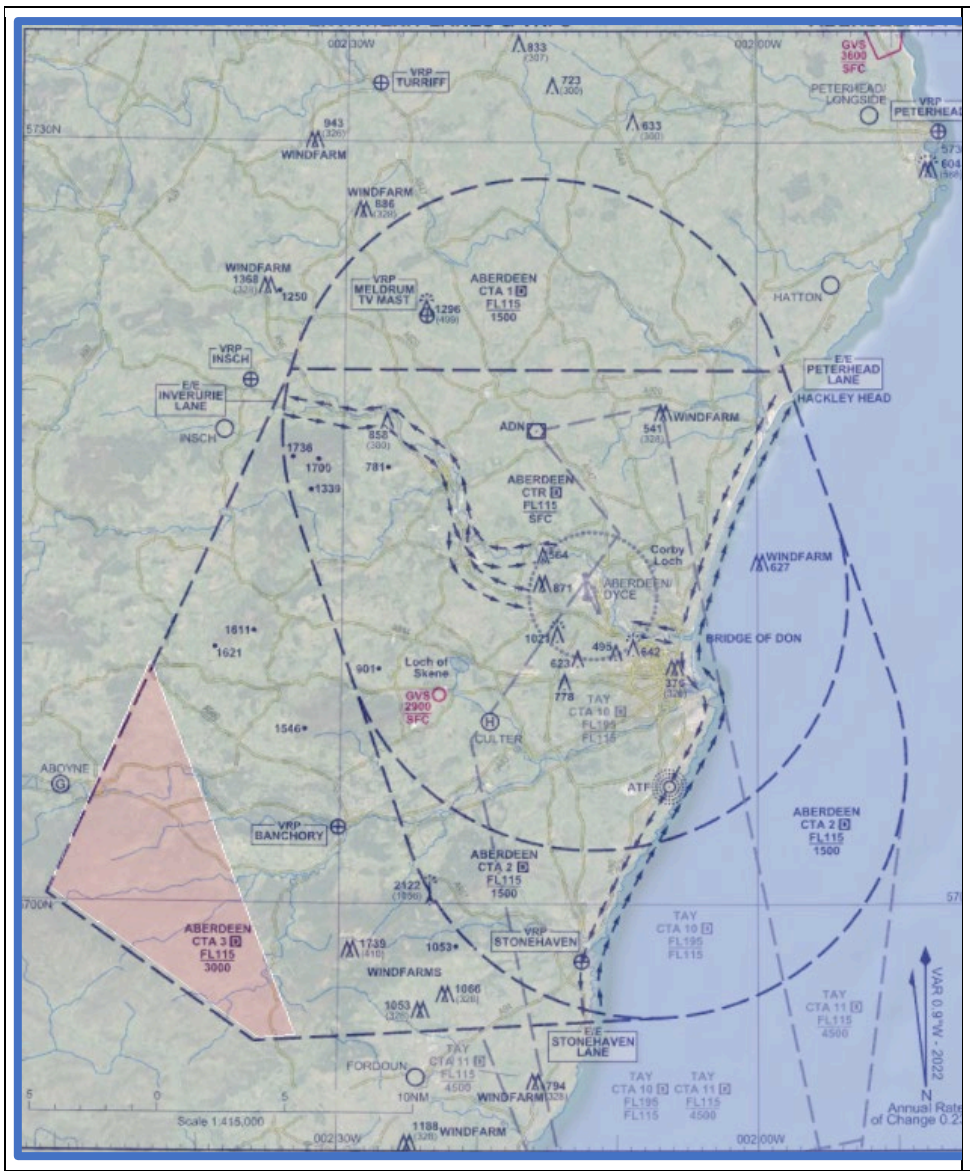
Figure 8 Gliding Activity Heatmap (Source: Airspace4All)

Airspace4All also published a piece of work on VFR Significant Areas (VSA) which highlighted two areas, ‘Aberdeen Coastal Corridor’ and the ‘Inverness – Aberdeen Coastal Corridor’ which have been identified as being particularly important to VFR operations i.e. General Aviation (GA). These areas do not have any official status but are intended to highlight the importance of a particular area so that any future airspace development plans can take due account of the GA activity. For more information, please see our Stage 2A document on the CAA Airspace Change Portal.

General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
Doing nothing will not enable any increased effective capacity.		

General Aviation/ commercial airlines	Fuel Burn	Qualitative
This option is the ‘do nothing’ for the existing CAS structure. Aircraft departing and arriving at Aberdeen will continue to fly as they do today; for more information, please see our Stage 2A document on the CAA Airspace Change Portal. CAS Option 1 will be compared against this baseline to understand if altering the CAS will result in any changes to track length, and subsequently to fuel burn.		
Commercial airlines	Training costs	Qualitative
As this option is already in operation, there are no training costs anticipated as there will be no change; later in this IOA we will estimate the difference between CAS Option 1 and this baseline.		
Commercial airlines	Other costs	Qualitative
As this option is already in operation, there are no other costs anticipated as there will be no change; later in this IOA we will estimate the difference between CAS Option 1 and this baseline.		
Airport/ANSP	Infrastructure costs	Qualitative
As this option is already in operation, there are no infrastructure costs anticipated as there will be no change; later in this IOA we will estimate the difference between CAS Option 1 and this baseline.		
Airport/ANSP	Operational costs	Qualitative
As this option is already in operation, there are no operational costs anticipated as there will be no change; later in this IOA we will estimate the difference between CAS Option 1 and this baseline.		
Airport/ANSP	Deployment costs	Qualitative
As this option is already in operation, there are no deployment costs anticipated as there will be no change; later in this IOA we will estimate the difference between CAS Option 1 and this baseline.		
All	Safety	Qualitative
The baseline is already in safe operation and there are no safety concerns raised at this time.		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
CAP1711 describes the objective as: Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. There is also the parameter to ‘use the minimum volume of controlled airspace consistent with safe and efficient air traffic operation’. This do nothing option would not enable any reductions in the volume or classification of CAS.		

CAS Option 1 Raise portion of CTA 3 to 4500ft



CAS Option 1 proposes to raise the base of a SW portion of CTA 3 from 3000ft to 4500ft.

Analysis of surveillance data followed by conversations with Aberdeen ATC identified a section of CTA 3 which was underutilised. The figure illustrates the section of CTA 3 that will be considered for declassification from Class D to Class G airspace.

Group	Impact	Level of Analysis
Communities	Noise impact on health and quality of life (includes impact on tranquillity due to SPA overflight)	Qualitative
The section of airspace proposed to be raised to 4500ft has been identified using radar data. Analysis of this data showed that the profiles of aircraft either arriving or departing from Aberdeen are currently above this volume. We can therefore conclude that raising this portion of CTA 3 would have no impact on aircraft arriving and departing from Aberdeen; therefore no changes to tracks over the ground, aircraft profiles, and subsequently noise, are expected as a result of implementing this option from Aberdeen Airport's operation.		
Communities	Air Quality	Qualitative
CAS Option1 is not expected to alter tracks over the ground for aircraft arriving and departing from Aberdeen below 1000ft and therefore this option is not expected to have any impacts on Air Quality from Aberdeen Airport's operation.		
Wider Society	Greenhouse Gas Impact	Qualitative
CAS Option1 is not expected to alter tracks over the ground for aircraft arriving and departing from Aberdeen and therefore this option is not expected to have any impacts to Greenhous Gas Impact from Aberdeen Airport's operation. However, it may enable more fuel efficient routings by GA, catering for flight up to 4400ft, instead of 2900ft.		
Wider Society	Capacity/Resilience	Qualitative
CAS Option 1 is not expected to change the capacity or resilience within the airspace compared to the 'do nothing' baseline.		
General Aviation	Access	Qualitative
A reduction in CAS is welcomed by General Aviation. The increase of the base of this part of CTA3 would enable improved soaring profiles for flights to/from Deeside Gliding Club at Aboyne.		
General Aviation/ commercial airlines	Economic impact from increased effective capacity	Qualitative
CAS Option 1 does not offer any increased capacity for Aberdeen Airport compared to the 'do nothing' baseline.		
General Aviation/ commercial airlines	Fuel Burn	Qualitative
CAS Option1 is not expected to alter tracks over the ground for aircraft arriving and departing from Aberdeen and therefore this option is not expected to have any impacts to fuel burn from Aberdeen Airport's operation.		
Commercial airlines	Training costs	Qualitative
This option is not expected to result in any additional training costs for airlines; aircraft will continue to operate as they within the baseline. Updated charts reflecting the changes to the CAS will be introduced as part of an AIRAC cycle.		
Commercial airlines	Other costs	Qualitative
No other airline costs are foreseen.		

Airport/ANSP	Infrastructure costs	Qualitative
No infrastructure costs are foreseen.		
Airport/ANSP	Operational costs	Qualitative
No operational costs are foreseen.		
Airport/ANSP	Deployment costs	Qualitative
This option is expected to require a small amount of cost for Air Traffic Controllers at Aberdeen ATC to update documentation and ATC procedures to reflect the new CAS structure. There will also be some Airport IFP cost to update some procedures to reflect the increased base of CAS (see safety assessment below). There may be some ATC system updates required to reflect the new CAS boundaries (e.g. Radar mapping and Controlled Airspace Infringement Tool updates)		
All	Safety	Qualitative
Some of Aberdeen Airport's published procedures, and NERL's enroute procedures will require amending to ensure procedural CAS containment. This includes the ILS/DME RWY 34, LOC/DME RWY 34 and VOR/DME RWY 34 procedures published on the EGPD eAIP, and the Direct Arrival from Airway P600. Note that amendment to these procedures is not anticipated to make any changes to tracks over the ground however this will be confirmed once this is fully investigated; this will form part of Stage 3 should this option progress should the option progress.		
All	Performance against the vision and parameters/strategic objectives of the AMS	Qualitative
CAP1711 describes the objective as: Deliver quicker, quieter and cleaner journeys and more capacity for the benefit of those who use and are affected by UK airspace. This IOA has shown that CAS Option 1 is not expected to alter tracks over the ground, and subsequently it will not impact noise, CO_2 or capacity (subject to safety review work). CAP1711 also contains a parameter to 'use the minimum volume of controlled airspace consistent with safe and efficient air traffic operation'. This option offers the opportunity to reduce the volume of CAS and raise the base so that the Aberdeen operation uses the minimum volume of controlled airspace consistent with safe and efficient air traffic.		

IOA Summary and Conclusion

The following sections provide an overview of the outcome of the IOA before explaining whether an option has been progressed into Stage 3 and the rationale around this. Within this document, we have identified that further qualitative assessment is required for some categories; details have been included, where applicable, in the full IOA tables and is also summarised in the 'preferred option' section below.

Discounting Methodology

We have used the detailed IOA assessments as the basis for determining whether to continue or discount an option. In some cases, there may be multiple options that perform well against the baseline and in these cases we have also looked at the comparative performance of each option; details of this are included in the conclusion tables below. As part of the conclusion table below we have summarised the main categories that differentiate the options such as noise, CO_2 and resilience. Please refer to the full IOA tables for assessments against all the IOA categories as required by CAP1616. Alongside this, when considering whether to continue or discontinue an option, we have considered the Design Principles developed with stakeholders at Stage 1 as well as the requirement to meet the Airspace Modernisation Strategy (AMS).

When considering the noise assessments, the primary metric required by CAP1616 to assess 'total adverse impacts' is the LAeq 16hr (day) and 8hr (night) contour. The Initial Options Appraisal of each option has considered potential impacts to these contours however the L_{Aeq} contours only extend partially along the final approach. This means they are outside of the scope of the changes associated with the options and therefore none of the options are expected to impact the L_{Aeq} metrics. Subsequently, we have looked to the secondary CAP1616 overflight metrics, as well as the Design Principles, when considering the noise assessment and whether to progress or discontinue an option. As well as this, we have considered the options performance against other IOA categories, where there is a means of differentiating between the options, as outlined in the table below.

The threshold for discounting an option cannot be based on quantitative assessments alone but must also come down to the qualitative appraisals and professional judgment, as there are many factors to balance - many of which will not be quantified until the Full Options Appraisal at Stage 3. The following table therefore provides the rationale for discounting or progressing an option and explains these qualitative elements:

Runway 16	Conclusion	Progress to Stage 3
Runway 16 Arrival Option 1 – Vectors to Final Approach	The IOA has established that for the c.5% of traffic estimated to operate this option, it is expected to: • Maintain noise impacts similar to the baseline; at the point of joining the procedure, which is within the main concentrated area of the existing arrivals swathe, there would be a small change in noise distribution however any adverse impacts of this are so marginal that they are not expected to be significant (and are outside the L_{Aeq} contours). • Maintain similar levels of track mileage to the baseline. Track mileage is an indicator of fuel burn and CO2 emissions and therefore these are estimated to remain the same as within the baseline. • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 We have therefore chosen to continue this option into Stage 3 of the ACP as it does not have any impacts in these categories compared to the baseline, and it meets most of Aberdeen's design principles and it meets the aims of the AMS.	Yes
Runway 16 Arrival Option 2 – Inner T Bar	The IOA has established that for the c.5% of traffic estimated to operate this option, it is expected to: • Have marginal negative impacts to noise compared to the baseline; this is because the western T-Bar is slightly south of the main area of concentration and, when compared to the baseline centreline data, there is a small increase in population overflown. Owing to the number of flights expected to operate these, any impacts are likely to be marginal and are not expected to be significant (and are outside the L_{Aeq} contours) however this information helps us to compare the performance of different PBN options. • Offer slightly improved track mileage compared to the baseline. Track mileage is an indicator of fuel burn and CO2 emissions. • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 Option 3 offers a T-Bar slightly further north than this option. When we compare the outcomes of the noise assessment, Option 3 offers improvements to population overflown whereas this option increases population overflown. Option 3 also locates the PBN procedure in the more concentrated part of the western arrivals swathe which more closely aligns with DP3 (Minimise change to tracks over the ground). When we compare the eastern T-Bar between the two options, this option offers slightly closer alignment with the concentrated area of the existing arrival swathe, however Option 3 still offers some overlap. This option does however offer improvements to track mileage, and associated fuel burn and CO_2 benefits compared to option 3, however these are marginal and the other curved approach options offer the opportunity for greater track mileage improvements (which would need to be balanced against potential impacts to noise). We have therefore	No

	chosen to discontinue this option as compared to other options, it comparatively performs less well against the baseline.	
Runway 16 Arrival Option 3 – Outer T Bar	The IOA has established that for the c.5% of traffic estimated to operate this option, it is expected to: • Have a marginal change in noise distribution compared to the baseline. The IOA has shown that the western T-Bar of Option 3 is located within the main area of concentration of the existing arrival swathe, and the eastern T-Bar is largely located within the main concentrated area and, where it isn't, it is still located within the existing arrival swathe. Overall, owing to the small number of flights operating the RNP APCH, any impacts of this are not expected to be significant (and are outside the L_{Aeq} contours). When comparing centreline to centreline data, there is mix of small increases in population overflown with some slightly larger decreases; cumulatively there is a decrease in centreline population overflown. • Maintain similar levels of track mileage to the baseline with the exception of RATPU which would increase by c.1nm. Track mileage is an indicator of fuel burn and CO_2 emissions • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 Compared to Option 2, Option 3 offers a T-Bar slightly further north which aligns more closely, particularly on the western T-Bar, with the baseline existing arrival swathe. This means that from a noise perspective, the small change in noise distribution due to the RNP approaches will occur over the areas already most frequently overflown within the baseline. When comparing the Option 2 and Option 3 centreline data, Option 3 offers a cumulative reduction in population overflown whereas Option 2 increases. Although there is a small increase in track mileage for arrivals from RATPU, for the purposes of this IOA track mileage has been rounded to the nearest nm and as part of the preparation of the IFPs for the Stage 3 full options appraisal, we will explore whether the procedure can be refined to enable similar track mileage to today. We have therefore chosen to continue this option into Stage 3 of the ACP as it performs comparatively well in this IOA, it meets the scope of the Statement of Need, meets most of our design principles and within the scope of minimising changes to tracks over the ground, it achieves a better balance between noise and CO_2 compared to Option 2. This option also meets the AMS.	Yes
Runway 16 Arrival Option 4 – Curved Approach from the West	The IOA has established that, for the c.10% of runway 16 fixed wing arrivals estimated to operate this option it is expected to: • Result in a small redistribution of traffic between 7000-5000ft over areas already overflown today. When flying the curved approach from c.5000ft, there is increased frequency of overflight at lower altitudes over some areas already overflown today, and there is also new overflight over areas not typically overflown. Owing to the small number of flights operating the RNP RF route, and this occurring largely over sparsely populated areas, any impacts of this are not expected to be significant (and are outside the L_{Aeq} contours). • Offer a c.9nm reduction in track milage. Track mileage is an indicator of fuel burn and CO_2 emissions and therefore this option offers potential reductions. • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue however only for aircraft/operators capable of flying RNP APCH RF. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 Analysis of the curved approaches has shown that although they would create overflight which would alter the distribution of traffic compared to the baseline, this would largely occur over sparsely populated areas, and the centreline data shows reductions in population overflown. The option also offers a c.9nm reduction in track mileage which has the potential to offer significant CO_2 and fuel savings compared to the baseline for those operators able to fly RNP RF. We have therefore chosen to take this option forward into Stage 3 to explore the potential positive benefits and negative impacts in quantified detail.	Yes
Runway 16 Arrival Option 5 – Curved Approach from the East	The IOA has established that for the c.10% of runway 16 fixed wing arrivals and c.5% of helicopter arrivals estimated to operate this option it is expected to: • Result in a small redistribution of traffic between 7-5000ft over areas already overflown today. When flying the curved approach from c.5000ft, there is increased frequency of overflight at lower altitudes over some areas already overflown today. Owing to the small number of flights operating the RNP RF route, and this occurring largely over sparsely populated areas, any impacts of this are not expected to be significant (and are outside the L_{Aeq} contours). • Offer a c.2nm reduction in track mileage. Track mileage is an indicator of fuel burn and CO_2 emissions and therefore this option offers potential reductions. • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue however only for aircraft/operators capable of flying RNP APCH RF. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1	Yes

	Analysis of this curved approach has shown that although it would create overflight which would alter the distribution of traffic compared to the baseline, this would largely occur over sparsely populated areas, and the centreline data shows reductions in population overflown. The option also offers a c.2nm reduction in track mileage which has the potential to offer CO_2 and fuel savings compared to the baseline for those operators able to fly RNP RF. We have therefore chosen to take this option forward into Stage 3 to explore the potential positive benefits and negative impacts in quantified detail.	
Runway 34	**Conclusion**	
Runway 34 Arrival Option 1 – Vectors to Final Approach	The IOA has established that, for the 5% of traffic expected to operate this option, it is expected to: • Maintain noise impacts similar to the baseline; at the point of joining the procedure, which is within the main concentrated area of the existing arrivals swathe, there would be a small change in noise distribution however any adverse impacts of this are so marginal that they are not expected to be significant (and are outside the L_{Aeq} contours). • Maintain similar levels of track mileage to the baseline. Track mileage is an indicator of fuel burn and CO2 emissions and therefore these are estimated to remain the same as within the baseline. • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 We have therefore chosen to continue this option into Stage 3 of the ACP as it does not have any impacts in these categories compared to the baseline, and it meets most of Aberdeen's design principles and it meets the aims of the AMS.	Yes
Runway 34 Arrival Option 2 – T Bar	The IOA has established that, for the 5% of traffic expected to operate this option, it is expected to: • Have a marginal change in noise distribution compared to the baseline. The IOA has shown that the western T-Bar of Option 2 is located slightly to the north but still within the main area of concentration of the existing arrival swathe. This location results in a small increase in population overflown when comparing the centreline data however owing to only c. 1 fixed wing arrival per day using the western T-Bar on average, any impacts are not expected to be significant (and are outside the L_{Aeq} contours). There may also be opportunities as part of IFP development in Stage 3 for the T-Bar to be positioned a fraction to the south to align with the existing overflight swathe more closely. • Offer a c.2nm reduction in track mileage. Track mileage is an indicator of fuel burn and CO_2 emissions and therefore this option offers potential reductions. (Note that if the T-Bar is slightly repositioned as discussed above, this will alter the track mileage which has been rounded to the nearest nm for the purposes of this IOA). • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 We have therefore chosen to continue this option into Stage 3 of the ACP as it performs comparatively well in this IOA, it meets the scope of the Statement of Need, meets most of our design principles. This option also meets the AMS.	Yes
Runway 34 Arrival Option 3 – Curved Approach from the East	The IOA has established that, for the c.10% arrivals and c.5% of helicopter arrivals, it is expected to: • Result in a small noise redistribution compared to the baseline which would include a very small amount of overflight over areas not currently overflown in the baseline. The centreline data has however shown that the increase in population overflown from this new overflight is mixed with decreases in population overflown due to the later joining point of the curved approach; cumulatively there is a decrease in centreline population overflown. Owing to the small number of flights operating the RNP RF route, the impacts of this are not expected to be significant (and are outside the L_{Aeq} contours). • Offer a c.8nm reduction in track mileage. Track mileage is an indicator of fuel burn and CO_2 emissions and therefore this option offers potential reductions. • Improve resilience and therefore offer some opportunities for reduced airline operating costs and increased operating revenue however only for aircraft/operators capable of flying RNP APCH RF. • Not impact General Aviation and accommodate the reduced CAS volume associated with CAS Option 1 Analysis of the curved approaches has shown that although they would create overflight which would alter the distribution of traffic compared to the baseline, this would largely occur over the water, and when over land, there would be a mix of benefits and impacts in terms of noise that would be useful to explore in quantitative detail. As the option also has the potential to offer significant CO_2 and fuel savings compared to the baseline for those operators able to fly RNP RF, we have chosen to take this option forward into Stage 3 to explore the potential positive benefits and negative impacts in quantified detail.	Yes
Controlled Airspace	**Conclusion**	
Existing CAS 'Do nothing'	We have chosen for the baseline 'do nothing' option to remain as Option 1 requires further safety investigation as part of Stage 3.	Yes

CAS Option 1 Raise portion of CTA 3 to 4500ft	We have chosen to take forward Option 1 into stage 3 as it offers opportunities to release CAS however the IOA has noted that this option requires further safety investigation to establish whether there would be impacts to some of Aberdeen Airport's published procedures, and NERL's enroute procedures. This investigation will be undertaken as part of Stage 3 activities.	Yes

Preferred Options

At the end of the Stage 2 IOA, an airspace change sponsor is required to indicate their preferred option from the shortlist of options proceeding to Stage 3. At this stage, our preferred option would be to implement the two T-Bars Options (Runway 16 Option 3 and Runway 34 Option 2) as well as the curved approach options (Runway 16 Option 4 and 5 and Runway 34 Option 3). Compared to Runway 16 Option 1 and Runway 34 Option 1 (Vectors to RNP APCH), the T-Bars offer a small reduction in ATC workload, and the IOA has demonstrated that they would present only very small changes from the baseline whilst meeting the AMS and offering resilience for Aberdeen in the event of ground based navigation aid outage. The curved approaches would offer significant track mileage, fuel burn and CO_2 savings. These would however alter the distribution of traffic compared to the baseline and overfly some areas not frequently overflown by arrivals. The centreline data has however shown that there are reductions in population overflown by the curved approaches compared to the baseline and therefore we intend to explore the positive benefits and negative impacts in further quantitative detail as part of the Stage 3 Full Options Appraisal.

With regards to our options around Controlled Airspace (CAS), our preferred option would be to implement Option 1 (Raise portion of CTA3 to 4500ft). This will be subject to further safety investigation we will undertake as part of Stage 3.

Information to collect as part of Full Options Appraisal at Stage 3

We have outlined which options we plan to take forward to Stage 3 as part of our IOA Summary and conclusion section above. As part of this, we have also indicated our preferred options however it's important to note that we will need to refine those options ahead of the Full Options Appraisal (FOA) to ensure they can integrate with the network, the PBN arrivals can connect to final approach in accordance with regulations and that the routes are all flyable. All refinements that lead to the final solution(s) taken to FOA and subsequent consultation will be documented as part of the design evolution.

Within this Initial Options Appraisal, we have highlighted where we plan to undertake further detailed appraisal as part of our Stage 3 Full Options Appraisal, in order to further assess the benefits and impacts of an option. This is particularly the case with the primary noise metric data, where at Stage 3 we will fully quantify the L_{Aeq} contours associated with each option to CAP2091 standards, allowing us to quantify the benefits and impacts. We have also identified other categories where further quantitative appraisal work is required.

We plan to collect the following data and undertake the additional assessments as part of our Full Options Appraisal assessment and following this assessment we will outline the options that we intend to take to Consultation:

- Quantify the baseline year (pre-implementation and 10 years post implementation, including 10 year traffic forecast)
- Quantitative L_{Aeq} contours, population counts and size (km^2)
- Quantitative Nx contours, population counts and size (km^2)
- WebTAG assessment
- Quantitative overflight contours that detail frequency of overflight including vectoring between 7000ft and joining the PBN procedures
- Detailed track length comparison
- Detailed fuel burn and equivalent CO_2 emissions data
- Further information around any interdependencies with the NATS NERL network
- Quantified CAS requirements

Impacted Audiences

At the ‘Develop and assess’ gateway, the IOA must set out impacted audiences as this information will be a key feature in developing the consultation strategy required during Step 3A and at the ‘Consult’ gateway.
The following figure shows our options on one map image, displayed using 5000ft overflight contours and the vectoring NTK heatmap. We will use this mapping as a starting point to identify our impacted audiences and ensure that this is considered when developing our consultation strategy at Stage 3. We’re aware that other factors also need to be considered when identifying the audience such as other noise metrics, changes to controlled airspace etc and we will ensure these are also factored in.

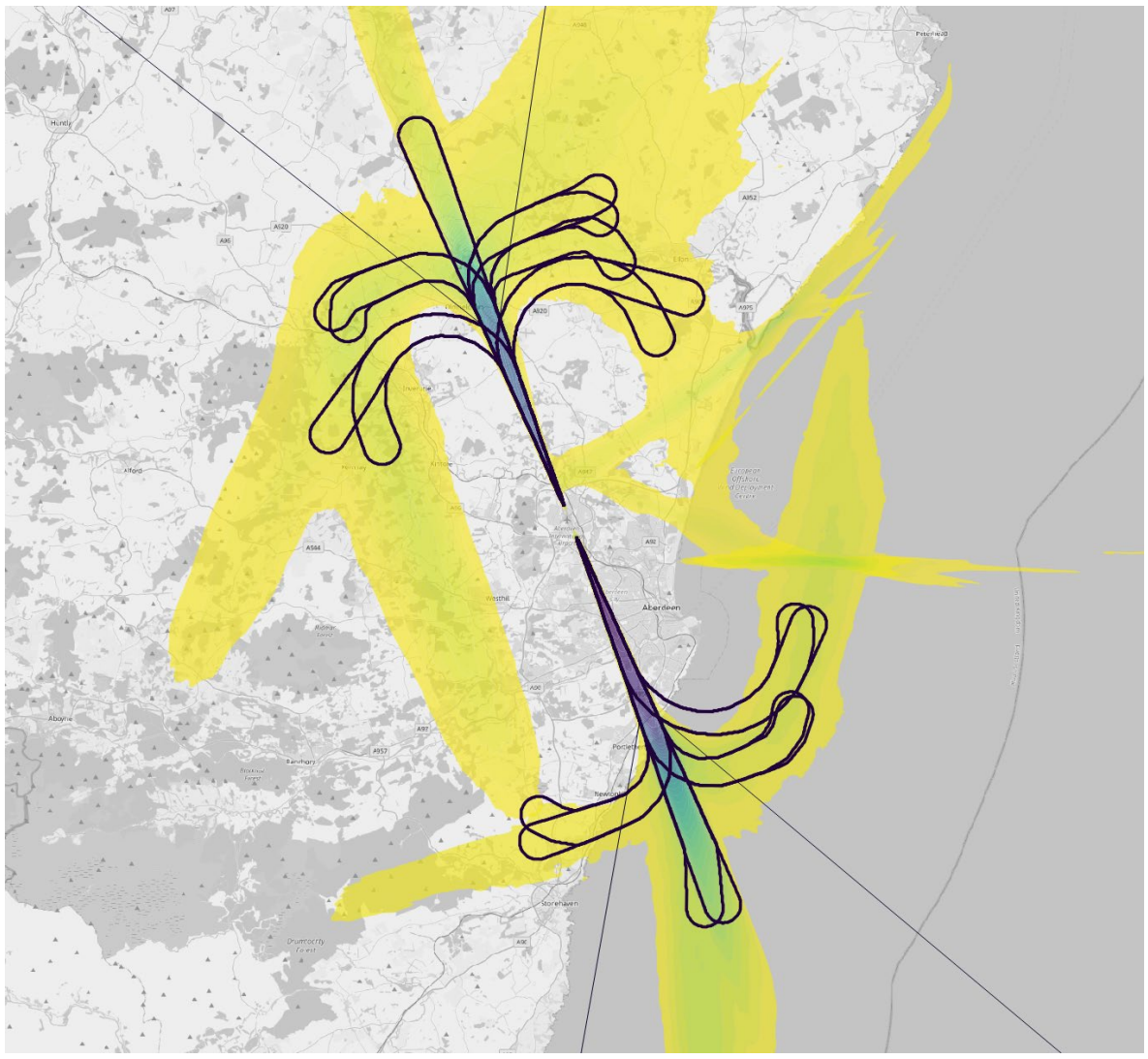
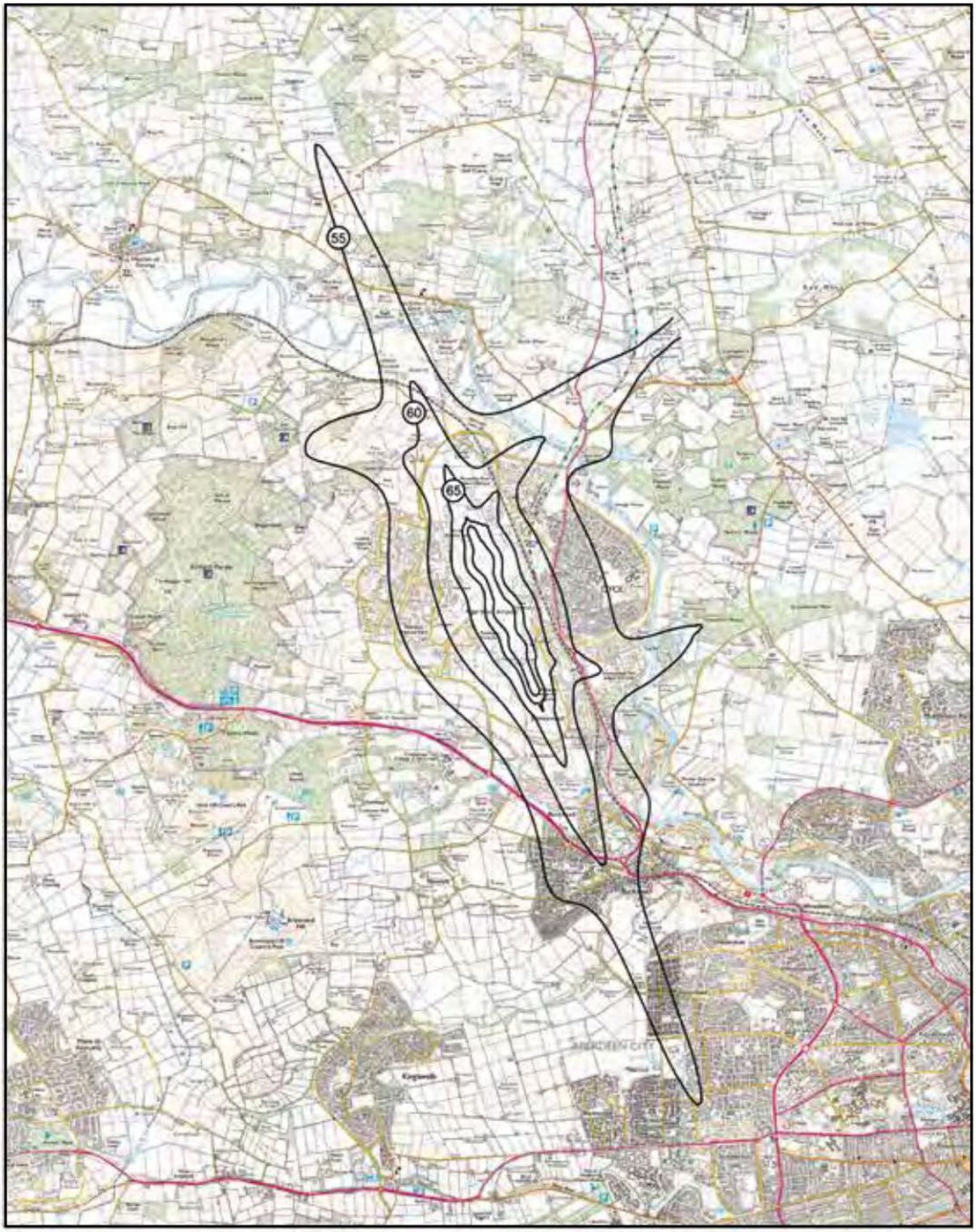


Figure 9 Aberdeen Impacted Audiences

Appendix A L_{Aeq} Contours



ABERDEEN INTERNATIONAL AIRPORT
2016 Annual Day $L_{Aeq,16hr}$ 55-75 dB(A) Noise Contours (Fixed-Wing + Helicopters)
Actual Modal Splits: Fixed-Wing 52% S / 48% N, Helicopters 64% S / 36% N

Appendix B Technical Appendix

Published on the CAA's Airspace Change Portal