Edinburgh Airport Airspace Change Programme 2023

Stage 2 Develop and Assess

Initial Options Appraisal Updated

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Edinburgh Airport: Airspace Change Programme
Stage 2: Develop and Assess
ACP-2019-32

Initial Options Appraisal Updated Feb 23

Initial Options Appraisal

Edinburgh Airport began their Airspace Change Proposal (ACP) in June 2019 and passed through Stage 1 of CAP1616 in July 2020. At this time, the project was paused due to the COVID-19 pandemic while the UK aviation industry and wider UK managed the pandemic, and its recovery from it. In May 2020 the project was remobilised, allowing Edinburgh Airport to recommence the ACP with work on Stage 2A Options Development commencing in August 2020. Initial airspace design options were shared with stakeholders from November 2020 and then through continual engagement.

This Initial Options Appraisal (IOA) forms part of Edinburgh Airports Stage 2 submission to the CAA and covers the following.

- Sets out the options that have progressed from Stage 2A;
- Describes the methodology used to assess each option;
- The outcomes of the IOA

The initial options appraisal provides a qualitative assessment of the potential impacts of aircraft operations within the departure and approach swathes for the 06 and 24 runways. At this stage, the swathes are broad to encompass a range of potential flight path options, including the existing baseline flight paths. The appraisal is based on a qualitative assessment of the relative benefits and disbenefits of potential flight path options within each swathe based on nominal tracks along the inner and outer edges of each swathe plus a central track. Detailed quantitative analysis and comparisons of the preferred SID options against the existing and RNAV-overlaid baselines will be provided in Stage 3, once the SIDs have been defined.

Each swathe has been overlaid on a population density map with a radius of 15 miles from the runway centre point. The swathe mapping extends to a nominal altitude of 10,000ft in indicative altitude bands of 0 – 4,000ft, 4,000 – 7,000ft and 7,000 – 10,000ft. The altitudes are based on the slowest climbing aircraft type likely to use Edinburgh Airport and therefore represent a conservative, worst-case, altitude at any given point on the ground. It is expected that the vertical climb profile of the majority of aircraft using Edinburgh Airport will out-perform the current slowest climbing aircraft and they will therefore track above the altitudes displayed in the swathes, resulting in an improvement to those impacts identified for the worst-case, conservative approach adopted for this appraisal.

CAP1616 requires consideration of noise impacts up to an altitude of 7,000ft, at which point aircraft will be transferred to NERL's en-route system and are no longer the responsibility of Edinburgh Airport. It should be noted that the swathe mapping displays an upper altitude band between 7,000ft and 10,000ft because there are no current fixed end points, and aircraft may be routed through any part of this upper altitude band. However, the initial options appraisal (other than the indicative track miles measurement for greenhouse gas and fuel burn assessment) is based only on consideration of the swathe up to an altitude of 7,000ft. Topic-specific considerations are detailed below.

The Statement of Need at the ACP's outset is always a consideration as well as applying design principles and the results of the Design Principle Evaluation in Stage 2A. This is the process we have followed to be where we are with analysis of baselines and swathes to take forward informed knowledge in order

to work towards a finalised design. The Statement of Need is referred to at each Stage and is always a consideration. Our three drivers are modernisation, capacity and minimising the environmental effect of our new flight paths. Each of our options in this appraisal will be designed with precision based navigation and will therefore comply with the needs of modern aircraft, keep the flight paths consistent and they will also accord with the CAA's airspace modernisation strategy and any current or future plans associated with it. Capacity will be increased with our reduction in departure intervals but we also have included some early turns for SIDs which will aid this goal if we cannot achieve the time interval reduction. Environmental concerns are high on the agenda and included in some detail in this the first of three iterations of options appraisals. The design process continues to evolve and Stage 3 will take the results of the appraisal here in refining the way that our flightpaths will be designed and this data provides some very useful information with regard to environmental impacts and the comparisons inside the swathes and between the options.

Human Health

CAA guidance CAP1616 (page 42) states that "*The appraisal must use WebTAG, the Department for Transport's appraisal guidance, for health impacts associated with noise and potentially for other impacts where possible"*. WebTAG is the Department for Transport's suite of guidance on how to assess the expected impacts of transport policy proposals and projects. WebTAG can be used to monetise certain aspects of noise impacts from transport projects, given the correct inputs are available. At Stage 2B, qualitative assessments of noise and air quality impacts are required and, consequently, there are no quantitative noise or air quality data yet available to permit a WebTAG assessment of health impacts to be undertaken at Stage 2B. The quantitative data required to inform the WebTAG assessments will be available at Stage 3. The WebTAG assessment and health appraisal will therefore be incorporated into the Stage 3 Full Options Appraisal.

Noise

The 51 dB LAeq,16hr (daytime noise) and 45 dB LAeq, 8 hr (night-time noise) contours form a key input into WebTAG. Determination of the forecast contours based on the new airspace design options requires noise modelling at a system level. This requires a complete system design of arrivals and departures plus noise modelling with a forecast schedule and fleet mix, which is very detailed and time-consuming work. At this stage in the airspace change process, given the number of arrival and departure options and the subsequent permutations when combining these, it is not proportionate to quantify the LAeq metrics. Full quantitative analysis will be undertaken in the Stage 3 Full Options Appraisal for the shortlisted options based on defined SIDs. These SIDS will incorporate noise preferential routes.

The Stage 2B initial options appraisals detailed below provide a qualitative assessment of communities that may be potentially affected by aircraft using each swathe. The swathes have been overlaid on a population density map with a radius of 15 miles, which has been used to identify key communities located under the swathe in the altitude bands of 0 – 4,000ft and 4,000 – 7,000ft. The total population located beneath each swathe has not been calculated as the eventual flight paths / SIDS will not overfly the whole of each swathe and this metric would therefore provide a significant over-estimate of the population likely to be affected by the new flight paths. RNAV flight paths will provide greater track concentration than the existing flight paths; in

conjunction with each swathe providing an opportunity to design a flight path / SID that will, as far as possible, minimise the overflown population, we anticipate a reduction in the overall impacts from the existing flight paths. These flight paths will be designed and assessed in Stage 3.

Air Quality

CAP1616 states that '*Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet (amsl) are unlikely to have a significant impact on local air quality. Therefore, the impact of airspace design on local air quality is generally negligible compared with other factors such as changes in the volume of air traffic, and local transport infrastructures feeding the airport*.'

The initial options appraisal provides an estimate of the number of properties located under the footprint of the swathe below an aircraft altitude of 1,000ft. This has been generated by overlaying a 1,000ft buffer against the swathe and calculating the number of properties within the buffer using the Ordnance Survey Address Base dataset. As an indicative aircraft increases in altitude, the 1,000ft buffer moves closer to the swathe until, at an aircraft altitude of 1,000ft the buffer and swathe merge. The number of properties located underneath the footprint is provided as a semi-quantitative assessment of the potential impacts of the options on local air quality. Quantitative assessment of local air quality, including modelling, will be undertaken in Stage 3.

Greenhouse Gas Impacts

Nominal flight path track lengths for the inner and outer edges of each swathe option have been estimated from GIS map measurements. A central flight path track length has been taken as the mid-point distance between the inner and outer track lengths. Based on professional judgement, it has been assumed that track length is a reasonable proxy for greenhouse gas emissions and that, assuming all other factors remain constant, a shorter track length will result in a lower volume of greenhouse gas emissions than a relatively longer track length.

At this stage of the project, it is not possible to take into consideration potential factors that may influence the relationship between track miles and greenhouse gas emissions, including the vertical flight profile and the aircraft type. These factors will be better defined in Stage 3, when a quantitative assessment will be developed based on the preferred flight path options, vertical flight profiles and aircraft fleet mix.

The Stage 2B appraisal therefore provides a comparative evaluation of the inner, central and outer flight path track miles including the percentage increase in track miles for the central and outer flight track compared to the inner flight track.

Tranquillity

CAA guidance CAP1616 (page 172) states that "*For the purposes of airspace change proposals, the impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONB) and National Parks unless other areas for consideration are identified through community engagement*".

There are no AONBs or National Parks that are likely to be affected by the ACP. However, a baseline tranquillity study has been undertaken to assess relative tranquillity across a study area around Edinburgh Airport. This followed a methodology that draws on established approaches to tranquillity mapping. Areas with no negative intrusion were identified, and these represent the areas with highest tranquillity within the study area. Full details are provided in the Tranquillity Assessment Baseline Report (September 2019).

The mapping indicates that tranquillity is a relatively limited resource across the study area, with a high level of influence of 'visual intrusion' indicators. This can be attributed to the dense pattern of settlement and transport links that characterise much of the study area.

The principal area of higher tranquillity is in the south of the study area, including the Pentland Hills and Moorfoot Hills, and the less settled areas surrounding them. An area of higher tranquillity occurs around Cramond and Dalmeny Park, extending across the Firth of Forth, where the effects of onshore intrusion are reduced. Smaller but significant concentrations of relative tranquillity are associated with other less settled areas, including the Bathgate Hills in West Lothian, and the inner Firth of Forth between Limekilns and Blackness.

Fuel Burn

The assessment of fuel burn has been based on the method used to assess relative greenhouse gas impacts for nominal inner, central and outer flight tracks within each swathe. This has been based on an assumption that track length is a reasonable proxy for fuel use and is subject to the same limitations regarding the potential influence of vertical flight profiles and aircraft types. These factors will be better defined in Stage 3, when a quantitative assessment will be developed.

The Stage 2B appraisal therefore provides a comparative evaluation of the inner, central and outer track miles including the percentage increase in track miles for the central and outer track compared to the inner track.

Biodiversity

CAP1616 states '*In general, airspace change proposals are unlikely to have an impact upon biodiversity because they do not involve ground-based infrastructure. As such they are unlikely to have a direct impact that would engage the Birds or Habitats legislation.*'

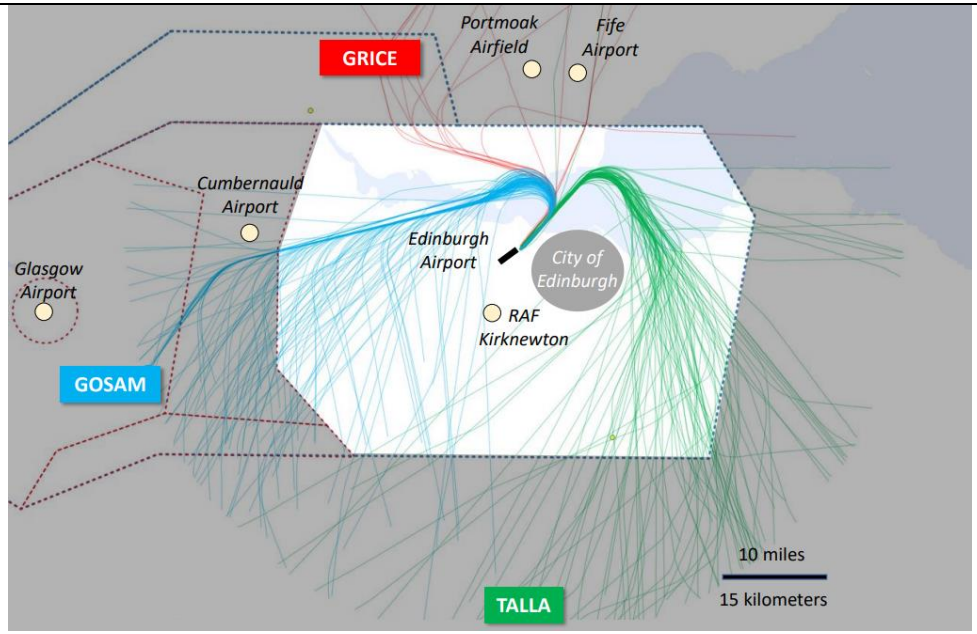
The biodiversity assessment prepared in 2019 for Stage 1B of the airspace change programme reviewed the potential biodiversity impacts within a search area up to an altitude of 7,000ft (taken to be a nominal radius of 15 miles). The assessment concluded that were no Likely Significant Effects on Habitats sites (Special Areas of Conservation, Special Protected Areas and Ramsar sites) in the search area compared to the baseline.

The potential impact of the swathes on biodiversity has therefore been scoped out of the Stage 2B initial options appraisal and subsequent assessment stages of the project.

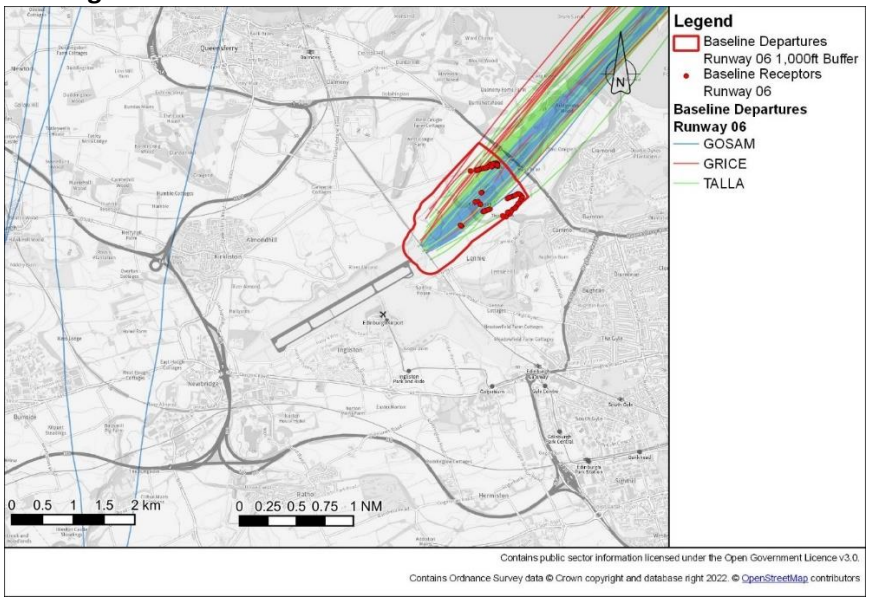
RUNWAY 06 BASELINE MODERNISED

Option No 2 – Runway 06 Baseline Modernised

THIS OPTION ADDED 06/02/23

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	 This option represents the current arrangement of departures from Rwy 06, with modernisation using RNAV navigation. The departures from Rwy 06 route to the north of Cramond and then split over the Firth of Forth. TALLA routes towards Kinghorn before turning to the south. While not necessarily overflown, Kinghorn experiences aircraft noise due to the aircraft turning in proximity despite the aircraft remaining over the water. GRICE and GOSAM take the same flight path before splitting adjacent to the South Fife coast. The community at Cramond is affected by

		aircraft below 2000ft while the communities of Dalgety Bay, Inverkeithing and North Queensferry are overflown at or around an altitude of 4000ft. Flight paths are flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. **NPR** As the SIDs will be modernised, rather than changed, there will be no requirement to adjust the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The existing SIDS do not offer respite. **Tranquillity** All SIDs pass over relatively tranquil areas of Cramond, Dalmeny Park and the Firth of Forth including islands in the Forth. Tranquil areas around Aberdour and Fordell are also overflown.

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>Communities</td><td>Air Quality</td><td>Overflight
 

The indicative footprint of the current departures from Rwy 06 up to 1,000ft is shown above.

Receptors
The number of residential properties located under the current 100ft footprint of departures from Rwy 06 is 79.

Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic and changes to ground operations including potential reductions in hold times.</td></tr>
<tr><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>The following table provides an indicative track length for each existing SID.

<table>
<tr><th>SID</th><th>Indicative Track Length (km)</th></tr>
<tr><td>TALLA 06</td><td>40</td></tr>
<tr><td>GOSAM 06</td><td>36</td></tr>
<tr><td>GRICE 06</td><td>36</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td>Actual tracks lengths can vary according to variables such as other air traffic, weather conditions and vectoring.</td></tr>
<tr><td>Wider Society</td><td>Capacity / Resilience</td><td>The existing SIDs do not deliver increased capacity.
Resilience is increased with systemised SIDs but RNAV substitution does not give increased capacity or resilience.</td></tr>
<tr><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected.
Once flight paths are designed we will give CAS back if able.</td></tr>
<tr><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA.
No reduction in track miles and no increased capacity will hamper airline growth, therefore the impact is negative. Delays on the ground would continue to be due to airspace issues in addition to ground and/or terminal constraints.</td></tr>
<tr><td>General Aviation / Commercial airlines</td><td>Fuel burn</td><td>The following table provides an indicative track length for each existing SID.
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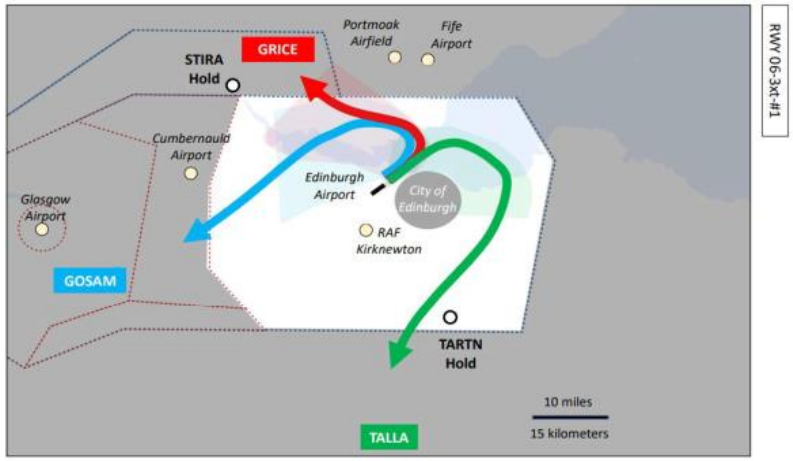
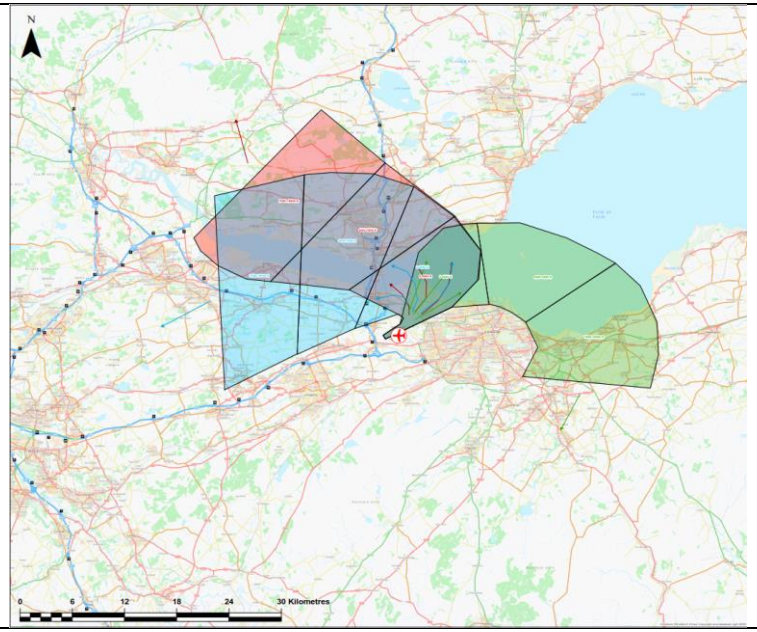
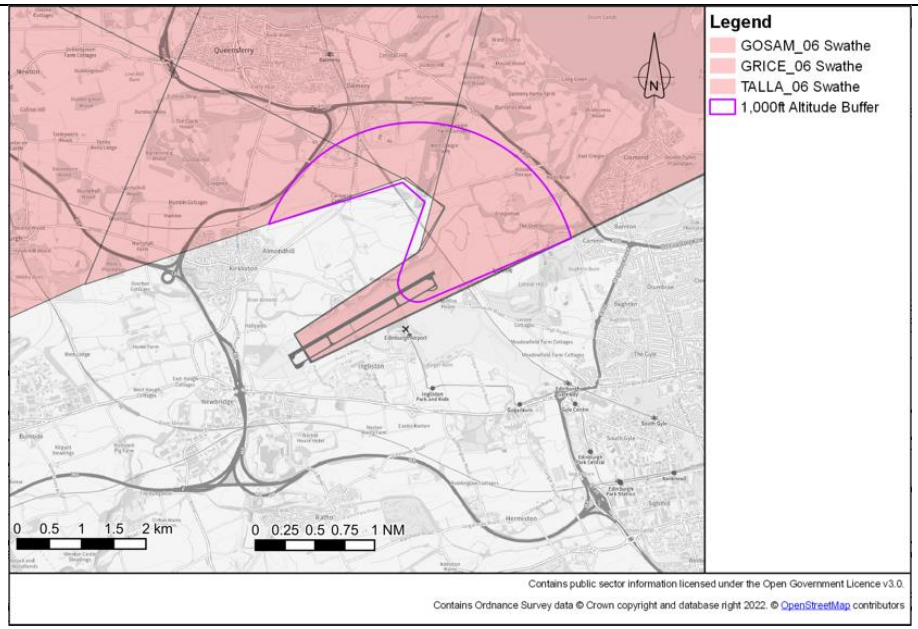
<tr><td>GRICE 06</td><td>36</td></tr>
</table>
Actual tracks lengths can vary according to variables such as other air traffic, weather conditions and vectoring.</td></tr>
<tr><td>Commercial airlines</td><td>Training costs</td><td>Negligible (Cat A airport with normal flight preparation – possible safety promotion material).</td></tr>
<tr><td>Commercial airlines</td><td>Other costs</td><td>Negligible (AIRAC cycle with FMS update). RNAV substitution only.</td></tr>
<tr><td>Airport / Air navigation service provider</td><td>Infrastructure costs</td><td>Negligible – done in house as part of an update / upgrade.
Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.</td></tr>
<tr><td>Airport / Air navigation service provider</td><td>Operational costs</td><td>There will be additional training costs before implementation and simulator time in addition to current training but these will be just familiarisation runs with no new design.</td></tr>
<tr><td>Airport / Air navigation service provider</td><td>Deployment costs</td><td>Cost of creating documentation, safety case and safety promotional material due to RNAV substitution.</td></tr>
</table>

RUNWAY 06 3 EXIT OPTIONS (departures)

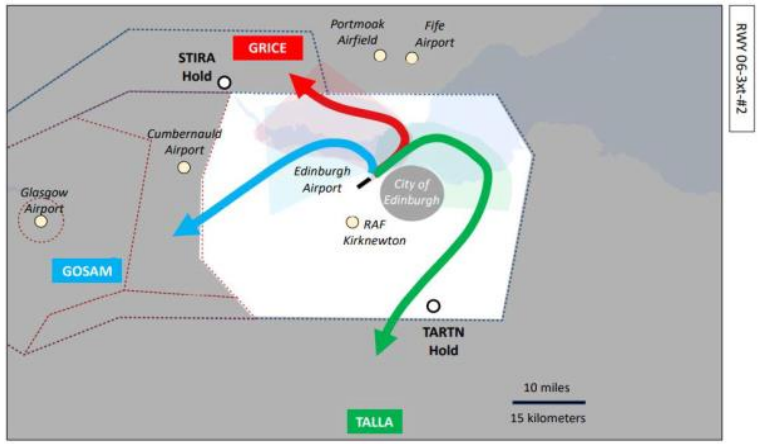
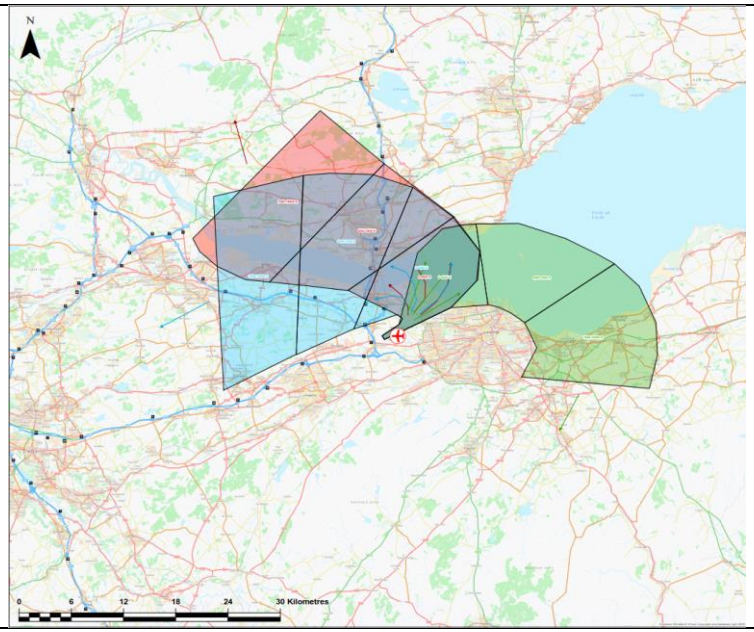
Option No 3 - Rwy 06 3xt #1 This option differs from Option No 4 by having a later left turn to GOSAM.		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The option supports a continuous climb profile to minimise noise impacts to overflown communities. All straight-ahead tracks of the swathes will directly overfly Cramond at an altitude of less than 2,000ft, where there is a primary school, healthcare facility and two public open space/nature reserves and the popular Cramond coastal path. Retention of the Cramond Offset would avoid direct overflight of the village. The outer edges of TALLA may skirt Burntisland and the densly population community of Granton below 4,000ft.

		The inside tracks of GOSAM and GRICE would newly overfly communities at Dalmeny, Kirkliston and South Queensferry, plus the already overflown communities of Dalgety Bay and Inverkeithing at an altitude below 4,000ft. Between 4,000 - 7,000ft GOSAM and GRICE may overfly the communities of Rosyth, Dunfermline, Crossgates, Cowdenbeath and communities west of Dunfermline such as Crossford, Cairneyhill and Limekilns, while TALLA may overfly Kinghorn, Leith and Portobello. The combined swathes provide opportunities to design flight paths that will provide track concentration and may minimise the frequency of overflights of communities in the City of Edinburgh, southern Fife and West Lothian. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** All swathes pass over Cramond and Dalmeny Park, which includes the relatively tranquil areas around Dalmeny Park and across the Firth of Forth islands. Aircraft currently overfly this area and use of these swathes is not anticipated to result in a change in tranquillity. There is potential for GOSAM and GRICE to pass over areas of tranquillity which are not currently overflown, namely the West Fife Hills, though aircraft would be approaching 7,000ft by this point.

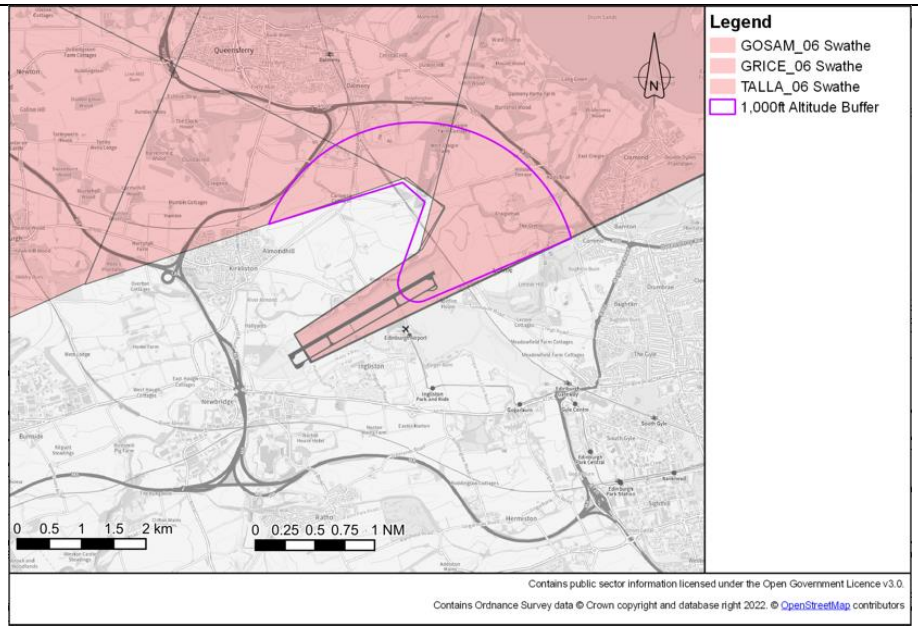
Communities	**Air Quality**	 The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 115. The GOSAM later left turn for Option 3 is more likely to minimise the number of properties overflown below 1000 feet compared to the GOSAM early left turn required for Option 4. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track length of each SID will range from 25km to 30 km and will, all other factors remaining constant, generate the least greenhouse gas emissions. The central tracks will generate approximately 20-56% higher emissions than the inner tracks. The outer tracks will generate approximately 37-108% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction.

General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath EAST.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track length of each SIDS will range from 25km to 30 km and will, all other factors remaining constant, result in the lowest fuel burn. The central tracks will generate approximately 20-56% higher fuel burn than the inner tracks. The outer tracks will generate approximately 37-108% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

Option No 4 - Rwy 06 3xt #2 This option differs from Option No 3 by having an earlier left turn to GOSAM.		

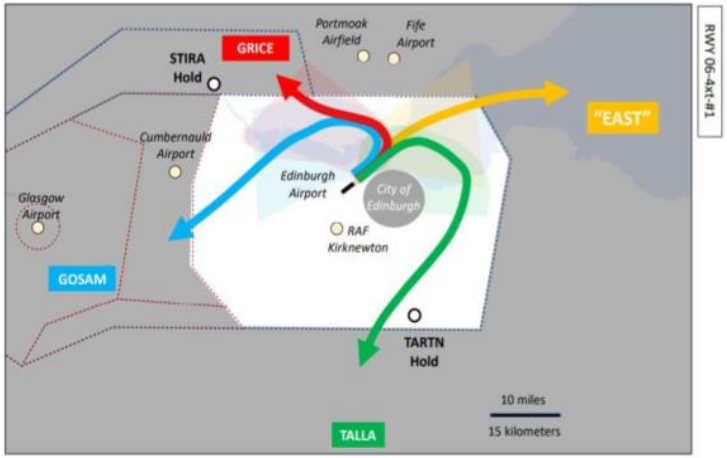
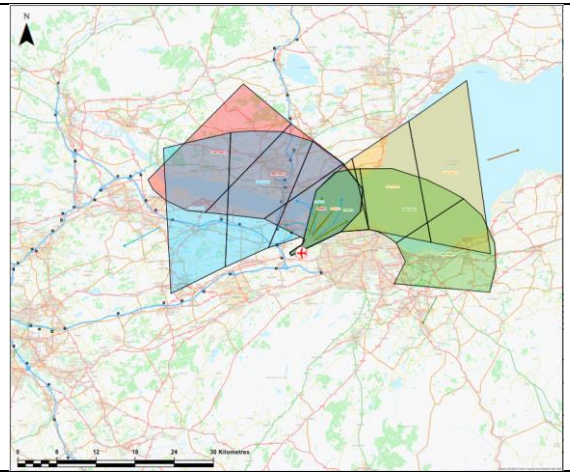
Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The option supports a continuous climb profile to minimise noise impacts to overflown communities. All straight-ahead tracks of the swathes will directly overfly Cramond at an altitude of less than 2,000ft, where there is a primary school, healthcare facility and two public open space/nature reserves and the popular Cramond coastal path. Retention of the Cramond Offset would avoid direct overflight of the village. The outer edges of TALLA may skirt Burntisland and the densly population community of Granton below 4,000ft. The inside tracks of GOSAM and GRICE would newly overfly communities at Dalmeny, Kirkliston and South Queensferry, plus the already overflown communities of Dalgety Bay and

		Inverkeithing at an altitude below 4,000ft. The early turn for GOSAM included in this option is likely to follow the inner track for this swathe. Between 4,000 - 7,000ft GOSAM and GRICE may overfly the communities of Rosyth, Dunfermline, Crossgates, Cowdenbeath and communities west of Dunfermline such as Crossford, Cairneyhill and Limekilns, while TALLA may overfly Kinghorn, Leith and Portobello. The combined swathes provide opportunities to design flight paths that will provide track concentration and may minimise the frequency of overflights of communities in the City of Edinburgh, southern Fife and West Lothian. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** All swathes pass over Cramond and Dalmeny Park, which includes the relatively tranquil areas around Dalmeny Park and across the Firth of Forth islands. Aircraft currently overfly this area and use of these swathes is not anticipated to result in a change in tranquillity. There is potential for GRICE to pass over areas of tranquillity which are not currently overflown. The early turn for GOSAM included in this option could avoid overflying the West Fife Hills (currently not overflown), but would overfly relatively tranquil areas in the Bathgate Hills.

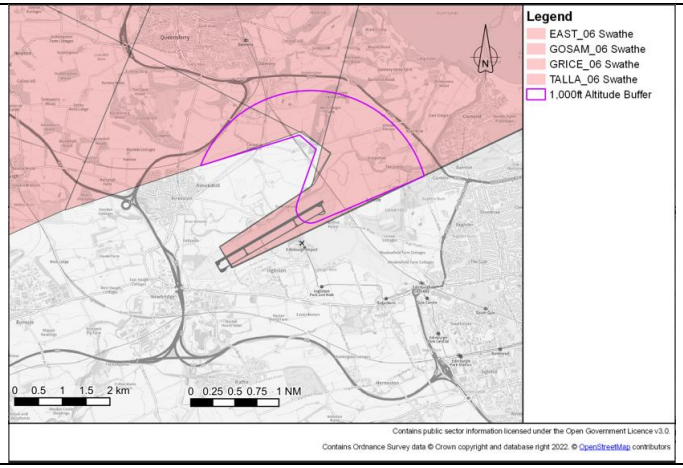
Communities	**Air Quality**	 The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 115. The GOSAM early left turn for Option 4 is more likely to increase the number of properties overflown below 1000 feet compared to the GOSAM later left turn required for Option 3. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track length of each SID will range from 25km to 30 km and will, all other factors remaining constant, generate the least greenhouse gas emissions. The early turn to GOSAM included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 20-56% higher emissions than the inner tracks. The outer tracks will generate approximately 37-108% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction.

General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath EAST.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track length of each SID will range from 25km to 30 km and will, all other factors remaining constant, result in the lowest fuel burn. The early turn for GOSAM included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 20-56% higher fuel burn than the inner tracks. The outer tracks will generate approximately 37-108% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

RUNWAY 06 4 EXIT OPTIONS (departures)

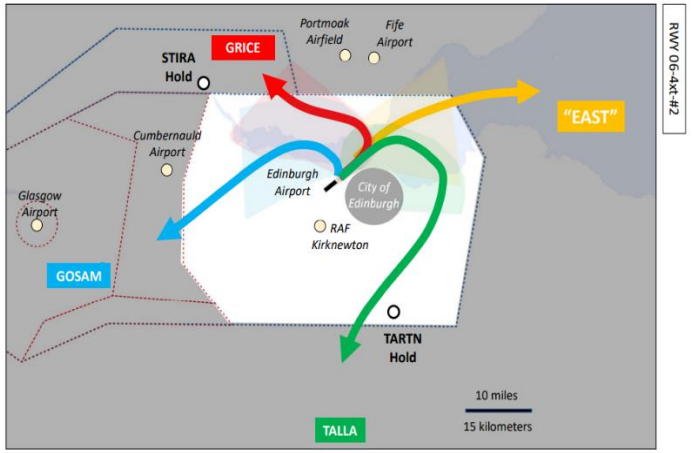
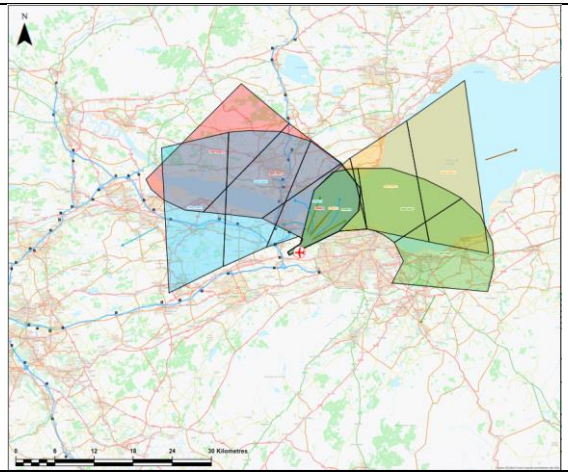
Option No 8 - Rwy 06 4xt #1 This option differs from Option No 9 by having a later left turn to GOSAM.		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The option supports a continuous climb profile to minimise noise impacts to overflown communities. All straight-ahead tracks of the swathes will directly overfly Cramond at an altitude of less than 2,000ft, where there is a primary school, healthcare facility and two public open space/nature reserves and the popular Cramond coastal path. Retention of the Cramond Offset would avoid direct overflight of the village. The outer edges of TALLA and EAST may skirt Burntisland and the densly population community of Granton below 4,000ft. The inside tracks of GOSAM and GRICE would newly overfly communities at Dalmeny, Kirkliston and South Queensferry, plus the already overflown communities of Dalgety Bay and Inverkeithing at an altitude below 4,000ft. Between 4,000 - 7,000ft GOSAM and GRICE may overfly the communities of Rosyth, Dunfermline, Crossgates, Cowdenbeath and communities west of Dunfermline such as Crossford, Cairneyhill and Limekilns. While TALLA and EAST may both overfly Kinghorn.

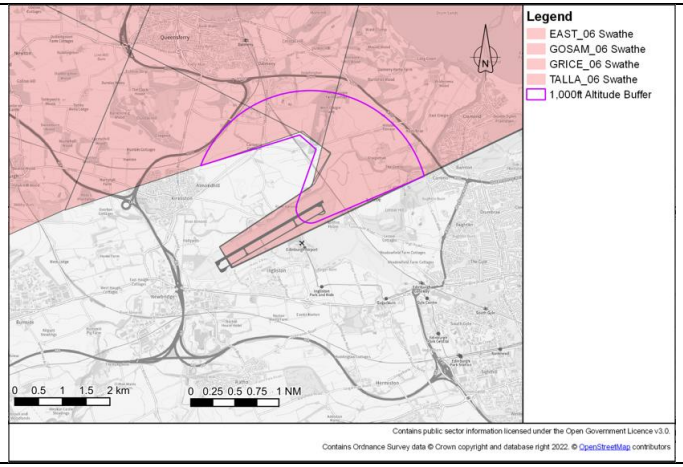
		The combined swathes provide opportunities to design flight paths that will provide track concentration and may minimise the frequency of overflights of communities in the City of Edinburgh, southern Fife and West Lothian. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** All swathes pass over Cramond and Dalmeny Park, which includes the relatively tranquil areas around Dalmeny Park and across the Firth of Forth islands. Aircraft currently overfly this area and use of these swathes is not anticipated to result in a change in tranquillity. There is potential for GOSAM and GRICE to pass over areas of tranquillity which are not currently overflown, namely the West Fife Hills, though aircraft would be approaching 7,000ft by this point.
Communities	**Air Quality**	

		The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 115. The GOSAM later left turn for Option 8 is more likely to minimise the number of properties overflown below 1000 feet compared to the GOSAM early left turn required for Option 9. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track length of each SID will range from 25km to 32km and will, all other factors remaining constant, generate the least greenhouse gas emissions. The central tracks will generate approximately 13 - 56% higher emissions than the inner tracks. The outer tracks will generate approximately 25 - 108% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction.
General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath EAST.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track length of each SID will range from 25km to 32km and will, all other factors remaining constant, result in the lowest fuel burn. The central tracks will generate approximately 13 - 56% higher fuel burns than the inner tracks. The outer tracks will generate approximately 25 - 108% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.

Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

Option No 9 - Rwy 06 4xt #2 This option differs from Option No 8 by having an earlier left turn to GOSAM.		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The option supports a continuous climb profile to minimise noise impacts to overflown communities. All straight-ahead tracks of the swathes will directly overfly Cramond at an altitude of less than 2,000ft, where there is a primary school, healthcare facility and two public open space/nature reserves and the popular Cramond coastal path. Retention of the Cramond Offset would avoid direct overflight of the village. The outer edges of TALLA and EAST may skirt Burntisland and the densly population community of Granton below 4,000ft. The inside tracks of GOSAM and GRICE would newly overfly communities at Dalmeny, Kirkliston and South Queensferry, plus the already overflown communities of Dalgety Bay and Inverkeithing at an altitude below 4,000ft. The early turn for GOSAM included in this option is likely to follow the inner track for this swathe. Between 4,000 - 7,000ft GOSAM and GRICE may overfly the communities of Rosyth, Dunfermline, Crossgates, Cowdenbeath and communities west of Dunfermline such as Crossford, Cairneyhill and Limekilns, while TALLA and EAST may both overfly Kinghorn.

		The combined swathes provide opportunities to design flight paths that will provide track concentration and may minimise the frequency of overflights of communities in the City of Edinburgh, southern Fife and West Lothian. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** All swathes pass over Cramond and Dalmeny Park, which includes the relatively tranquil areas around Dalmeny Park and across the Firth of Forth islands. Aircraft currently overfly this area and use of these swathes is not anticipated to result in a change in tranquillity. There is potential for GRICE to pass over areas of tranquillity which are not currently overflown. The early turn for GOSAM included in this option could avoid overflying the West Fife Hills (currently not overflown) but would overfly relatively tranquil areas in the Bathgate Hills.
Communities	**Air Quality**	

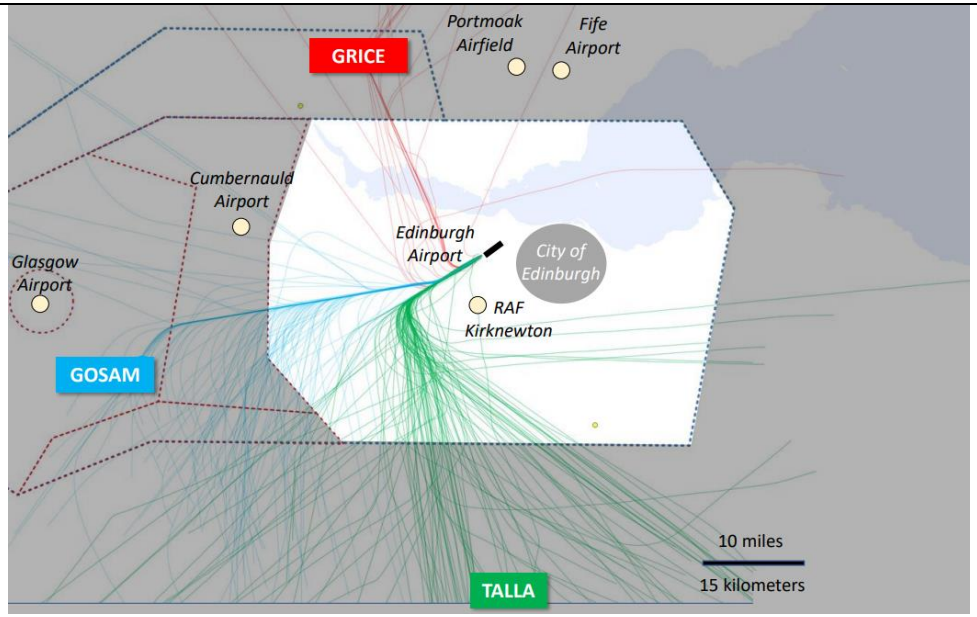
		The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 115. The GOSAM early left turn for Option 9 is more likely to increase the number of properties overflown below 1000 feet compared to the GOSAM later left turn required for Option 8. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track length of each SID will range from 25km to 32km and will, all other factors remaining constant, generate the least greenhouse gas emissions. The early turn for GOSAM included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 13 - 56% higher emissions than the inner tracks. The outer tracks will generate approximately 25 - 108% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction.
General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath EAST.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track length of each SIDS will range from 25km to 32km and will, all other factors remaining constant, result in the lowest fuel burn. The early turn for GOSAM included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 13 - 56% higher fuel burns than the inner tracks. The outer tracks will generate approximately 25 - 108% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.

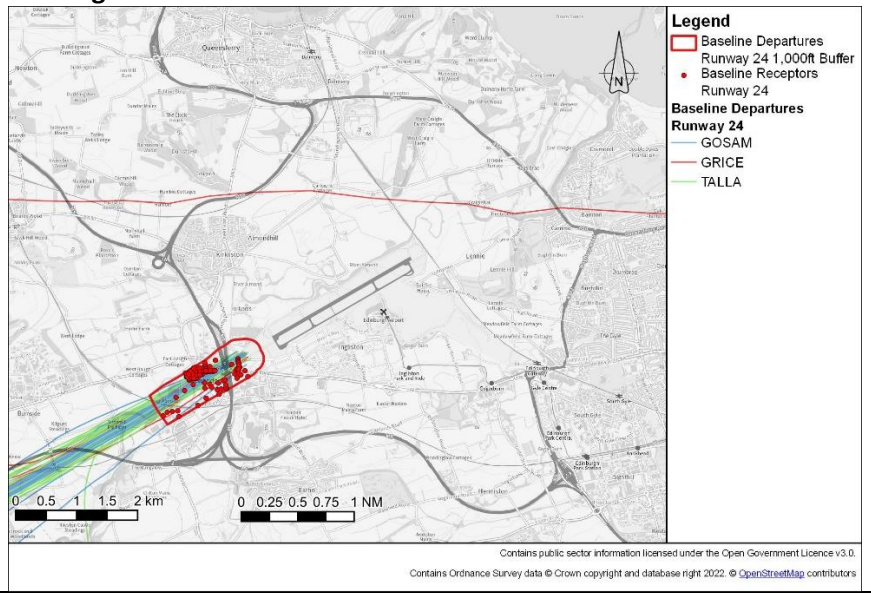
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

RUNWAY 24 BASELINE MODERNISED

Option No 14 – Runway 24 Baseline Modernised

OPTION ADDED 06/02/23

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	 This option represents the current arrangement of departures from Rwy24, with modernisation using RNAV navigation. The departures from Rwy24 route to the west of the airport and then split over the UW beacon; GRICE splits to the North, GOSAM continues to the west and TALLA turns to the south. GOSAM and TALLA overfly Livingston at around 4,500ft, while GRICE overflies Broxburn and Blackness. The UW beacon is approximately 6 miles on the extended centreline so Livingston experiences aircraft noise from both arrivals for Rwy06 and departures from Rwy24. Flight paths are flown at optimum aircraft performance to minimise noise. The routes will accept

		RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. **NPR** As the SIDs will be modernised, rather than changed, there will be no requirement to adjust the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as '*planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time*.' The existing SIDS do not offer respite. **Tranquillity** GOSAM overflies parts of the Bathgate Hills, which are an area of relative tranquillity. GRICE overflies areas of relative tranquillity including the Bathgate Hills and the inner Forth near Blackness and Limekilns. TALLA overflies the south-western hills of the Pentland Hills, which include areas of highest tranquillity.
Communities	**Air Quality**	**Overflight** 

<table>
<tr><td></td><td></td><td>The indicative footprint of the current departures from Rwy 24 up to 1,000ft is shown above.

Receptors
The number of residential properties located under the current 100ft footprint of departures from Rwy 24 is 149.

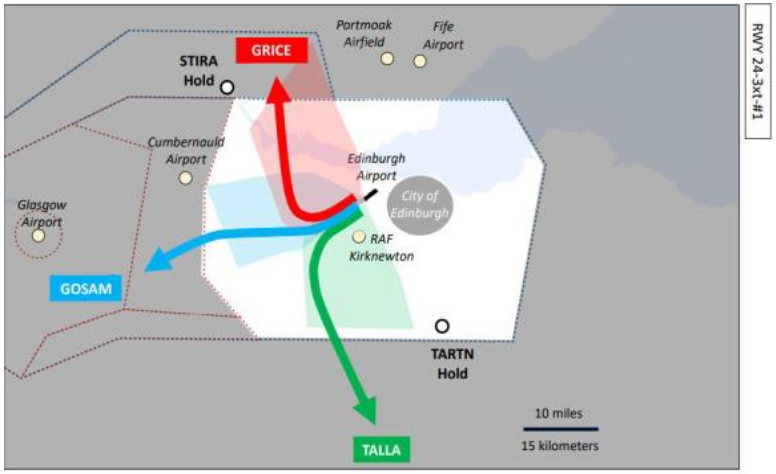
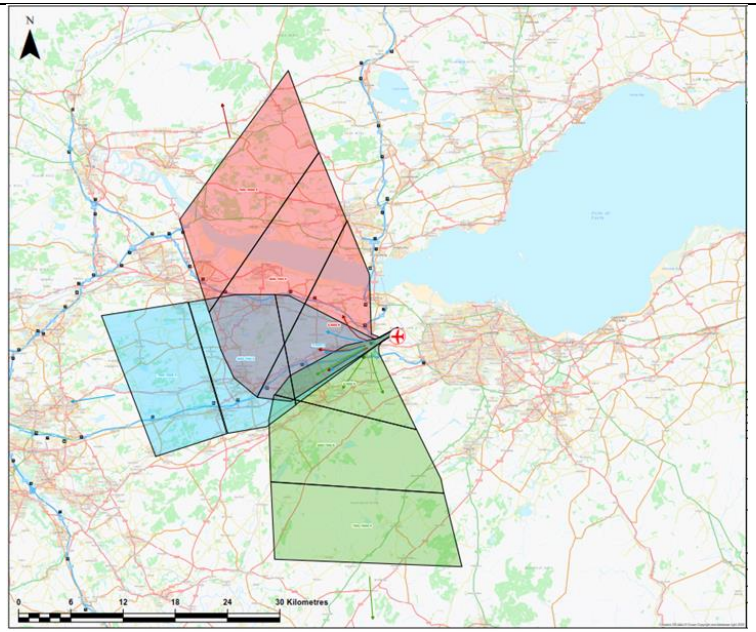
Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic and changes to ground operations including potential reductions in hold times.</td></tr>
<tr><td>Wider Society</td><td>Greenhouse Gas Impact</td><td>The following table provides an indicative track length for each existing SID.

<table><tr><th>SID</th><th>Indicative Track Length (km)</th></tr><tr><td>TALLA 24</td><td>34</td></tr><tr><td>GOSAM 24</td><td>32</td></tr><tr><td>GRICE 24</td><td>46</td></tr></table>
Actual tracks lengths can vary according to variables such as other air traffic, weather conditions and vectoring.</td></tr>
<tr><td>Wider Society</td><td>Capacity / Resilience</td><td>The existing SIDs do not deliver increased capacity.
Resilience is increased with systemised SIDs but RNAV substitution does not give increased capacity or resilience.</td></tr>
<tr><td>General Aviation</td><td>Access</td><td>The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected.
Once flight paths are designed we will give CAS back if able.</td></tr>
<tr><td>General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>There will be no economic impact on GA.
No reduction in track miles and no increased capacity will hamper airline growth, therefore the impact is negative. Delays on the ground would continue to be due to airspace issues in addition to ground and/or terminal constraints.</td></tr>
<tr><td>General Aviation / Commercial airlines</td><td>Fuel burn</td><td>The following table provides an indicative track length for each existing SID.

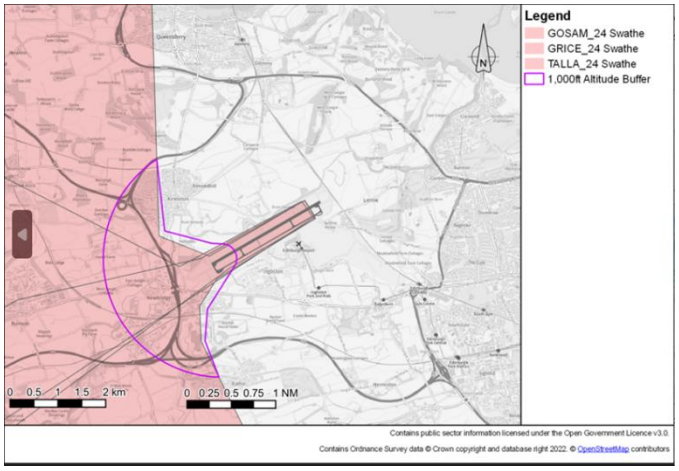
<table><tr><th>SID</th><th>Indicative Track Length (km)</th></tr><tr><td>TALLA 24</td><td>34</td></tr><tr><td>GOSAM 24</td><td>32</td></tr><tr><td>GRICE 24</td><td>46</td></tr></table></td></tr>
</table>

		Actual tracks lengths can vary according to variables such as other air traffic, weather conditions and vectoring.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation – possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update). RNAV substitution only.
Airport / Air navigation service provider	**Infrastructure costs**	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training but these will be just familiarisation runs with no new design.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material due to RNAV substitution.

RUNWAY 24 3 EXIT OPTIONS (departures)

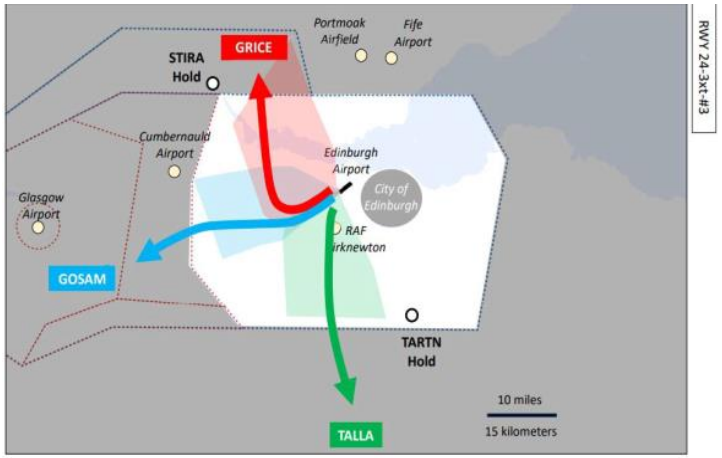
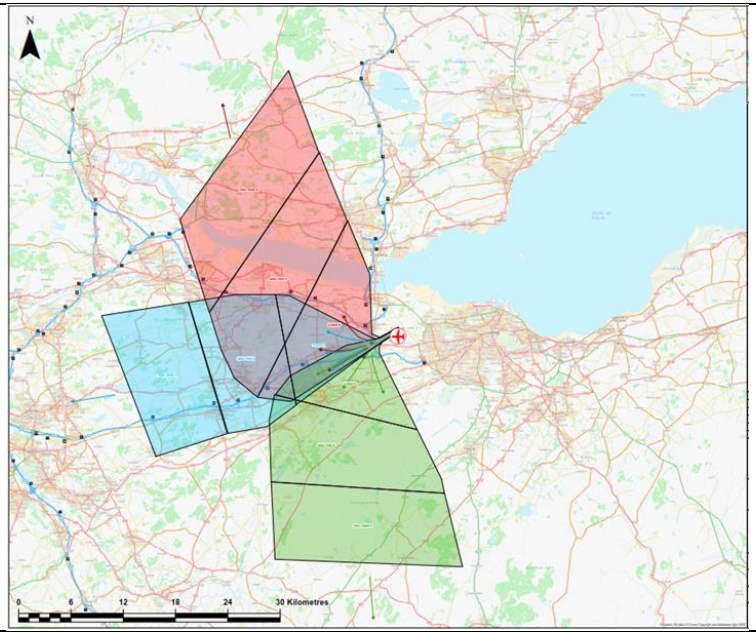
Option No 15 - Rwy 24 3xt #1 This option consists of three exits to TALLA, GOSAM and GRICE. It differs from Option No 17 by having a later left turn to TALLA.		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities. Below 4,000ft the option may overfly; Winchburgh, Broxburn, Uphall, Livingston, the eastern edge of Linlithgow, Newbridge and East Calder. There is the potential for communities at Kirkliston, Winchburgh, South Queensferry, Balerno and Kirknewton to be newly overflown below 4,000ft.

		Between 4,000ft and 7,000ft the communities of Bathgate, Blackburn, Armdale, Whitburn, Linlithgow, Bo'ness, Polbeth, West Calder, Addiewell, Maddiston, and small communities to the west of Dunfermline may be overflown. The option provides the opportunity to design flight paths that provide track concentration and may minimise the frequency of overflights of communities in West Lothian, North Lanarkshire, Falkirk, Fife, South Lanarkshire and the Scottish Borders. **NPR** The changes to SIDs will result in a requirement to adjust the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This option covers areas of relative tranquillity in the Bathgate Hills and within the inner Forth near Blackness and Limekilns, both of which are already overflown to some extent around 4,000ft. The TALLA swathe includes a large section of the Pentland Hills, an area of the highest tranquillity, though the south-western hills are currently overflown.
Communities	**Air Quality**	

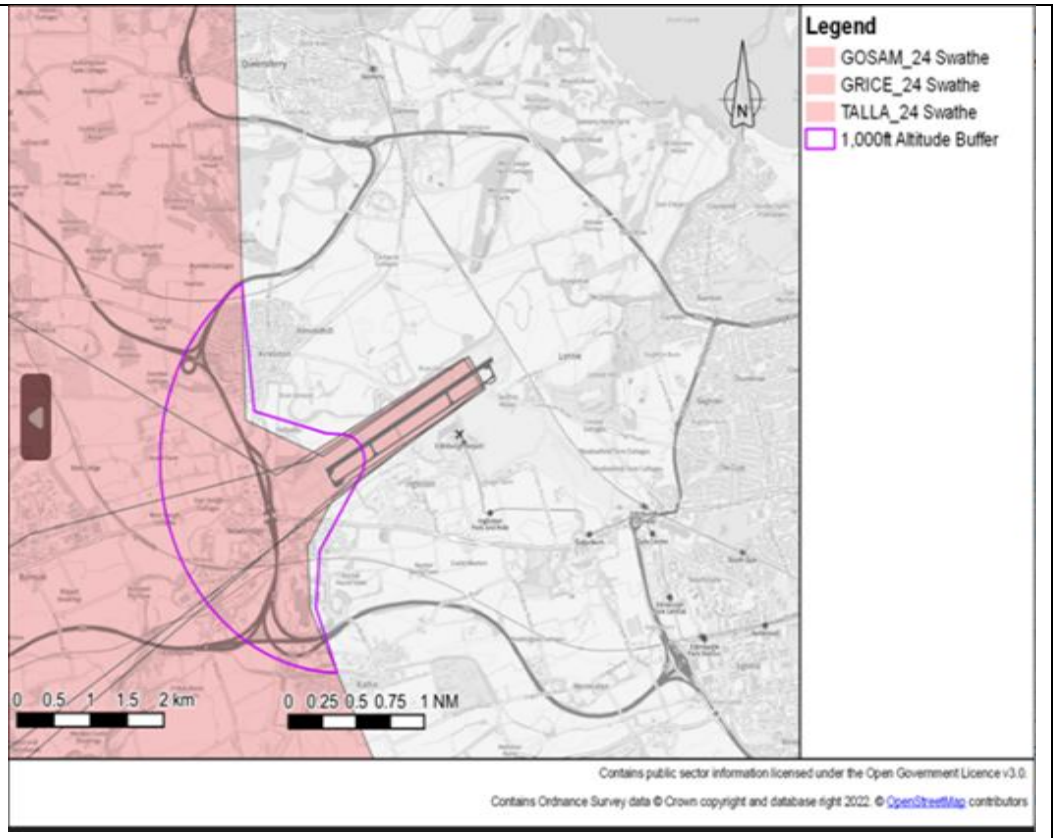
		The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 1,281. The later left turn for TALLA required for Option 15 is likely to reduce the number of properties overflown below 1000 feet compared to Option 17. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track lengths for each SID will range from 31km to 36km, and will, all other factors remaining constant, generate the least greenhouse gas emissions. The central tracks will generate approximately 6-10% higher emissions than the inner tracks. The outer tracks will generate approximately 13-17% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath East.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track lengths for each SID will range from 31km to 36km, and will, all other factors remaining constant, result in the lowest fuel burn. The central tracks will generate approximately 6-10% higher fuel burn than the inner tracks. The outer tracks will generate aproximately 13-17% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.

Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

Option No 17 - Rwy 24 3xt #3 This option differs from No 15 as it has a TALLA early left turn		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities. Below 4,000ft the option may overfly; Winchburgh, Broxburn, Uphall, Livingston, the eastern edge of Linlithgow, Newbridge, and East Calder. There is the potential for communities at Kirkliston, Winchburgh, South Queensferry and Kirknewton to be newly overflown below 4,000ft. The inner track of the TALLA swathe may skirt Balerno at close to 4,000ft; the early to turn to TALLA included in this option is likely to follow this inner track.

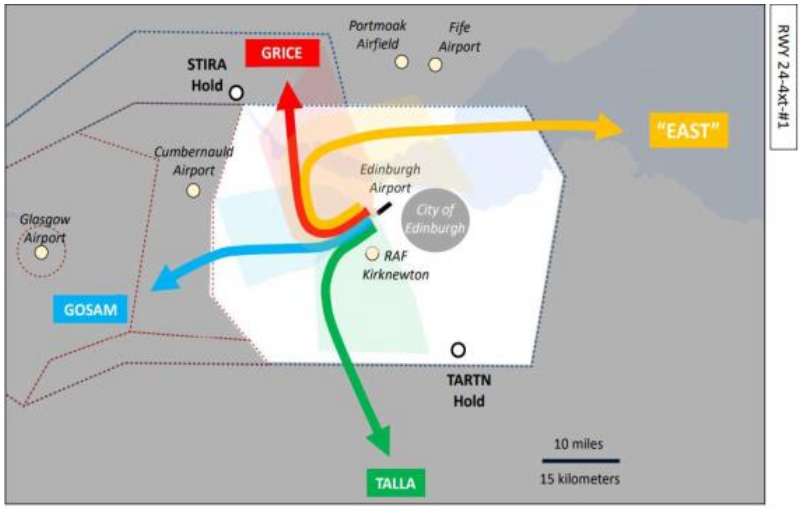
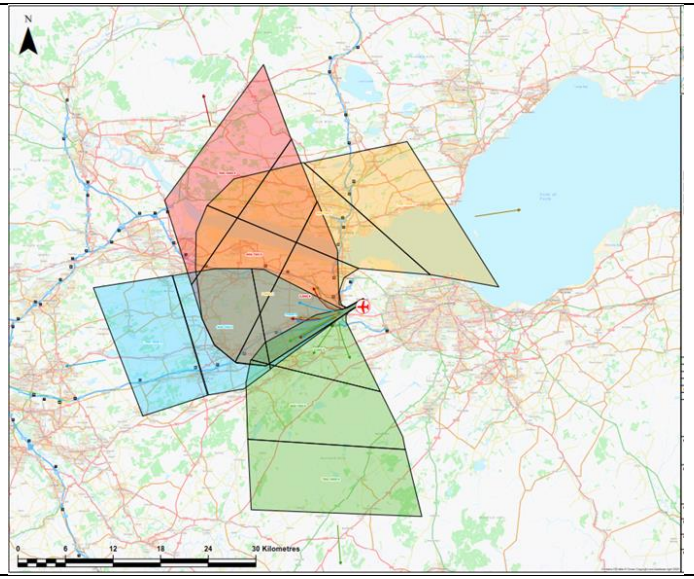
		Between 4,000ft and 7,000ft the communities of Bathgate, Blackburn, Armdale, Whitburn, Linlithgow, Bo'ness, Polbeth, West Calder, Addiewell, Maddiston and small communities to the west of Dunfermline may be overflown. The early turn to TALLA included in this option could result in the communities of Polbeth, West Calder and Addiewell not being overflown, as these are situated along the outer track of the swathe. The option provides the opportunity to design flight paths that provide track concentration and may minimise the frequency of overflights of communities in West Lothian, North Lanarkshire, Falkirk, Fife, South Lanarkshire, and the Scottish Borders. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This option covers areas of relative tranquillity in the Bathgate Hills and within the inner Forth near Blackness and Limekilns, both of which are already overflown to some extent around 4,000ft. The TALLA swathe includes a large section of the Pentland Hills, an area of the highest tranquillity, though the south-western hills are currently overflown. The early turn to TALLA proposed in this option could result in an increase in aircraft over the central Pentlands, which currently has few overflights.

Communities	**Air Quality**	 The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 1,281. The TALLA early left turn required for Option 17 is more likely to increase the number of properties overflown below 1000 feet compared to Option 15. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of

		new receptors and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track lengths of each SID will range from 31km to 36km, and will, all other factors remaining constant, generate the least greenhouse gas emissions. The early turn to TALLA included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 6-10% higher emissions than the inner tracks. The outer tracks will generate approximately 13-17% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath East.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track length of each SID will range from 31km to 36km, and will, all other factors remaining constant, result in the lowest fuel burn. The central tracks will generate approximately 6-10% higher fuel burn than the inner tracks. The outer tracks will generate approximately 13-17% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material)
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update)
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.

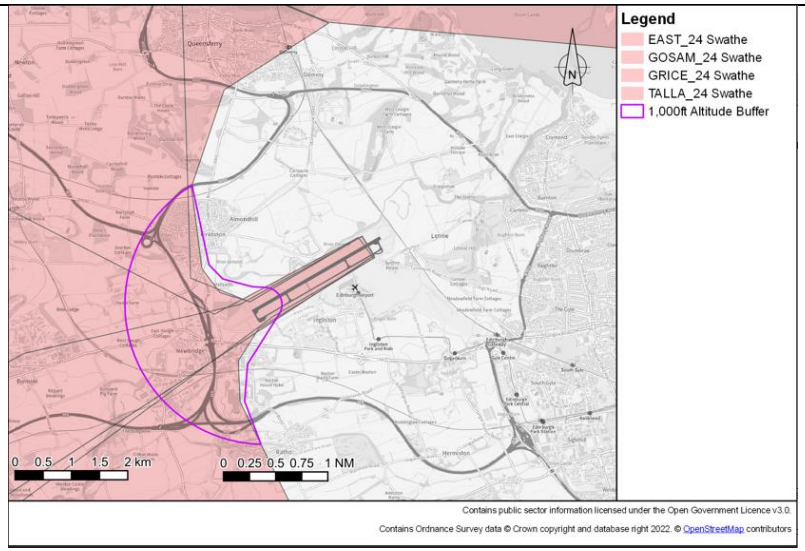
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

RUNWAY 24 4 EXIT OPTIONS (departures)

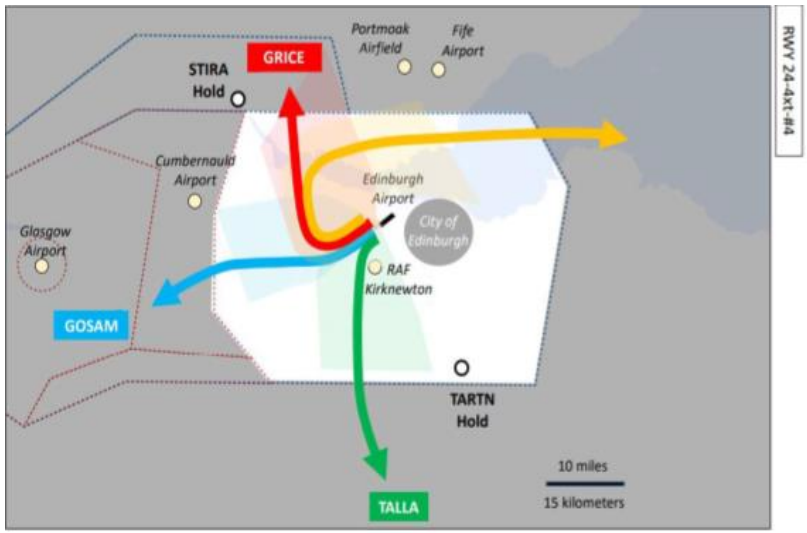
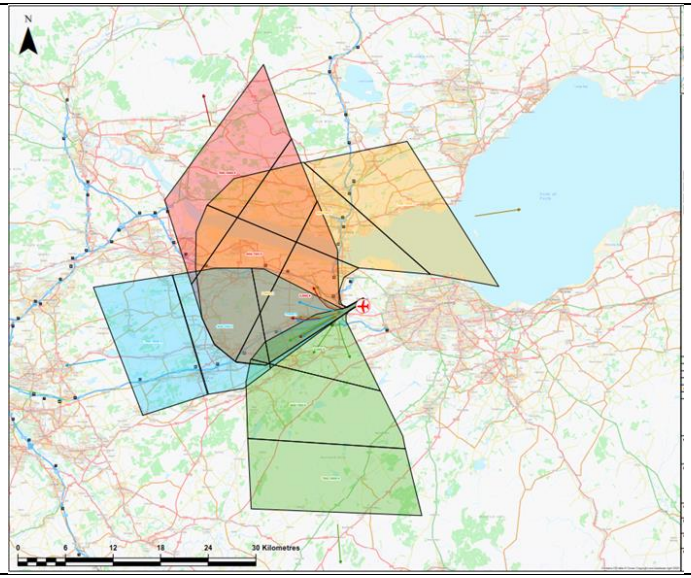
Option No 22 - Rwy 24 4xt #1 This option differs from No 25 as it has a later TALLA left turn.		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities. Below 4,000ft the option may overfly; Winchburgh, Broxburn, Uphall, Livingston, Linlithgow, Newbridge, Bathgate, Bo'ness and East Calder. There is the potential for communities at Kirkliston, Winchburgh, South Queensferry, and Kirknewton to be newly overflown below 4,000ft. Between 4,000ft and 7,000ft the communities of Bathgate, Blackburn, Armdale, Whitburn, Linlithgow, Bo'ness, Polbeth, West Calder, Addiewell, Maddiston, North

		Queensferry, Inverkeithing, Rosyth, Limekilns, Valleyfield, Cairneyhill, Crossford, Oakley, Carnock, Dunfermline and small communities to the west of Dunfermline may be overflown. The option provides the opportunity to design flight paths that provide track concentration and may minimise the frequency of overflights of communities in West Lothian, North Lanarkshire, Falkirk, Fife, South Lanarkshire, the Scottish Borders, and Southern Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This option covers areas of relative tranquillity in the Bathgate Hills and within the inner Forth near Blackness and Limekilns, both of which are already overflown to some extent around 4,000ft. The TALLA swathe includes a large section of the Pentland Hills, an area of the highest tranquillity, though the south-western hills are currently overflown. The outer track of the EAST swathe covers the West Fife Hills, an area of highest tranquillity, though only when approaching 7,000ft.

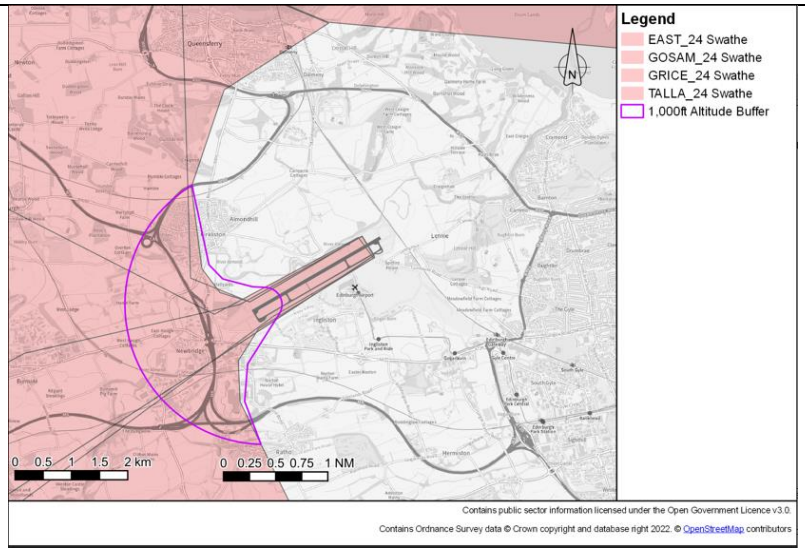
Communities	**Air Quality**	 The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 1,620. The later TALLA left turn required for Option 22 is more likely to reduce the number of properties overflown below 1000 feet compared to the TALLA early left turn required for Option 25. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors in Kirkliston and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track lengths of each SID will range from 31km to 36km, and will, all other factors remaining constant, generate the least greenhouse gas emissions. The central tracks will generate approximately 6-78% higher emissions than the inner tracks. The outer tracks will generate approximately 13-152% higher emissions than the inner tracks.
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction.

General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath East.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track lengths of each SID will range from 31km to 36km, and will, all other factors remaining constant, result in the lowest fuel burn. The central tracks will generate approximately 6-78% higher fuel burn than the inner tracks. The outer tracks will generate approximately 13-152% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

Option No 25 - Rwy 24 4xt #4 This option differs from No 22 as it has a TALLA early left turn.		

Group	Impact	Qualitative Assessment
Communities	**Noise Impact on Health and Quality of Life**	Flight paths will be flown at optimum aircraft performance to minimise noise. The routes will accept RNAV navigation that will concentrate flight paths along a narrower and more precise track compared to the current flight paths, which are typically dispersed. The swathe supports a continuous climb profile to minimise noise impacts to overflown communities. Below 4,000ft the option may overfly; Winchburgh, Broxburn, Uphall, Livingston, Linlithgow, Newbridge, Bathgate, Bo'ness and East Calder. There is the potential for communities at Kirkliston, Winchburgh, South Queensferry and Kirknewton to be newly overflown below 4,000ft. The inner track of the TALLA swathe may skirt Balerno at close to 4,000ft; the early turn to TALLA included in this option is likely to follow this inner track.

		Between 4,000ft and 7,000ft the communities of Bathgate, Blackburn, Armdale, Whitburn, Linlithgow, Bo'ness, Polbeth, West Calder, Addiewell, Maddiston, North Queensferry, Inverkeithing, Rosyth, Limekilns, Valleyfield, Cairneyhill, Crossford, Oakley, Carnock, Dunfermline and small communities to the west of Dunfermline may be overflown. The early turn to TALLA included in this option could result in the communities of Polbeth, West Calder and Addiewell not being overflown, as these are situated along the outer track of the swathe. The option provides the opportunity to design flight paths that provide track concentration and may minimise the frequency of overflights of communities in West Lothian, North Lanarkshire, Falkirk, Fife, South Lanarkshire, the Scottish Borders, and Southern Fife. **NPR** The changes to SIDs will result in a requirement to adjustment the baseline Noise Preferred Routes. **Respite** CAP1616 defines respite as 'planned and notified periods where overflight or noise impact are reduced or halted to allow communities undisturbed time.' The use of SIDS for respite will be explored in Stage 3 and will take into consideration safety, operational feasibility and whether this approach can deliver the desired respite outcomes. **Tranquillity** This option covers areas of relative tranquillity in the Bathgate Hills and within the inner Forth near Blackness and Limekilns, both of which are already overflown to some extent around 4,000ft. The TALLA swathe includes a large section of the Pentland Hills, an area of the highest tranquillity, though the south-western hills are currently overflown. The early turn to TALLA proposed in this option could result in an increase in aircraft over the central Pentlands, which currently has few overflights. The outer track of the EAST swathe covers the West Fife Hills, an area of highest tranquillity, though only when approaching 7,000ft.

Communities	**Air Quality**	 The indicative footprint of departing aircraft up to an altitude of 1000 feet is illustrated above. The number of residential properties located under the indicative footprint is 1,620. The TALLA early left turn required for Option 25 is more likely to increase the number of properties overflown below 1000 feet compared to Option 22 which has a later TALLA left turn. Any effects on local air quality from this option up to an altitude of 1,000ft will primarily be driven by changes in the volume of air traffic, the potential overflight of new receptors in Kirkliston and changes to ground operations including potential reductions in hold times.
Wider Society	**Greenhouse Gas Impact**	The inner track lengths of each SID will range from 31km to 36km, and will, all other factors remaining constant, generate the least greenhouse gas emissions. The early turn to TALLA included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 6-78% higher emissions than the inner tracks. The outer tracks will generate approximately 13-152% higher emissions than the inner tracks.

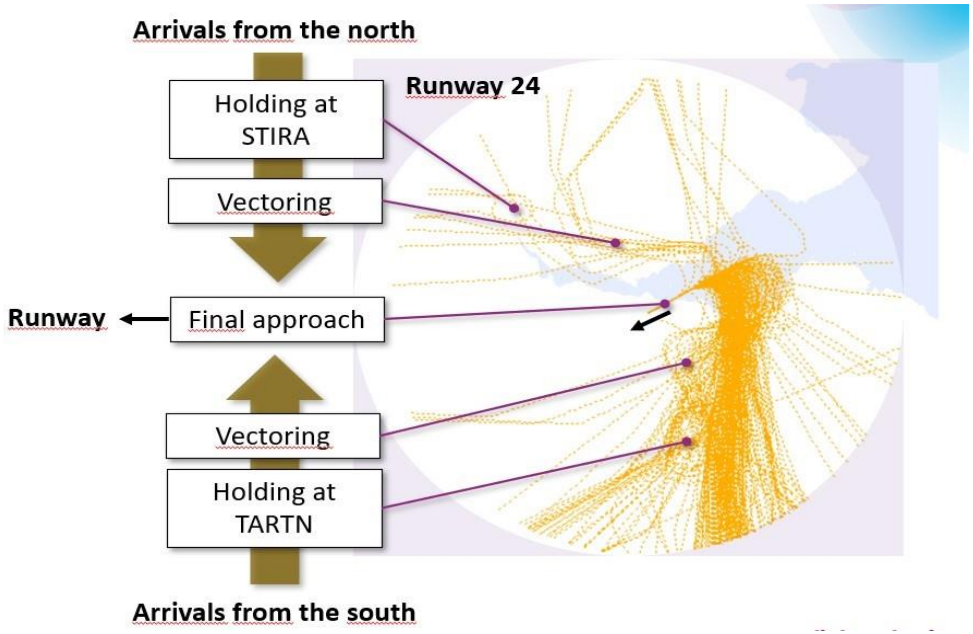
Wider Society	**Capacity / Resilience**	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction.
General Aviation	**Access**	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected. Once flight paths are designed we may give CAS back. VFR traffic pass underneath East.
General Aviation / Commercial airlines	**Economic impact from increased effective capacity**	There will be no economic impact on GA. With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
General Aviation / Commercial airlines	**Fuel burn**	The inner track lengths of each SIDS will range from 31km to 36km, and will, all other factors remaining constant, result in the lowest fuel burn. The early turn to TALLA included in this option is likely to follow the inner track of the swathe. The central tracks will generate approximately 6-78% higher fuel burn than the inner tracks. The outer tracks will generate approximately 13-152% higher fuel burn than the inner tracks.
Commercial airlines	**Training costs**	Negligible (Cat A airport with normal flight preparation - possible safety promotion material).
Commercial airlines	**Other costs**	Negligible (AIRAC cycle with FMS update).
Airport / Air navigation service provider	**Infrastructure costs**	Negligible - done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
Airport / Air navigation service provider	**Operational costs**	There will be additional training costs before implementation and simulator time in addition to current training.
Airport / Air navigation service provider	**Deployment costs**	Cost of creating documentation, safety case and safety promotional material.

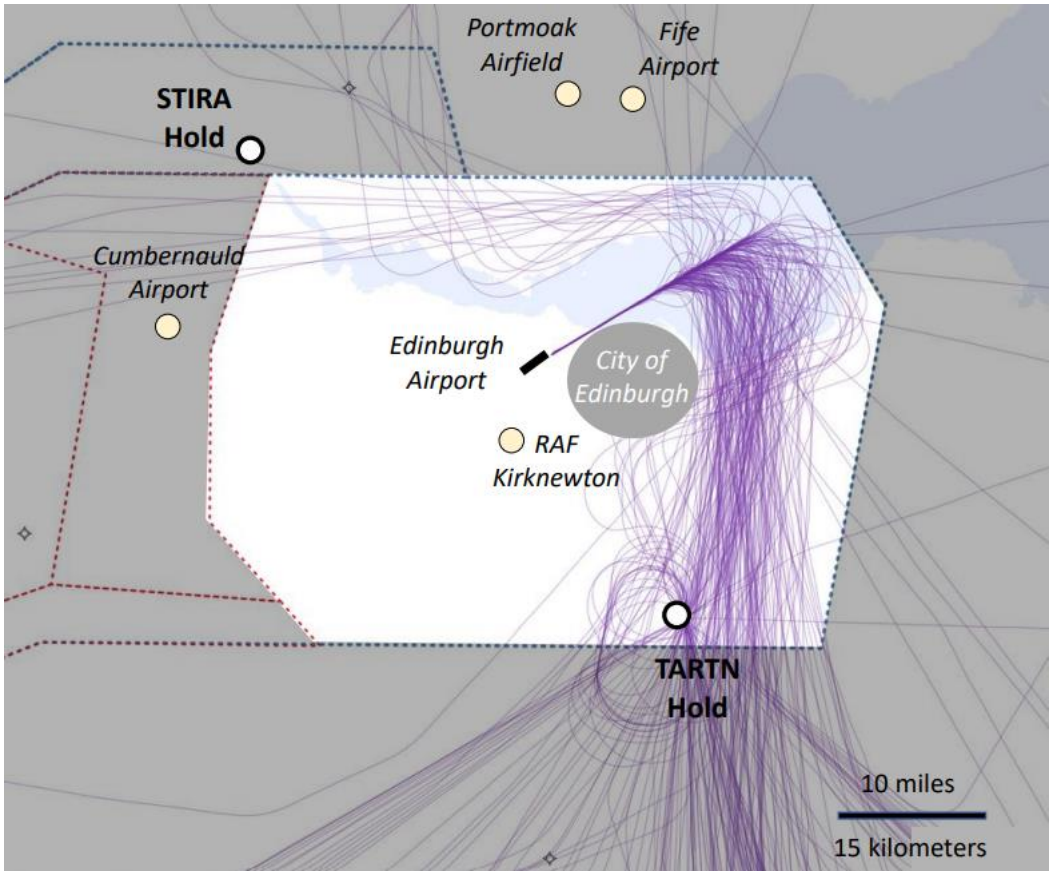
Stage 2B: Initial Options Appraisal - Arrivals

Air Quality

CAP1616 states that '*Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet (amsl) are unlikely to have a significant impact on local air quality. Therefore, the impact of airspace design on local air quality is generally negligible compared with other factors such as changes in the volume of air traffic, and local transport infrastructures feeding the airport*.'

As the final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules, there will be no air quality difference between the various arrival options and so no assessment has been undertaken as part of Stage 2B. Any change in air quality is likely to be primarily because of changes in the volume of air traffic, local transport movements feeding the airport and ground movements, and will be assessed quantitatively at Stage 3.

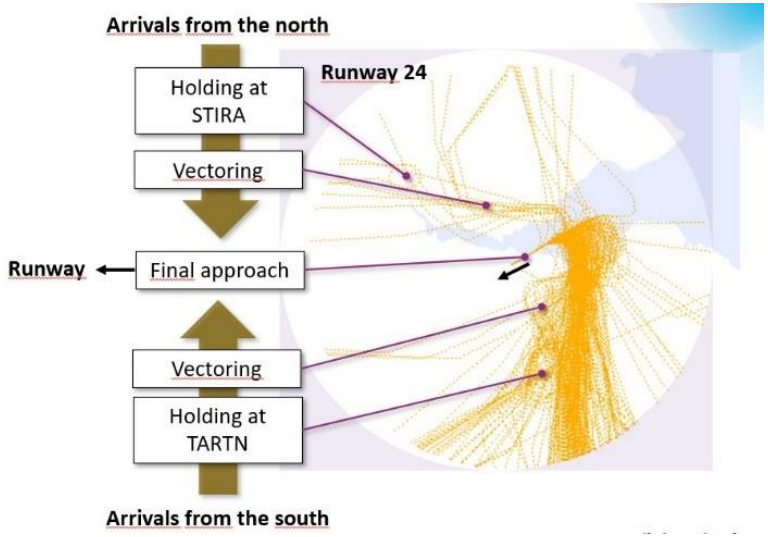
Option	Group	Impact	Qualitative Assessment
24 Baseline	Communities	Noise Impact on Health and Quality of Life	

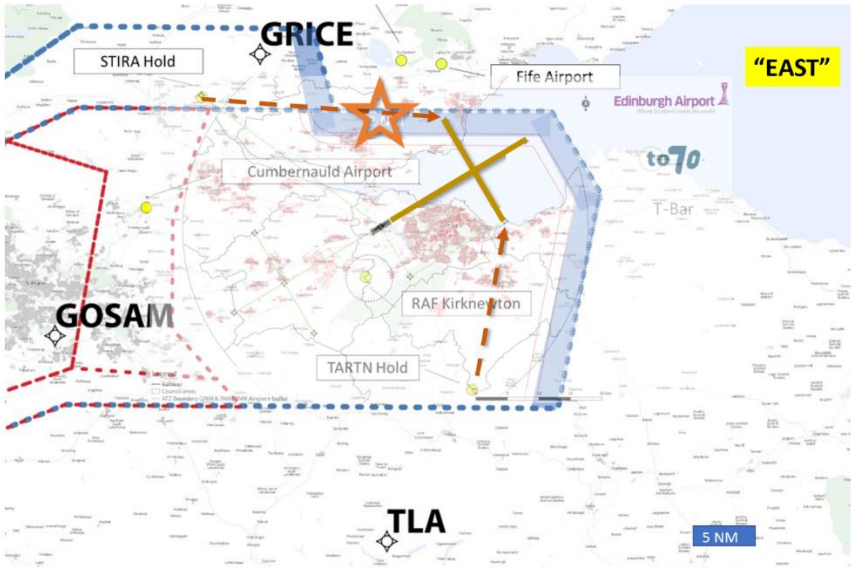
			 *All* descending aircraft, either routed directly from 7,000ft or released from the STIRA (north) or TARTN (south) holds at approximately 8,000ft, are vectored to the final approach and overfly small to large communities and population centres in the Scottish Borders, Midlothian, East Lothian and the City of Edinburgh.

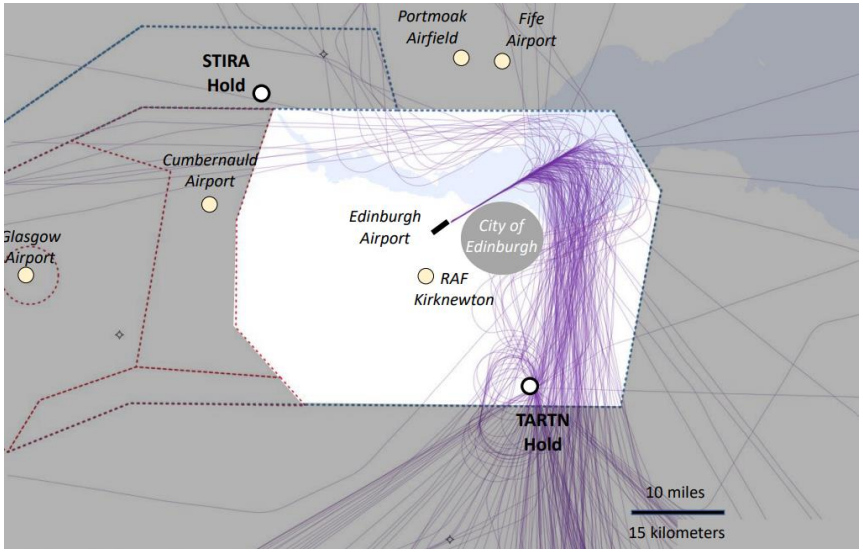
			From the south, aircraft cross the coast between Leith at approximately 3,000ft altitude to Longniddry at approximately 6,000ft altitude. From the north, aircraft are routed across Stirling, Clackmannanshire, Fife and the City of Edinburgh, crossing the Fife coast approximately between Kinghorn and Kirkcaldy at an altitude of around 3,000ft. Aircraft join the final approach at approximately 8 miles distance from the airport, over the Firth of Forth, and all arrivals overfly Cramond at an altitude of less than 1,000ft; this is unavoidable given the orientation of the 24 runway and aircraft operating rules. While the arriving aircraft will be operating at a lower (and hence quieter) engine power than departing aircraft, the concentration of aircraft on the final approach provides no opportunity to minimise impacts to the affected community in Cramond. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft provides a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal results in a wider area and larger population being overflown. **Tranquillity** This option represents the current arrangement. Aircraft from the south descend over the tranquil areas to the south of Edinburgh, including the Pentland Hills and Moorfoot Hills. Vectoring of *all* aircraft reduces the frequency of overflights over any one area. For the most part, aircraft will be above or just below 7,000 ft when crossing these areas, making most of their descent across the built-up area around Edinburgh. Aircraft approaching from the north descend across less tranquil areas of Fife. All runway 24 approaches unavoidably overfly the relatively tranquil areas around Cramond and across the Firth of Forth.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway.

			Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and fuel burn. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.

	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
24 Baseline and RNAV	Communities	Noise Impact on Health and Quality of Life	

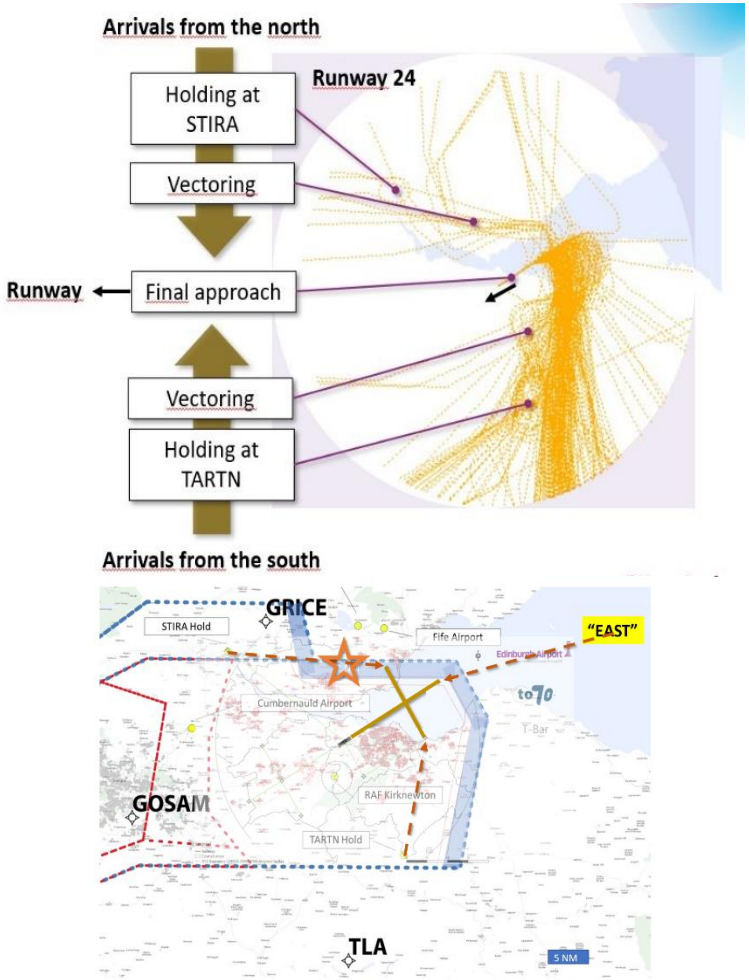

GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
to70
T-Bar
Cumbernauld Airport
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

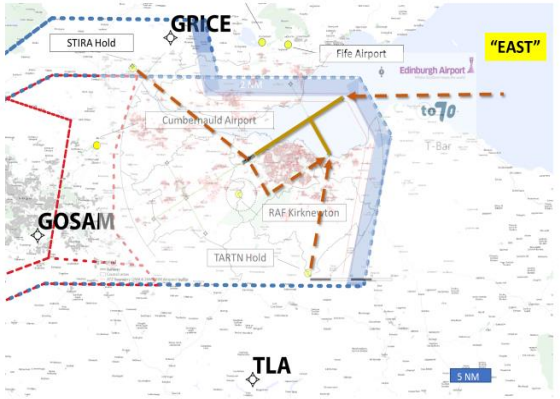

Portmoak Airfield
Fife Airport
STIRA Hold
Cumbernauld Airport
Edinburgh Airport
City of Edinburgh
Glasgow Airport
RAF Kirknewton
TARTN Hold
10 miles
15 kilometers

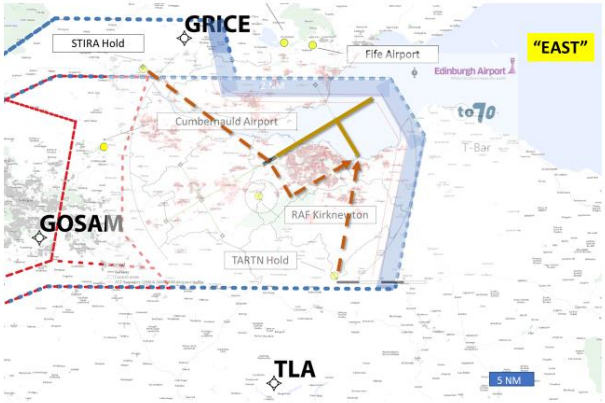
			Descending aircraft will continue to overfly small to large communities and population centres in the Scottish Borders, Midlothian, West Lothian, East Lothian, Stirling, Clackmannanshire, Fife and the City of Edinburgh. All aircraft on the final approach will overfly Cramond at an altitude of less than 1,000ft. This is unavoidable given the orientation of the 24 runway and aircraft operating rules, which provide no opportunity to minimise impacts to the affected community in Cramond. This option overlays RNAV on the baseline option. During busy periods, vectoring of *most* aircraft between 8,000ft and 3,000ft will provide a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown. The introduction and use of an RNAV overlay may generate slightly greater track concentration when aircraft are not vectored (during quieter periods of the day / night). **Tranquillity** This option is similar to the current arrangement, but with a slightly greater level of concentration of flight tracks (during quiet periods) before joining the final approach. Vectoring will still be used during busier periods for most flights. As the tranquil areas are located at the start of the descent, no change to overflights of tranquil areas is anticipated relative to the baseline.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 3,000ft will be used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night).

			While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 7,000ft will be used to deliver efficient route management that minimises track miles and fuel burn. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night). While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)

	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
24 Vectoring and Approach Transitions	Communities	Noise Impact on Health and Quality of Life	



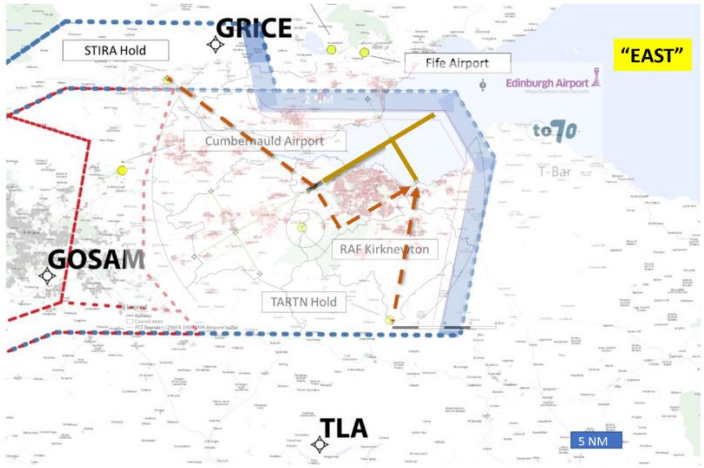


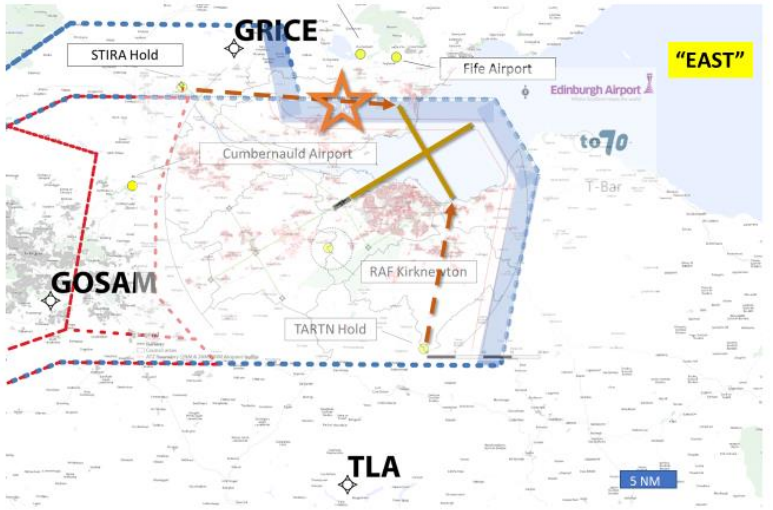
Descending aircraft will continue to overfly small to large communities and population centres in the Scottish Borders, Midlothian, West Lothian, East Lothian, Stirling, Clackmannanshire, Fife and the City of Edinburgh.

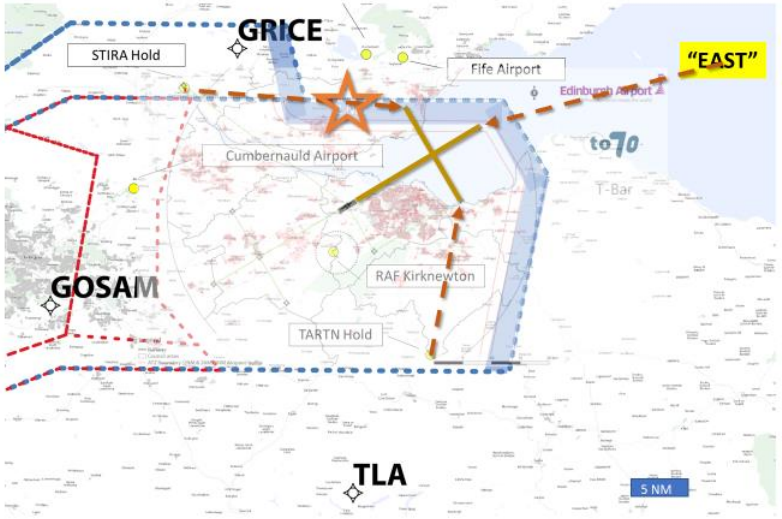
			All aircraft on the final approach will overfly Cramond at an altitude of less than 1,000ft. This is unavoidable given the orientation of the 24 runway and aircraft operating rules, which provide no opportunity to minimise impacts to the affected community in Cramond. This option provides increased systemisation of the airspace through the introduction and use of approach transitions to the t-bars. These will be used during the majority of the day. This will generate greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring of *some* aircraft will be required during busy periods, providing a small degree of track dispersion that will slightly reduce the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown. **Tranquillity** This option is more systemised than the baseline, with aircraft likely to be more concentrated on particular tracks, though with *some* vectoring during busier periods. While this may increase the frequency of overflights of tranquil areas, no additional tranquil areas will be affected. As with the baseline, aircraft will be above or just below 7,000 ft when crossing these tranquil areas.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and resulting greenhouse house emissions. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and greenhouse house emissions for some flights. Overall, the systemisation of

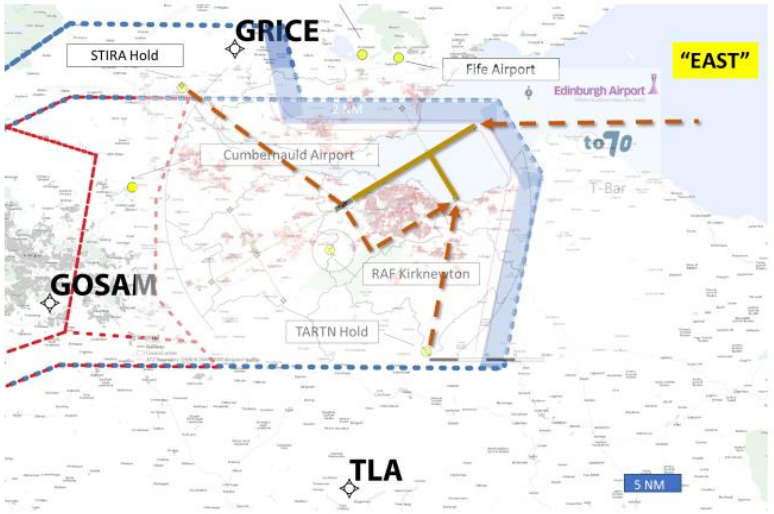
			most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and fuel burn. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and fuel burn for some flights. Overall, the systemisation of most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)

	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	**Group**	**Impact**	**Qualitative Assessment**
24 Approach transition and Holds	Communities	Noise Impact on Health and Quality of Life	

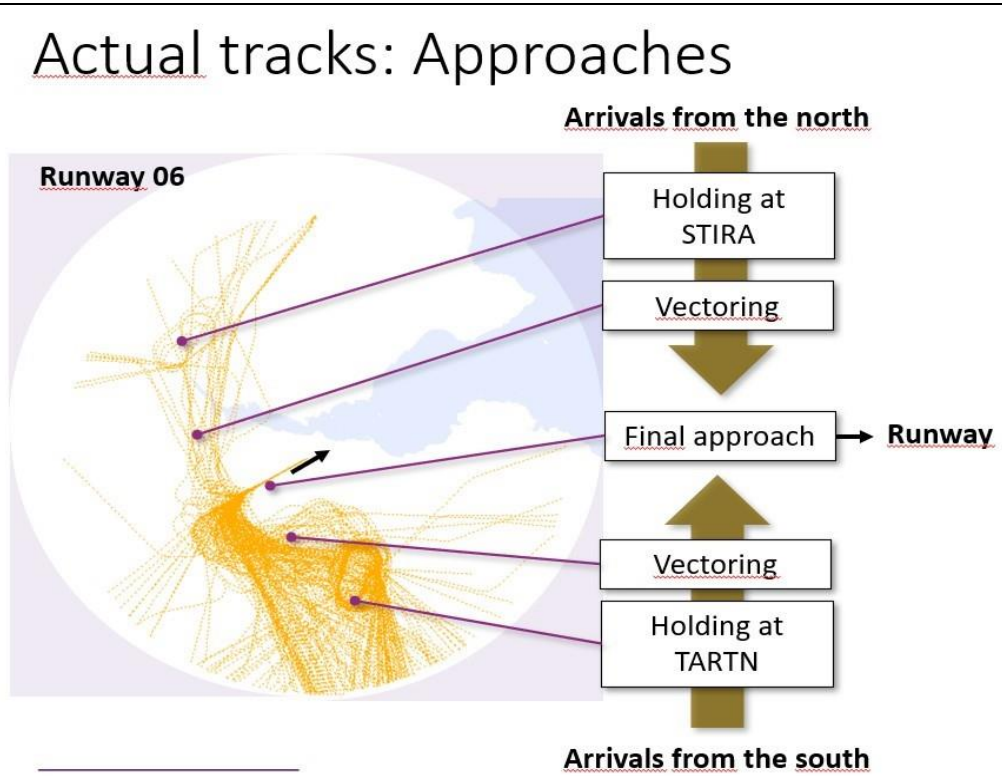

GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

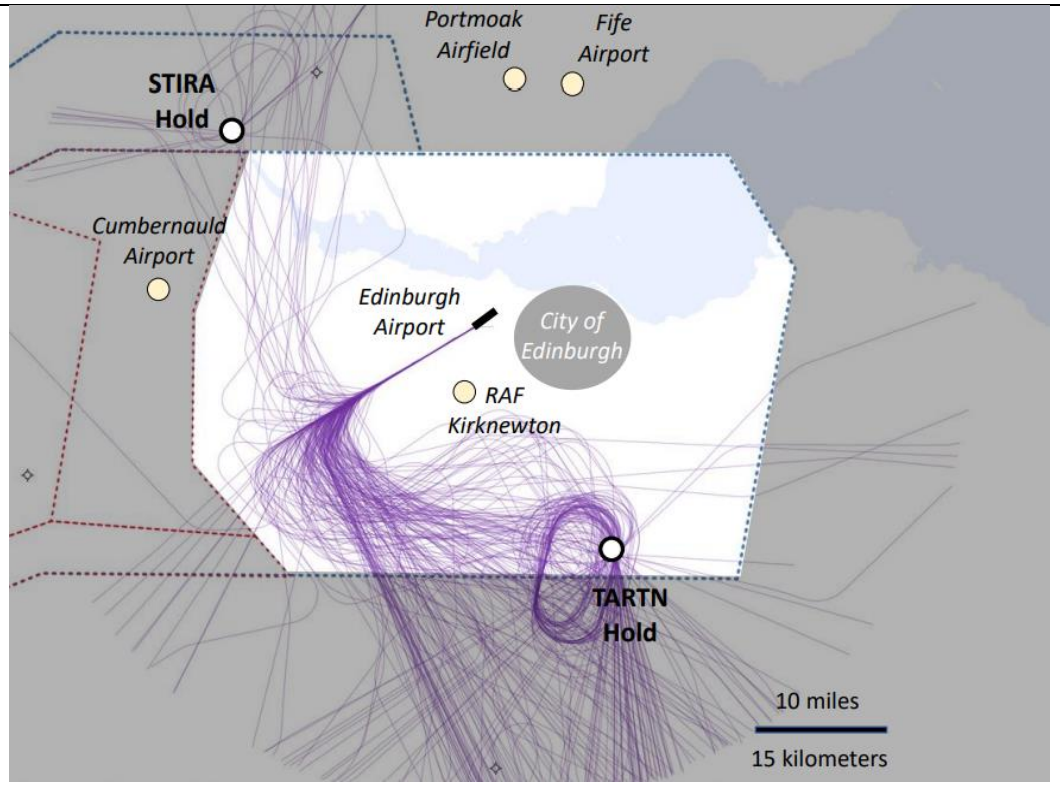

GRICE
STIRA Hold
Fife Airport
"EAST"
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

			 Descending aircraft will continue to overfly small to large communities and population centres in the Scottish Borders, Midlothian, West Lothian, East Lothian, Stirling, Clackmannanshire, Fife and the City of Edinburgh. All aircraft on the final approach will overfly Cramond at an altitude of less than 1,000ft. This is unavoidable given the orientation of the 24 runway and aircraft operating rules, which provide no opportunity to minimise impacts to the affected community in Cramond. This option provides full systemisation of the airspace through the introduction and use of approach transitions to the t-bars for all aircraft. This will generate significantly greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring, which would generate a degree of track dispersal, will only be used in exceptional circumstances.

			Tranquillity This option is fully systemised, with all aircraft concentrated on particular tracks, and with minimal use of vectoring and dispersal. While this may increase the frequency of overflights of tranquil areas, no additional tranquil areas will be affected. As with the baseline, aircraft will be above or just below 7,000 ft when crossing these tranquil areas.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and associated emissions for many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.

	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and fuel burn for many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
06 Baseline	Communities	Noise Impact on Health and Quality of Life	



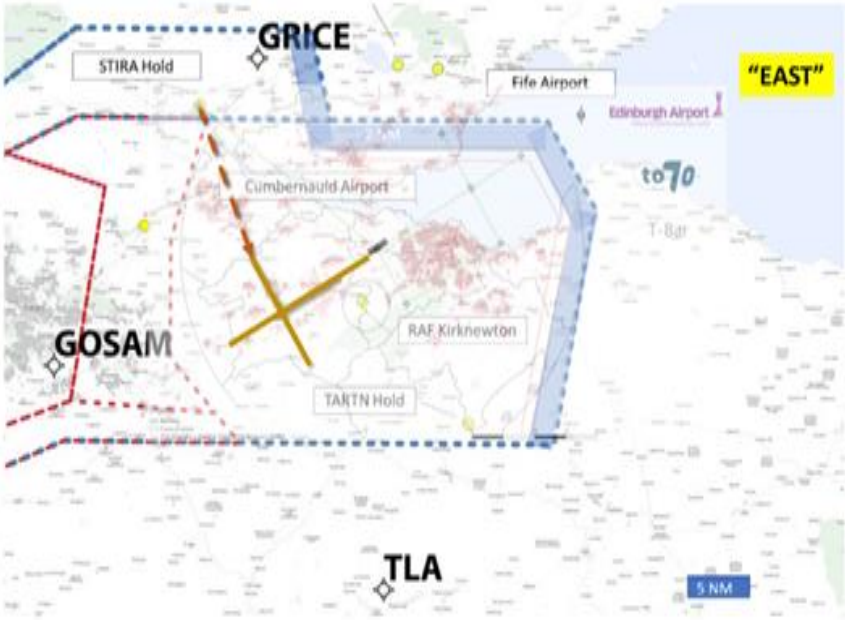
All descending aircraft, either routed directly from 7,000ft or released from the STIRA or TARTN hold at approximately 8,000ft, are vectored to the final approach and overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire and West Lothian (from the south / TARTN) and Stirling, Clackmannanshire, Falkirk and West Lothian (from the north / STIRA) at altitudes between approximately 8,000ft to 3,000ft.

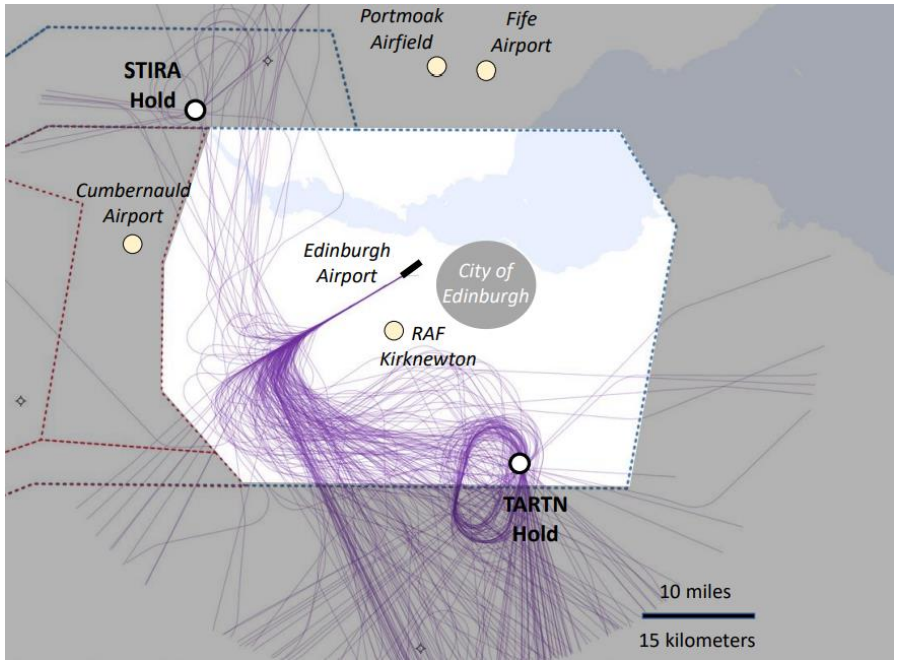
Aircraft join the final approach at approximately 8 miles distance from the airport and all overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet –

			this is unavoidable given the orientation of the 06 runway and aircraft operating rules. While the arriving aircraft will be operating at a lower (and hence quieter) engine power than departing aircraft, the concentration of aircraft on the final approach provides no opportunity to minimise impacts to affected communities. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft provides a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal results in a wider area and larger population being overflown. **Tranquillity** This option represents the current arrangement. Aircraft from the south descend over tranquil areas within the Pentland Hills. Descending aircraft cross the south-west Pentlands at between 7,000ft and 4,000 ft. Vectoring of *all* aircraft increases dispersal of aircraft, which reduces the frequency of overflights over this area: some flights are vectored around the most tranquil areas, while others overfly longer stretches of the hills. Aircraft approaching from the north descend across generally less tranquil areas of West Lothian and Falkirk, though with some vectoring across the relatively tranquil Bathgate Hills. The later part of the descent, from north and south, is made across the less tranquil areas around Livingston.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, ground movements and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.

	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *all* descending aircraft between approximately 8,000ft to 3,000ft is used to deliver efficient route management that minimises track miles and fuel burn. While the unavoidable use of the STIRA and TARTN holds during busy periods increases track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *all* aircraft delivers the most efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.

	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
06 Baseline and RNAV	Communities	Noise Impact on Health and Quality of Life	



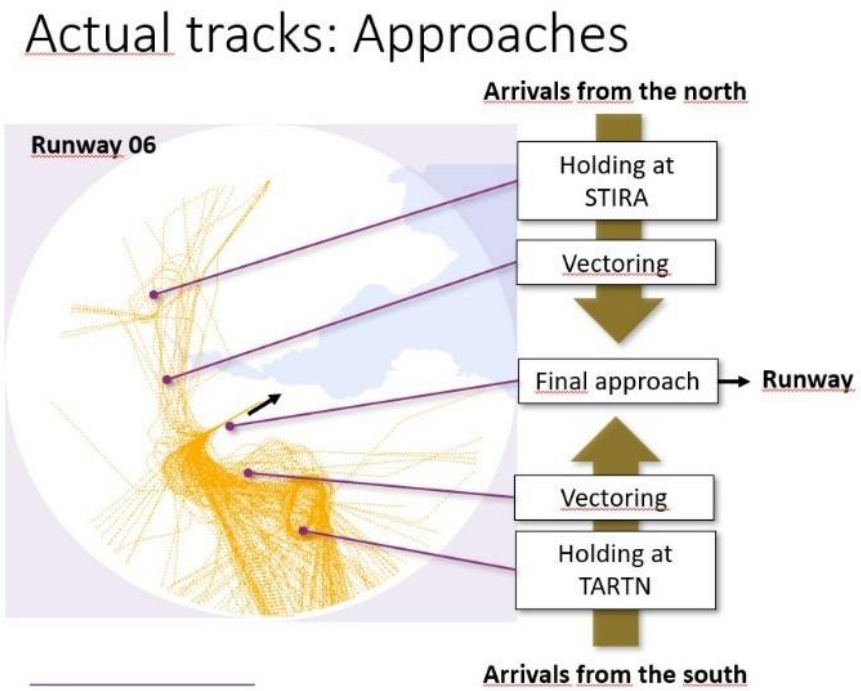
Descending aircraft will continue to overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire, West Lothian, Stirling, Clackmannanshire and Falkirk.

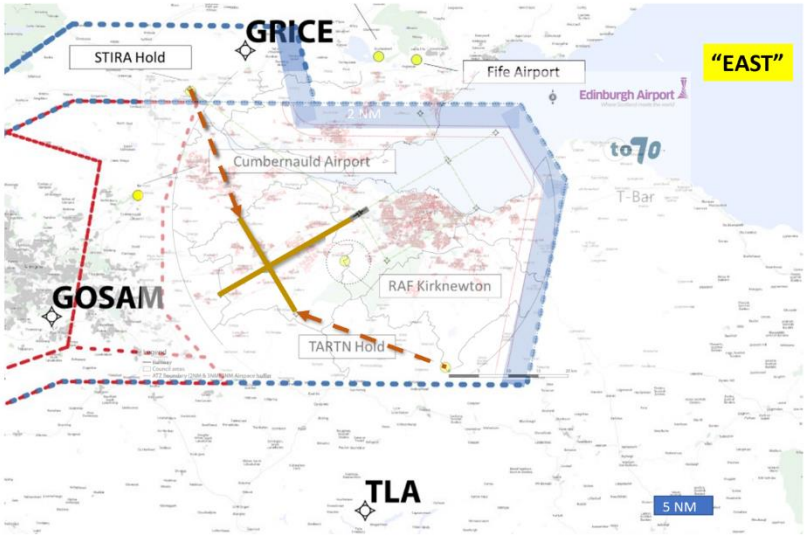
All aircraft on the final approach will overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet. This is unavoidable given the orientation of the 06 runway and aircraft operating rules, which provide no opportunity to minimise impacts to these affected communities.

This option overlays RNAV on the baseline option. During busy periods, vectoring of *most* aircraft between 8,000ft and 3,000ft will provide a high degree of track dispersion that reduces the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown.

			The introduction and use of an RNAV overlay may generate slightly greater track concentration when aircraft are not vectored (during quieter periods of the day / night). **Tranquillity** This option is similar to the current arrangement, but with a greater level of concentration of flight tracks on the final approaches. Vectoring will still be used during busier periods for most flights. As the tranquil areas are located at the start of the descent, no change to overflights of tranquil areas is anticipated relative to the baseline.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 3,000ft will be used to deliver efficient route management that minimises track miles and resulting greenhouse gas emissions. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night). While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and associated emissions for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.

	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Vectoring of *most* descending aircraft between approximately 8,000ft to 3,000ft will be used to deliver efficient route management that minimises track miles and resulting fuel burn. The introduction and use of an RNAV overlay will deliver efficient route management when aircraft are not vectored (during quieter periods of the day / night). While the unavoidable use of the STIRA and TARTN holds during busy periods will increase track miles and fuel burn for some flights, overall, the flexibility provided by vectoring *most* aircraft will deliver a highly efficient operation.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

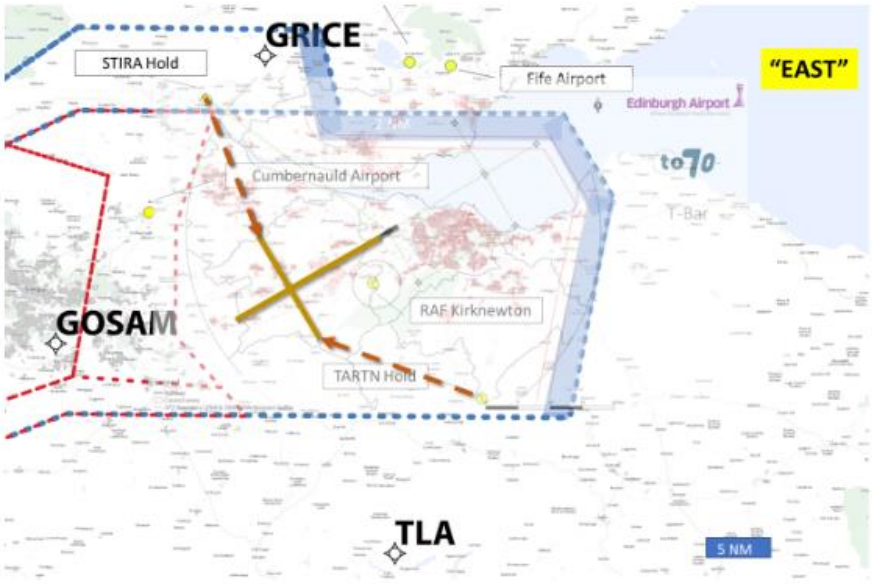
Option	Group	Impact	Qualitative Assessment
06 Vectoring and Approach transitions	Communities	Noise Impact on Health and Quality of Life	

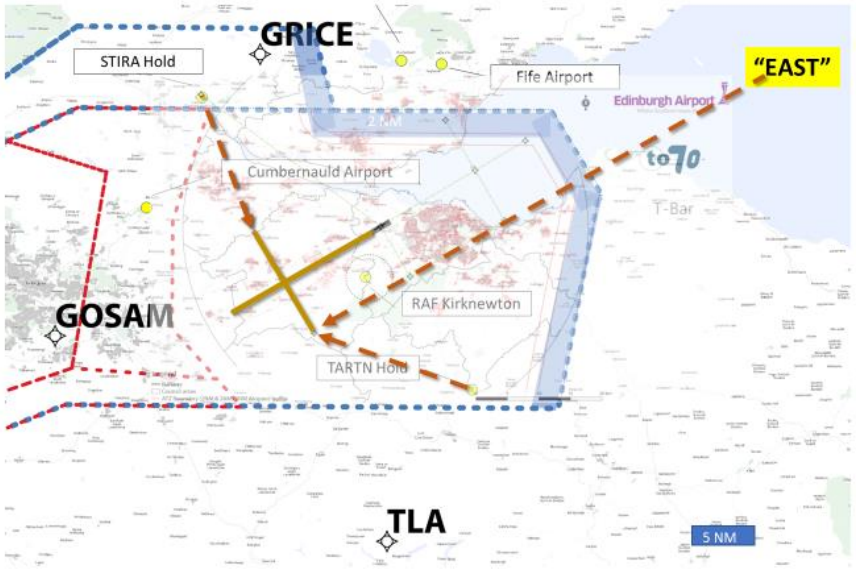
			 Descending aircraft will continue to overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire, West Lothian, Stirling, Clackmannanshire and Falkirk. All aircraft on the final approach will overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet. This is unavoidable given the orientation of the 06 runway and aircraft operating rules, which provide no opportunity to minimise impacts to these affected communities. This option provides increased systemisation of the airspace through the introduction and use of approach transitions to the t-bars. These will be used during the majority of the day. This will generate greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring of *some* aircraft will be required during busy periods, providing a small degree of track dispersion that will slightly reduce the frequency of impacts to individual affected receptors, but the dispersal will result in a wider area and larger population being overflown.

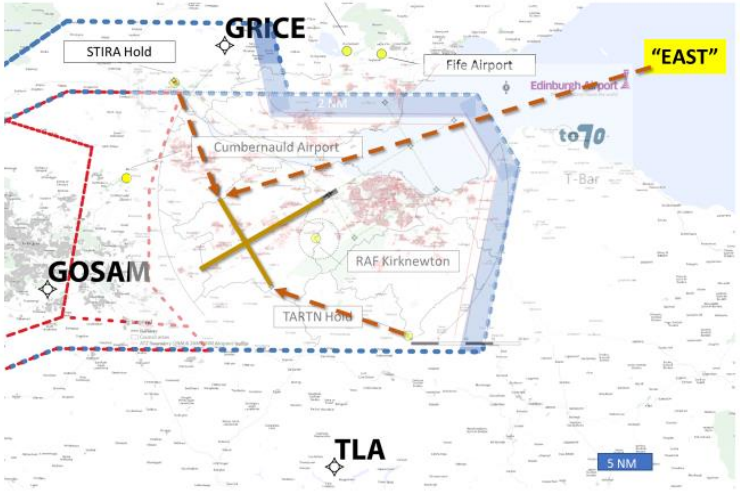
			Tranquillity This option is more systemised than the baseline, with aircraft likely to be more concentrated on particular tracks, though with *some* vectoring. As with the baseline, aircraft from the south will continue to overfly the Pentland Hills at between 7,000ft and 4,000 ft. The approach will increase the frequency of overflights along particular tracks across the tranquil areas but is likely to reduce the extent of tranquil areas overflown. No additional tranquil areas will be affected.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.
	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and resulting greenhouse house emissions. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and greenhouse house emissions for some flights. Overall, the systemisation of most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back.

			VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Increased systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. *Some* vectoring will be used during busy periods to deliver efficient route management that will minimise track miles and fuel burn. The increased systemisation may increase the use of the STIRA and TARTN hold, which would increase track miles and fuel burn for some flights. Overall, the systemisation of most flights is likely to deliver a slightly less efficient operation than an approach with more vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.

	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

Option	Group	Impact	Qualitative Assessment
06 Holds approach transition and holds	Communities	Noise Impact on Health and Quality of Life	


GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
2 NM
to 70
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM


GRICE
STIRA Hold
Fife Airport
"EAST"
Edinburgh Airport
2 NM
to 70
Cumbernauld Airport
T-Bar
RAF Kirknewton
GOSAM
TARTN Hold
TLA
5 NM

			Descending aircraft will continue to overfly small to medium communities and population centres in the Scottish Borders, South Lanarkshire, West Lothian, Stirling, Clackmannanshire and Falkirk. All aircraft on the final approach will overfly Livingston at an altitude of less than 3,000 feet and Newbridge at an altitude of less than 1,000 feet. This is unavoidable given the orientation of the 06 runway and aircraft operating rules, which provide no opportunity to minimise impacts to these affected communities. This option provides full systemisation of the airspace through the introduction and use of approach transitions to the t-bars for all aircraft. This will generate significantly greater track concentration along the defined flightpaths. This will reduce the area and number of people overflown but increase the frequency of overflights to those affected. Vectoring, which would generate a degree of track dispersal, will only be used in exceptional circumstances. **Tranquillity** This option is fully systemised, with all aircraft concentrated on particular tracks, and with minimal use of vectoring and dispersal. As with the baseline, aircraft from the south will continue to overfly the Pentland Hills at between 7,000ft and 4000 ft. The approach will increase the frequency of overflights along particular tracks across the tranquil areas but is likely to reduce the extent of tranquil areas overflown. No additional tranquil areas will be affected.
	Communities	Air Quality	The final approach (the last approximately 8 miles and below 3,000ft altitude) is fixed for all arrival options because of the runway orientation and aircraft operating rules. Changes in the volume of air traffic, and local transport infrastructure feeding the airport, will be assessed quantitatively at Stage 3.

	Wider Society	Greenhouse Gas Impact	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and associated emissions for many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Wider Society	Capacity / Resilience	Designed for 10 years hence capacity is a driver. Resilience is increased with systemised SIDs and arrivals in case of radar failure. ILS and radar capacity reduction
	General Aviation	Access	The airspace will remain Class D and the number of GA aircraft operating out of Edinburgh is comparatively very small compared to commercial traffic. En-route traffic not affected One flight paths are designed we may give CAS back. VFR traffic pass underneath East.
	General Aviation / Commercial airlines	Economic impact from increased effective capacity	There will be no economic impact on GA With the hopeful reduction in track miles on some routes and also increased capacity airlines should be free to grow in size therefore the impact is positive. Delays on the ground would be due to ground and/or terminal constraints as opposed to airspace issues.
	General Aviation / Commercial airlines	Fuel Burn	The final approach is fixed and provides the most efficient flight path to the runway. Full systemisation through the introduction and use of approach transitions to the t-bars will deliver relatively efficient route management during most of the day. Vectoring will only be used by exception. Full systemisation may result in potential capacity constraints during busy periods, which may result in more aircraft being held in the STIRA or TARTN holds, increasing track miles and fuel burn for

			many flights. Overall, full systemisation is likely to deliver a moderately less efficient operation than an approach including vectoring.
	Commercial airlines	Training costs	Negligible (Cat A airport with normal flight preparation – possible safety promotion material)
	Commercial airlines	Other costs	Negligible (AIRAC cycle with FMS update)
	Airport / Air navigation service provider	Infrastructure costs	Negligible – done in house as part of an update / upgrade. Removal of Nav Aids reduces maintenance budgets and over the long term will reduce costs.
	Airport / Air navigation service provider	Operational costs	There will be additional training costs before implementation and simulator time in addition to current training.
	Airport / Air navigation service provider	Deployment costs	Cost of creating documentation, safety case and safety promotional material.

This IOA is the first stage of the appraisal of airspace change options and is primarily a qualitative assessment of the options determined to be compliant with the Design Principles in Stage 2A. Options will progress through two further evaluations in Stage 3 (Full Options Appraisal) and Stage 4 (Final Options Appraisal) where options will be quantitively assessed. We will take through this shortlist of proposals and develop the design further in Stage 3 and the requirements of all of our design principles as well as the Statement of need Drivers.