CHAPTER 14: MILITARY AND CIVIL AVIATION

Chapter Summary

The Seagreen Project is a proposed offshore wind farm comprised of two component Projects, Project Alpha and Project Bravo. Since award of consent in 2014, advances have been made in design and technology within the offshore wind farm industry and Seagreen are now seeking consents for an optimised Seagreen Project based on fewer, larger, higher capacity turbines and the addition of a monopile foundation option.

The proposed design changes to the originally assessed scheme have the potential to change the scheme's environmental impact on specified receptors. A new assessment in relation to Military and Civil Aviation is set out within this chapter of the EIA Report – Military and Civil Aviation, being within the EIA scope as set out in paragraphs 14.13 to 14.16 of this report.

The key impacts considered in this chapter relate to military and civil radar, with other considerations being helicopter routes and offshore platforms. PSR detect aircraft and are usually used for ATC. Wind turbines can have a significant impact on PSR with the most significant effects being clutter and desensitisation.

The optimised Seagreen Project includes up to 120 wind turbines each having a maximum tip height of 280 metres which will affect both civil and military radar. Details of the radar assessment are set out from paragraphs 14.53 through to 14.112 of this Chapter.

The civil NATS en-Route radar at Perwinnes is likely to detect the turbines whilst its two radar at Allanshill and Lowther Hill will be unlikely to be affected, due to intervening terrain between radar and turbines. A TMZ is proposed to mitigate the effects of the optimised Seagreen Project on the NATS radar at Perwinnes. This will include blanking of the Perwinnes radar. With the application of this proposed mitigation the residual impact on the NATS radar will be acceptable and therefore not significant.

The MOD ATC radar at Leuchars Station (formerly RAF Leuchars) is likely to detect the turbines as are the MOD Air Defence radars at Brizlee Wood and Buchan. These impacts are likely to be unacceptable without mitigation. Mitigation will be required to limit the turbines' impact on these radar making their impacts acceptable and therefore not significant. No significant impacts are anticipated for helicopter routes or offshore platforms as none are identified in proximity to the project.

Consultation is ongoing with both NATS and the MOD. This has involved sharing wind turbine data, agreeing the affected radar and mitigation discussions.

INTRODUCTION

14.1. As set out in Chapter 1 (Introduction), the original Seagreen Project (herein referred to as the originally consented Project) received development consents from Scottish Ministers in 2014. This was confirmed in November 2017, following legal challenge to the consent award decision. Seagreen is now applying for additional consents for an optimised design (herein referred to as the optimised Seagreen Project), based on fewer, larger, higher capacity wind turbines that have become available since the 2014 consent decision and inclusion of monopiles as a foundation option.

14.2. This Environmental Impact Assessment (EIA) Report provides an assessment of the potential environmental impacts of the optimised Seagreen Project, to support a new application for development consent. This chapter of the EIA Report assesses the potential impacts upon Military and Civil Aviation throughout the construction, operation and decommissioning phases of the Project.

14.3. The originally consented project comprises the Seagreen Alpha Offshore Wind Farm (OWF) (herein referred to as 'Project Alpha'), Seagreen Bravo OWF (herein referred to as 'Project Bravo'), and the Offshore Transmission Asset. It is noted that the Offshore Transmission Asset has been separately licensed, no changes are proposed and therefore this is not considered further within this assessment. A full description of the optimised Seagreen Project is provided in Chapter 5 (Project Description) of this EIA Report.

14.4. The Structure of this chapter is as follows:

- Legislation, policy and guidance: sets out key legislation, policy context and guidance with reference to latest updates in guidance and approaches;
- Consultation: provides details of consultation undertaken to date and how this has informed the assessment;
- Scope of assessment: sets out the scope of the impact assessment for Military and Civil Aviation in line with the 2017 Scoping Opinion and further consultation;
- Methodology: sets out the study area, data collection undertaken and approach to the assessment of impacts on Military and Civil Aviation;
- Baseline Conditions: describes and characterises the baseline environment for Military and Civil Aviation and information used to inform the baseline;
- Assessment of impacts: confirms the project design parameters to be assessed (the Worst Case Scenario [WCS]) and presents the impact assessment for Military and Civil Aviation throughout the construction, operation and decommissioning phases and concludes on the likely significance of impacts. The assessment includes the consideration of any mitigation measures (both embedded and additional) and sets out any monitoring proposals for potentially significant effects, if required;
- Cumulative impact assessment: presents the cumulative impact assessment for Military and Civil Aviation throughout the construction, operation and decommissioning phases and concludes on the likely significance of impacts with consideration of mitigation measures;
- Interrelationships: Assesses the potential interrelated effects on any given receptor scoped into the assessment;
- Transboundary impacts: Considers the potential for any transboundary impacts in relation to Military and Civil Aviation; and
- Assessment summary: provides a summary of the impact assessment undertaken.

14.5. All figures supporting this chapter can be found in Volume II: Figures.

14.6. Radar line of sight (RLOS) reports support this chapter and these are provided in Volume III: Appendix 14A to 14G for the following radar assessed:

- Allanshill
- Brizlee Wood
- Buchan
- Edinburgh
- Leuchars
- Lowther Hill
- Perwinnes

14.7. This chapter was produced by Pager Power Limited.

LEGISLATION, POLICY AND GUIDANCE

14.8. CAP764 – Civil Aviation Authority (CAA) Policy and Guidelines on Wind Turbines Version 6 applies to both Military and Civil Aviation (CAA, 2016). The most relevant sections are listed in Table 14.1 below:

Table 14.1 Relevant Sections of CAP 764

Chapter	Page	Section
2	20	Wind turbine effects on Primary Surveillance Radar (PSR)
2	23	Mitigation
2	25	TMZ and surveillance by co-operative ground sensor
2	28	Offshore helicopter operations
2	30	Cumulative effects
2	37	Military impact
2	41	Offshore obstacles requirements

14.9. Other relevant publications include:

- CAP393 – Air Navigation: The Order and the Regulations (CAA) – specifically Part 7 Air Traffic Services and Part 8 Aerodromes and Lighting;
- CAP493 Manual of Air Traffic Services (ATS) – Part 1 – specifically Section 1: Chapter 1 Air Traffic Services
- CAP670 – ATS Safety Requirements (CAA) – specifically GEN01 Wind Farms and SUR 13 Requirements for Implementation of Wind Turbine Interference Mitigation Techniques;
- National Air Traffic Services (NATS) Aeronautical Information Service, (2018). NATS - specifically sections relating to En-Route operations (ENR), Aberdeen Airport (EGPD) and Leuchars Station (EGQL);
- UK Military Aeronautical Information Publication (UK Mil AIP);
- UK Integrated Aeronautical Information Package (UKIAIP);
- Military Aviation Authority (MAA): MAA Regulatory Publication 3000 Series: Air Traffic Management Regulations; and
- MAA: Manual of Military Air Traffic Management (MMATM).

CONSULTATION

14.10. As part of the EIA process Seagreen has consulted with a number of statutory and non-statutory organisations to inform the approach to assessment on Military and Civil Aviation.

14.11. A Scoping Report was submitted by Seagreen in May 2017. This considered the proposed changes to the optimised Seagreen Project and identified potential requirements for assessment. A Scoping Opinion was issued by Marine Scotland Licensing and Operations Team (MS-LOT) on behalf of Scottish Ministers in September 2017. This considered the information presented within the Scoping Report and set out key issues to be addressed within the impact assessment.

14.12. Table 14.2 sets out the consultation undertaken to date, including the date and type of consultation, the issues raised and how these have been addressed within this EIA Report.

Table 14.2 Summary of Consultee Responses

Consultee and Date	Summary of issues raised	How addressed in this EIA Report
CHC Helicopters Scoping Consultation 2017	No comments	Wind turbines to be publicised and lit in accordance with the requirements of CAP 764 and CAP 393 (ANO)
Civil Aviation Authority Scoping Consultation 2017	No comments	Wind turbines to be publicised and lit in accordance with the requirements of CAP 764
Heathrow Airport Holdings Limited Scoping Consultation 2017	No comments	This consultation relates to Aberdeen Airport. Aberdeen Airport uses NATS radar at Perwinnes. NATS has been consulted separately (addressed below).
Ministry of defence (MOD) Scoping Consultation 2017	Acknowledged Consultation	Explanation of changes to project name provided to MOD. It is likely that the predicted impacts on one or more of the three affected radar (Buchan, Brizlee Wood and Leuchars Station) will require a technical mitigation solution. The effects and mitigation requirements are detailed from paragraph 14.53 of this chapter onwards.
MOD informal consultation 29 Jan 2018	MOD requested formal consultation with turbine heights and positions in OSGB36, 6 figure Eastings and Northings	
MOD formal pre-planning consultation 31 Jan 2018	MOD pre-planning consultation undertaken as requested by MOD. Consultation is ongoing as outlined below.	
MOD Consultation Update 19 Feb 2018	MOD confirmed receipt of consultation package and is assessing internally. MOD has previously assessed applications at this location and raised queries regarding the originally consented project.	
MOD Consultation Update 26 March 2018	MOD provided with further information regarding consent applications for Project Alpha and Project Bravo.	
MOD Consultation Update 26 April 2018	MOD advised internal consultation in progress. Advised that the turbines are in RLOS to radar at Brizlee Wood, Buchan and Leuchars.	
Consultation Update 22 May 2018	MOD advised internal consultation in progress with RAF responses received regarding Leuchars radar and expected for the Air Defence Radar at Brizlee Wood and Buchan	
NATS Scoping Consultation 2017	NATS highlighted that the proposal would have significant adverse impacts on the Perwinnes Radar and air traffic control at Prestwick Centre, Prestwick Centre Military and Aberdeen en-route, which could be addressed through the implementation of agreed mitigation measures. NATS objected due to potential impact on its radar at Perwinnes. NATS advised that mitigation may be available.	The Prestwick Centre, Prestwick Centre Military and Aberdeen en-route use data from the Perwinnes radar. Accordingly this chapter focusses on the Perwinnes radar as impacts and mitigation relating to this system will also be directly applicable to above locations/systems.

Consultee and Date	Summary of issues raised	How addressed in this EIA Report
NATS informal consultation 29 Jan 2018	NATS advised formal consultation. NATS also advised their position on mitigation would likely be similar to their position on the 2012 application.	The radar at Perwinnes will be affected and will require mitigation. On 5 April 2018 NATS formally confirmed that a mitigation solution has been agreed. The mitigation solution will also require approval from the Civil Aviation Authority (CAA). This mitigation applies to Perwinnes and the locations/systems which rely on its data (Prestwick Centre, Prestwick Centre Military and Aberdeen en-route). Radar impacts and mitigation are detailed from paragraph 14.53 of this chapter onwards.
NATS formal pre-planning consultation 31 Jan 2018	NATS pre-planning consultation undertaken as advised by NATS.	
NATS Consultation Update Feb 2018	NATS stated it was considering the application and considering two different mitigation solutions for the predicted impact on the Perwinnes radar. The first involves using blanking and in-fill and the second involves use of a Transponder Mandatory Zone (TMZ) including blanking of the Perwinnes radar.	
NATS Consultation Update 13 March 2018	NATS have advised informally that preferred mitigation solution is likely to be the implementation of a TMZ. Formal internal approval is being progressed.	
NATS Consultation update 5 April 2018	NATS formally confirmed that a mitigation solution has been agreed. This involves blanking the Perwinnes radar and implementing a TMZ.	

SCOPE OF ASSESSMENT

14.13. With reference to the 2017 Scoping Opinion and confirmed through further consultation with NATS and the MOD, the scope of the assessment for Military and Civil Aviation considers impacts to the following only:

- Military Air Traffic Control (ATC) Radar;
- Military Air Defence Radar;
- NATS En-Route Radar (including Lowther Hill);
- Low Flying Aircraft; and
- Helicopter Routes and Offshore Platforms (see paragraph 14.20).

14.14. This is based on the optimised Seagreen Project design set out in Chapter 5 (Project Description) and with the assumption that mitigation measures and consent conditions as set out in Chapter 7 (Scope of EIA Report) will be applied.

14.15. The originally consented project involved consultation with CAA, Aberdeen Airport and helicopter operators. The new application for the proposed optimised Seagreen Project has larger and fewer turbines which will not change the impact on these consultees. Furthermore the CAA and CHC Helicopters have not commented on the new application at the scoping stage. The turbines are to be publicised and lit in accordance with the requirements of CAA policy and guidelines on wind turbines CAP 764 and CAP 393(ANO).

14.16. All other potential impacts on Military and Civil Aviation have been scoped out of the assessment for the optimised Seagreen Project and are not assessed further within this impact assessment.

METHODOLOGY

14.17. This section presents the impact assessment methodology applied to assess the potential environmental impacts associated with the construction, operation and decommissioning phases of the optimised Seagreen Project.

Study Area

14.18. Seven relevant radar are located throughout eastern Scotland and northern England. These are radar that provide coverage over this part of the North Sea that could potentially be affected by the proposed turbines. The radar have ranges that extend beyond 250 kilometres from the radar antenna. All military and civil radar that have coverage above the proposed development have been considered.

14.19. Figure 14.1 (Volume II) shows the radar locations in relation to the optimised Seagreen Project boundaries. Figure 14.2 (Volume II) provides a chart showing the optimised Seagreen Project area and the indicative wind turbine locations selected as samples for the RLOS analysis (see paragraph 14.63 for further information).

14.20. It should be noted that neither Project Alpha or Project Bravo are in close proximity to Helicopter Main Routes or offshore platforms, with the closest route (HMR116) being more than 30 nautical miles (55km) away – beyond the typical 2 nautical mile distance at which concerns might be raised. Therefore these are not considered further within this assessment.

Data Collection

14.21. The optimised Seagreen Project has the same area and is within the same application boundaries as the originally consented Project and therefore, data collected to inform the 2012 Offshore ES, remains an appropriate source of information to inform the assessment of impacts for this EIA Report.

14.22. Baseline characterisation for Military and Civil Aviation has been undertaken using desk based research and analysis undertaken by Pager Power specifically for this EIA Report. The general principle is to determine whether a radar's antenna will be able to 'see' any part of a wind turbine. Computer modelling is used to determine whether there will be a clear line of sight between radar and turbine or whether the path between antenna and turbine is obscured due to terrain or Earth curvature. The assessment also accounts for radar refraction caused by the Earth's atmosphere. Details of the analysis and methodology are shown in the appendices to this chapter (Appendices 14A to 14G). No radar modelling data from the 2012 Offshore ES has been used to inform this assessment.

14.23. Pager Power has used its own database of radar locations which is managed with data being sourced from NATS and the MOD and subject to review by Pager Power survey over the past 12 years. The database includes radar coordinates, antenna height above ground, antenna height above sea level, radar name, radar type, information source and information date. The relevant radar are listed in Table 14.3 within the 'Baseline Conditions' section of this chapter.

Impact Assessment

14.24. The impact assessment for Military and Civil Aviation follows the general principles of the approach set out within Chapter 6 (EIA Process). This includes consideration of Project Alpha alone; Project Bravo alone; Project Alpha and Project Bravo combined (the optimised Seagreen Project) and Project Alpha and Project Bravo in a cumulative scenario.

14.25. The impact of wind turbines on radar does not become a factor until turbines are commissioned and the blades begin to rotate; stationary turbines do not cause radar interference.

14.26. For the assessment on Military and Civil Aviation technical knowledge has been used to determine if the projects will be acceptable, in terms of aviation safeguarding, or unacceptable. Where impacts are found to be unacceptable, mitigation will be applied to find a management or design solution, to ensure the impact is adequately managed and can be reduced to a level that is considered acceptable.

Developments in Assessment Methods

14.27. The assessment methodology employed is broadly similar to that employed in the 2012 Offshore ES. However, the assessment has been undertaken by a different company which has slightly different practices and working methods. These differences will not result in any significant change to the assessment of overall impact, or any identified requirement for mitigation. This is because the assessed impacts on radar infrastructure have not changed as a result of using different assessment tools.

14.28. An additional assessment of the coverage of the NATS Lowther Hill has also been undertaken. This was to confirm that the radar was not impacted and to determine its potential suitability for mitigating impacts on other radar.

Significance Criteria

14.29. RLOS Assessments provide a good indication as to whether wind turbines are likely to be detected by radar. As a general rule turbines that can be 'seen' by a radar will effect it and turbines that cannot be 'seen' will have no effect.

14.30. It is not always necessary to assess all turbine locations to understand the likely radar impact of a large offshore wind farm. Evenly spaced sample turbine locations can be assessed with the radar results being interpreted to determine the overall impact of a wind farm. This methodology works particularly well when all sample turbines are visible to the radar – or indeed when all are hidden. In this case the sampling approach has been found to be appropriate for the assessed radar.

14.31. Due to the fact that aviation and radar related impacts are not subject to the immediate geographical constraints of a tightly geographically defined study area and may even, in some cases, extend as far as 200nm from an OWF development; expert judgement has been used to consider the extent of the impact and/or to quantify the extent of that impact within this assessment.

14.32. The assessment presented in this chapter therefore does not exactly follow the approach presented in Chapter 6 (EIA Process) of this EIA Report. With respect to this chapter, an acceptable impact is deemed to be not significant in terms of EIA whilst unacceptable impacts are deemed to be significant in terms of EIA.

14.33. A radar impact is acceptable if either: (a) the turbines are predicted to have no technical impact on the radar system or (b) the technical impacts will not adversely affect the operators (typically air traffic controllers) of the radar system.

14.34. This means that unacceptable unmitigated radar impacts are considered significant and radar impacts made acceptable by mitigation are considered not significant.

Assessment Limitations and Uncertainty

14.35. As stated above RLOS Assessments provide a good indication as to whether wind turbines are likely to be detected by radar. Where results are marginal (i.e. a turbine is 'just' visible or 'just' hidden) it can be useful to undertake alternative assessment types such as Radar Detectability Calculations. Radar detectability calculations are more accurate because they consider additional factors such as diffraction and the turbine dimensions. In this case radar detectability calculations were not required as the RLOS assessments provided sufficient certainty of turbine detection by radar.

BASELINE CONDITIONS

Current Baseline

14.36. Radar are used to present aircraft symbols on air traffic controllers' displays so that air traffic services can be provided to pilots, enabling aircraft to be safely separated from each other. National civil air traffic control services are provided by NATS En-Route whilst more localised services are provided by individual airports and air bases.

14.37. Air Defence Radar are used by the RAF to detect aircraft that represent a threat to national security. These radar are also used to direct military aircraft to intercept threat aircraft.

14.38. All fixed civil and military aeronautical radar that have coverage above the proposed development have been assessed. Whilst there is no possibility of the NATS En-Route radar at Lowther Hill being affected by the optimised Seagreen Project (due to intervening terrain) it could, potentially, be part of a technical mitigation solution for impacts on the Perwinnes radar. The principal being that data from an unaffected radar is used to 'in-fill' the affected area of another radar. 'In-fill' is a technique for mitigating the effects of wind turbines on radar whereby the affected radar is blanked in the area of the wind farm and data from an alternate unaffected radar is used to fill the blanked area. The Lowther Hill radar has therefore been assessed.

14.39. As set out within the Study Area section of this chapter, there are seven radar that provide coverage over this part of the North Sea that could potentially be affected by the proposed turbines. Identified receptors, including radar and other considerations are summarised in the Table 14.3 below.

Table 14.3 Identified Potential Receptors

Receptor	Operator	Description
Brizlee Wood Radar	RAF	Air Defence Radar
Buchan Radar	RAF	Air Defence Radar
Edinburgh Radar	Edinburgh Airport	Civil Air Traffic Control Radar
Leuchars Radar	RAF	Military Air Traffic Control Radar
Perwinnes Radar	NATS En-Route	Civil Air Traffic Control Radar – Long Range
Allanshill Radar	NATS En-Route	Civil Air Traffic Control Radar
Lowther Hill Radar	NATS En-Route	Civil Air Traffic Control Radar – Long Range

14.40. The Leuchars PSR is currently safeguarded by the MOD despite the fact that flying operations at Leuchars have diminished significantly with operational control having been transferred to the Army from the RAF.

14.41. RLOS calculations have been undertaken for the areas of Project Alpha and Project Bravo. Radar with low level coverage are more likely to detect wind turbines and are less likely to be suitable for technical mitigation solutions. This is because the radio path between the radar antenna and the wind turbine blades is less likely to be obstructed by terrain. Coverage predictions are provided in Table 14.4 below.

Table 14.4 Radar Coverage

Receptor	Project Alpha	Project Bravo
Brizlee Wood Radar	Limited low level radar coverage. Radar may be impacted.	Some low level radar coverage. Radar may be impacted.
Buchan Radar	Low level radar coverage. Radar likely to be impacted.	Low level radar coverage. Radar likely to be impacted.
Edinburgh Radar	No low level radar coverage. No impacts expected. May be suitable for mitigation.	No low level radar coverage. No impacts expected. May be suitable for mitigation.
Leuchars Radar	Good low level radar coverage. Radar likely to be impacted.	Good low level radar coverage. Radar likely to be impacted.
Perwinnes Radar	Good low level radar coverage. Radar likely to be impacted.	Good low level radar coverage. Radar likely to be impacted.
Allanshill Radar	No low level radar coverage No impacts expected. May be suitable for mitigation.	No low level radar coverage. No impacts expected. May be suitable for mitigation.
Lowther Hill Radar	No low level radar coverage No impacts expected. May be suitable for mitigation.	No low level radar coverage. No impacts expected. May be suitable for mitigation.

Predicted Future Baseline

14.42. It is likely that radar infrastructure and airspace structure will evolve over the 25 year lifetime of the proposed project. Generally, replacement radar are likely to be at the same locations as existing radar meaning that impacts are unlikely to change significantly over the project life time.

ASSESSMENT OF IMPACTS – WORST CASE SCENARIO (WCS)

14.43. As identified within the 'Scope of Assessment', the impact assessment for Military and Civil Aviation considers the potential impacts of the optimised Seagreen Project on Radar and Low Flying operations. All other impacts have been scoped out of this EIA Report in line with the 2017 Scoping Opinion and review of potential receptor proximity to the optimised Seagreen Project.

14.44. The assessment considers the potential impacts of Project Alpha alone; Project Bravo alone; Project Alpha and Project Bravo combined (the optimised Seagreen Project) and Project Alpha and Project Bravo in a cumulative scenario. The following sections set out the assessment of potential impacts during the construction, operation and decommissioning phases of the Project.

14.45. The impact of an individual wind turbine on radar is dependent on its location and height, while the impact of a wind farm is dependent on the combined impact of the individual wind turbines. At shorter ranges, for example less than 15km, it may be possible for static WTGs or construction equipment such as cranes, to affect radar operations, however, at this range from the radar (the nearest radar being Leuchars at a range of 65km) static turbines and construction equipment will not have a significant radar impact. Therefore significant impacts are only likely to occur during operation and not during construction or decommissioning of the optimised Seagreen Project.

14.46. This is because radar are affected by the moving wind turbine blades which typically have tip speeds in excess of 150 kilometres per hour. This high speed movement does not occur during construction and decommissioning.

Worst Case Scenario

14.47. To inform the impact assessment on Military and Civil Aviation a worst case scenario (WCS) has been defined using the information contained within the design envelope for optimised the Seagreen Project, Chapter 5 (Project Description). The worst case represents, for any given impact, the scenario within the range of options in the design envelope that would result in the greatest potential for change to the receptors assessed.

14.48. Table 14.5 identifies, the WCS in relation to those issues scoped into the assessment and provides justification as to why no other scenario would result in a greater impact on the receptors considered. It should be noted that, while the WCS is defined for each impact for Project Alpha and Project Bravo in isolation, the WCS would be consideration of the projects combined (the optimised Seagreen Project). The impact assessment undertaken therefore considers the impacts of each project in isolation as well as the projects combined.

14.49. It should be noted that decommissioning impacts will be the same or reduced as construction impacts as the process of decommissioning will be similar to construction but in reverse order.

Table 14.5 Worst Case Scenario Justification

Type of Impact	Worst Case Scenario (individual project)	Justification/Rationale of Selected Design Envelope Parameter
Construction and Decommissioning		
Impact on Low Flying Aircraft	Maximum static blade tip height 280 metres above Lowest Astronomical Tide (LAT) Maximum number of cranes at maximum height above LAT.	Low flying aircraft overflying wind turbines and cranes will have to fly higher to avoid turbines. NB: Maximum crane height will not exceed maximum blade tip height of wind turbines.
Operation		
Radar Impact	Maximum operational blade tip height 280 metres above Lowest Astronomical Tide (LAT)	The largest wind turbine will have the greatest radar impact as it is most visible to the radar.
Impact on Low Flying Aircraft	Maximum operational blade tip height 280 metres above Lowest Astronomical Tide (LAT)	Low flying aircraft overflying wind turbines will have to fly higher to avoid turbines.

Environmental Measures Incorporated into the Project

14.50. Throughout the design evolution process and with consideration of the findings of the 2012 Offshore ES, measures have been taken to avoid potentially significant impacts wherever possible and practical to do so. Mitigation measures that are incorporated into the design of the project are referred to as 'environmental measures incorporated into the Project'. These measures are intended to prevent, reduce and where possible offset any significant adverse impacts on the environment. These are effectively 'built in' to the impact assessment and as such, the assessment includes consideration of these measures.

14.51. There are no specific Environmental Measures incorporated into the design to minimise impacts on Military and Civil Aviation.

14.52. A number of consent conditions were attached to the original consents received for the Seagreen Project in 2014. These were defined to manage the environmental risk of the Project. Any future consents issued to Seagreen may include similar conditions to manage the risk to Military and Civil Aviation, where necessary. Consent conditions applied to the originally consented project are provided within Chapter 7 (Scope of EIA Report). These consent conditions have been reviewed and remain relevant to the management of Military and Civil Aviation. The conditions will ensure that radar mitigation is in place prior to operation of the wind turbines. These conditions are set out in Table 14.6.

Table 14.6 Military and Civil Aviation – original consent conditions

Project phase	Consent and condition number	Summary of conditions
Construction	Section 36, conditions 20 to 22	Development of Air Traffic Control Radar Mitigation Scheme, to include controls on WTG construction
	Section 36, condition 23	Development and implementation of a Primary Radar Mitigation Scheme (PRMS) in agreement with the Operator
	Section 36, condition 24	Provide the positions and maximum heights of the WTGs and construction equipment over 150 m (measured above LAT) and any Offshore Sub-Station Platforms to the United Kingdom Hydrographic Office (UKHO) for aviation and nautical charting purposes
Operation	Marine Licence, condition 3.2.3.2	Notify the UKHO of the Completion of the Works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications through the national Notice to Mariners system. Provide the 'as-built' positions and maximum heights of all WTGs, Metrological Masts, along with any sub-sea infrastructure, to the UKHO for aviation and nautical charting purposes. Ensure that local mariners, fishermen's organisations and HM Coastguard, in this case Maritime Rescue Coordination Centre Aberdeen, are made fully aware of the Completion of the Works. Ensure that the Completion of the Works is promulgated in the Kingfisher Fortnightly Bulletin to inform the Sea Fish Industry. Notify the Licensing Authority, in writing, as soon as reasonably practicable, of any case of damage to or destruction or decay of the Works. Ensure that no radio beacon or radar beacon operating in the Marine frequency bands is installed or used on the Works without the prior written approval of OfCom.
	Marine Licence, condition 3.2.3.4	Ensure that the Works are marked and lit in accordance with the requirements of the Northern Lighthouse Board (NLB), the CAA and MOD at all times Ensure that the required IALA availability target for Category 1 Aids to Navigation (AtoN) is achieved

IMPACT ASSESSMENT – CONSTRUCTION PHASE

14.53. The impact of wind turbines on radar does not become a factor until the operational phase of a Project, when turbines are commissioned and the blades begin to rotate, as stationary turbines do not cause radar interference. Impacts during construction therefore relate to the impact of wind turbines and cranes on low flying aircraft.

14.54. There are no significant differences between the impacts of Project Alpha alone, Project Bravo alone or Project Alpha and Project Bravo in combination, due to their similar locations and areas.

Project Alpha

Potential Impacts

14.55. The impact of wind turbines on radar does not become a factor until the operational phase of a Project, when turbines are commissioned and the blades begin to rotate; stationary turbines do not cause radar interference. Impacts during construction therefore relate to the impact of wind turbines and cranes on low flying aircraft.

14.56. Details of construction activity will be promulgated via the NATS Aeronautical Information Service (AIS) in time to ensure that it can be promulgated to all affected airspace users – as set out in Table 14.6. This is an approved and recognised method of disseminating information concerning the presence of temporary hazards to aviation. Information will include the vertical heights of obstacles, both temporary in nature such as cranes used to erect the turbines and the permanent wind farm. This will ensure there is no unacceptable impact on aviation.

14.57. The impact of the Project Alpha on low flying aircraft during the construction phase is therefore considered acceptable and is **Not Significant** in EIA Terms.

Additional Mitigation

14.58. There is no additional requirement for mitigation.

Residual Impact

14.59. The residual impact of Project Alpha on low flying aircraft, during this phase, is therefore also considered acceptable and **Not Significant** in EIA terms.

Project Bravo

14.60. As set out above, the impacts of Project Alpha and Project Bravo on low flying aircraft are the same due to their similar locations and areas. The impact of Project Bravo during the construction phase is therefore also considered acceptable and **Not Significant** in EIA terms.

14.61. There is no additional requirement for mitigation and the residual impact of Project Bravo during this phase is also acceptable and **Not Significant** in EIA terms.

Projects Alpha and Bravo Combined

14.62. The impact of Project Alpha and Project Bravo combined on low flying aircraft are the same as the individual projects as the overall impact on low flying aircraft will be similar. The impact is therefore assessed acceptable and **Not Significant**. There is no additional requirement for mitigation and the residual impact of Project Alpha and Project Bravo combined during this phase is therefore acceptable and **Not Significant** in EIA terms.

IMPACT ASSESSMENT – OPERATIONAL PHASE

Project Alpha

14.63. RLOS Analysis has been undertaken for radar (military and civil) that are scoped into the assessment and a sample of indicative turbine locations. The assessed radar are listed in Table 14.3, with the locations of the sample turbine locations shown in Figure 14.2, Volume II, and listed in Table 14.7. The sample has been selected to accurately reflect the overall impact of all turbines, with sample locations being evenly spaced around the Project Alpha boundary to accurately capture the predicted impact of all turbines.

14.64. RLOS Assessment reports are shown for each radar in Volume III, Appendices 14A to 14G.

Table 14.7 Sample indicative turbine locations – Project Alpha

Sample	UTM 30N Easting	UTM 30N Northing	BNG Easting	BNG Northing
A1	566731.404	6280565.199	405537.29	752516.24
A2	577825.317	6281631.755	416644.98	753420.86
A3	580039.078	6278993.498	418819.9	750750.77
A4	575886.636	6272511.971	414573.7	744330.85
A5	572034.385	6268530.245	410664.08	740405.88
A6	569220.244	6266168.9	407815	738085.89
A7	565230.453	6268066.195	403854.44	740040.99
A8	566131.024	6275565.597	404864.12	747526.15

14.65. RLOS results for Project Alpha sample turbines, with a maximum blade tip height of 280m, are shown in Table 14.8 below. Positive values indicate the turbine is likely to have a technical impact on the radar whereas negative values indicate the turbine is unlikely to affect the radar. The values in the table are the vertical clearance, in metres, between the wind turbine tip and the RLOS. Further information is available in Volume III Appendices 14A to 14G.

Table 14.8 RLOS results summary – Project Alpha

Sample turbine	Brizlee Wood	Buchan	Edinburgh	Leuchars	Perwinnes	Allanshill	Lowther Hill
A1	-40.5	157	-577.4	180.7	104.3	-221.1	-1224.4
A2	-45.8	161.9	-1024	124.9	230.5	-390.6	-2061.9
A3	-23.3	146.7	-993.2	119.3	243.2	-436.4	-1249.6
A4	28.8	110.2	-838.5	155.1	169.3	-484.5	-892.4
A5	57.5	85	-755.6	180.1	87.9	-324.4	-866.0
A6	73	68.6	-734.6	195.7	31.3	-408.2	-882.1
A7	57.2	80.7	-698	209.2	-26.7	-307.1	-1709.4
A8	0.7	128.7	-799.8	193.7	96	-212.7	-1674.4

14.66. Further expert analysis of the line of sight results and data has been undertaken to determine the likely impact of the turbines on the respective radar. These potential impacts are summarised in Table 14.9 below.

14.67. Pager Power has observed the impact of numerous wind farms on various civil and military radar systems and therefore has an in-depth understanding of the relationship between RLOS results and expected impact on air traffic control and air defence radar displays. This expertise has been used to determine the likely impact on the assessed radar.

Table 14.9 Radar Impact summary – Project Alpha

Radar	Likely Impact
Brizlee Wood Radar	50% of turbines detected - at worst case maximum height
Buchan Radar	All turbines detected - at worst case maximum height
Edinburgh Radar	No turbines detected
Leuchars Radar	All turbines likely to be detected
Perwinnes Radar	Most turbines detected – at worst case maximum height
Allanshill Radar	No turbines detected
Lowther Hill Radar	No turbines detected

Civil radar (airport)

14.68. The line of sight assessment results within this EIA Report show that there will be no impact on the radar at Edinburgh Airport.

Military radar (air traffic control)

14.69. The line of sight assessment results within this EIA Report show the turbines are likely to impact the radar at Leuchars Station. The radar is likely to detect the rotating turbines and show them on air traffic control displays and there may also be a reduction in the radar's ability to detect aircraft above the optimised Seagreen Project. Without mitigation these effects will impair any air traffic control services that rely on this radar.

14.70. MOD consultation is ongoing and will determine whether there is a requirement to mitigate the impact of the optimised Seagreen project on the Leuchars Station radar.

14.71. In the event that technical mitigation is required then it could be provided through a local in-fill radar from Aveillant, Terma or another supplier. Furthermore other forms of technical mitigation could be identified following further consultation and liaison between Seagreen and the MOD – these could include integration of alternate conventional radar or use of a Transponder Mandatory Zone. Mitigation solutions will be agreed and implemented prior to operation with consultation ongoing as set out in Table 14.2 above.

14.72. In the event that the neighbouring Neart na Gaoithe and Inch Cape offshore wind farms also require mitigation it is likely that a single common solution may be appropriate for all three schemes.

14.73. Without mitigation Project Alpha is likely to be unacceptable and have a significant adverse impact on the radar at Leuchars which would be **Significant** in EIA terms. With the application of suitable technical mitigation the residual impact will be reduced to a level that is considered acceptable and therefore **Not Significant** in EIA terms.

En-Route Radar

14.74. NATS En-Route (NERL) – also referred to as NATS - operate a number of Primary Surveillance Radar (PSR) throughout the United Kingdom. As set out in Table 14.9, the two radar at Lowther Hill and Allanshill will not be affected whilst the radar at Perwinnes

is likely to detect the rotating turbines and display them on air traffic control displays. Without mitigation these effects may impair national civil air traffic control services above the optimised Seagreen Project.

14.75. Consultation with NERL (NATS) has indicated that mitigation will be possible. The most likely form of mitigation involves the establishment of a Transponder Mandatory Zone around Project Alpha. This mitigation would ensure that overflying aircraft will be detected by other Secondary Surveillance Radar that are unaffected by wind turbines. The mitigation solution would require approval by the CAA.

14.76. With the application of identified suitable mitigation the residual impact of Project Alpha on En-route will be acceptable and therefore **Not Significant** in EIA terms.

MOD Air Defence Radar

14.77. As set out within the baseline section of this chapter Air Defence Radar are used by the RAF to detect aircraft that represent a threat to national security. These radar are also used to direct military aircraft to intercept threat aircraft. Wind turbines can impair the performance of Air Defence Radar in the airspace above a wind farm. The analysis undertaken within this assessment and presented in Table 14.9, shows that Project Alpha is likely to have a technical impact on both the radar at Buchan and at Brizlee Wood.

14.78. It is likely that any impacts can be mitigated using in-built technology within the radar system that will eliminate significant wind turbine effects. The radar have processors and filters that can be configured to minimise wind turbine effects whilst continuing to detect and display aircraft correctly.

14.79. MOD consultation is ongoing and radar mitigation will be agreed prior to construction of the Project.

14.80. Without the application of suitable mitigation Project Alpha is likely to have an unacceptable adverse impact on the radar at Buchan and Brizlee Wood which would be **Significant** in EIA terms. With the application of suitable mitigation the residual impact will be acceptable and therefore **Not Significant** in EIA terms.

Low Flying

14.81. The current Civil Aviation Authority topographical chart of the area (CAA 2016 Aeronautical chart) has been reviewed to identify features that may suggest significant low flying activity.

14.82. There is no evidence to suggest that there will be significant levels of military or civil low flying in the vicinity of Project Alpha with no resulting significant impacts predicted.

14.83. The impact is therefore acceptable and **Not Significant** in EIA terms, there is no requirement for mitigation and the residual impact is also therefore acceptable and **Not Significant** in EIA terms**.**

Civil Aviation Authority (CAA) – Lighting

14.84. The wind turbines are to be lit in accordance with the requirements of Civil Aviation Authority CAP 393 and CAP 764 Policy and Guidelines on wind turbines.

14.85. Wind turbines are lit at night with medium intensity 2000 candela lights to reduce the risk of aircraft collision.

14.86. The impact is therefore acceptable and **Not Significant** in EIA terms, there is no requirement for additional mitigation and the residual impact is also therefore acceptable and **Not Significant** in EIA terms.

Project Bravo

14.87. RLOS Analysis has been undertaken for a number of radar and a sample of indicative turbine locations for Project Bravo. The assessed radar are listed in Table 14.2, with the locations of the sample turbine locations being shown in Figure 14.2, Volume II and listed in Table 14.10. The sample has been selected to accurately reflect the overall impact of all turbines with sample locations being evenly spaced around the Project Bravo boundary.

14.88. RLOS Assessment reports are shown for each radar in Volume III, Appendices 14A to 14G.

Table 14.10 Sample indicative turbine locations – Project Bravo

Sample	UTM 30N Easting	UTM 30N Northing	BNG Easting	BNG Northing
B1	571734.195	6266030.444	410327.54	737910.85
B2	576762.096	6265753.532	415350.59	737560.78
B3	581789.998	6265476.619	420373.6	737210.72
B4	586680.359	6271078.727	425344.67	742740.62
B5	582828.108	6267097.001	421435.12	738815.7
B6	576624.556	6271632.552	415298.69	743440.83

14.89. RLOS results for Project Bravo sample turbines, with a maximum blade tip height of 280m, are shown in Table 14.11 below. Positive values indicate the turbine is likely to have a technical impact on the radar whereas negative values indicate the turbine is unlikely to affect the radar. The values in the table are the vertical clearance, in metres, between the wind turbine tip and the RLOS. Further information is available in Volume III, Appendices 14A to 14G.

Table 14.11 RLOS results summary – Project Bravo

Sample turbine	Brizlee Wood	Buchan	Edinburgh	Leuchars	Perwinnes	Allanshill	Lowther Hill
B1	75	67.8	-770.5	184.9	42.1	-355.4	-674.6
B2	78	64.8	-847.2	161.1	114.4	-543.1	-1252.9
B3	79.5	60	-900.4	134.5	106.2	-597.8	-1233.5
B4	37.6	93.8	-1055.5	96.5	208.9	-663	-1399.5
B5	68	70.6	-923	126.3	171.6	-576.8	-1298.9
B6	35.6	104.4	-836.8	152.9	173.8	-496.9	-737.9

14.90. Expert analysis of the RLOS results has been undertaken to better understand the potential radar impact with potential impacts summarised in Table 14.12 below.

14.91. Pager Power has observed the impact of numerous wind farms on various civil and military radar systems and therefore has an in-depth understanding of the relationship between RLOS results and expected impact on air traffic control and air defence radar displays. This expertise has been used to determine the likely impact on the assessed radar.

Table 14.12 Radar Impact summary – Project Bravo

Radar	Likely Impact
Brizlee Wood Radar	All turbines detected – at worst case maximum height
Buchan Radar	All turbines detected – at worst case maximum height
Edinburgh Radar	No turbines detected – at worst case maximum height
Leuchars Radar	All turbines likely to be detected
Perwinnes Radar	All turbines detected – at worst case maximum height
Allanshill Radar	No turbines detected – at worst case maximum height
Lowther Hill Radar	No turbines detected – at worst case maximum height

14.92. The impacts, required mitigation measures and residual impacts for Project Bravo are identical to those for Project Alpha and are summarised in Table 14.13 at the end of this chapter. This is because the two projects have similar visibility to the radar.

Projects Alpha and Bravo Combined

14.93. There are no major differences between the impacts of Project Alpha, Project Bravo or Project Alpha and Project Bravo in combination. This is because Project Alpha and Project Bravo have similar technical radar impacts.

IMPACT ASSESSMENT – DECOMMISSIONING PHASE

14.94. There are no significant differences between the impacts of Project Alpha, Project Bravo or Project Alpha and Bravo in combination. This is because Project Alpha and Project Bravo both affect the same radar and will have similar technical impacts. This occurs because of the turbines' distance from the relevant radar and because the areas are similar.

Project Alpha

Potential Impacts

14.95. The impact of wind turbines on radar is a factor during the operational phase of a Project, however stationary turbines do not cause radar interference. Impacts during decommissioning therefore relate to the impact of stationary wind turbines and cranes on low flying aircraft.

14.96. Details of decommissioning activity will be promulgated via the NATS Aeronautical Information Service (AIS) in time to ensure that it can be promulgated to all affected airspace users, as set out in Table 14.6. This is an approved and recognised method of disseminating information concerning the presence of temporary hazards to aviation. Information will include the vertical heights of obstacles, both temporary in nature such as cranes used to dismantle the turbines and the permanent wind farm. This will ensure there is no unacceptable impact on aviation.

14.97. The impact of the Project Alpha during the decommissioning phases is therefore considered acceptable and is **Not Significant** in EIA terms.

Additional Mitigation

14.98. Impact are assessed as not significant and therefore there is no additional requirement for mitigation.

Residual Impact

14.99. The residual impact of Project Alpha, during this phase, is therefore also considered acceptable and is **Not Significant** in EIA terms**.**

Project Bravo

14.100. The impact of Project Bravo during the decommissioning phase would be the same as Project Alpha. This occurs because of the turbines' distance from the relevant radar and because the wind farm areas are similar. Therefore the impact is considered acceptable and **Not Significant** in EIA terms. There is no additional requirement for mitigation and the residual impact of Project Bravo during this phase is therefore acceptable and **Not Significant** in EIA terms.

Projects Alpha and Bravo Combined

14.101. The impact of Projects Alpha and Bravo combined during the decommissioning phase is therefore acceptable and **Not Significant** in EIA terms. This is because the turbines will not be moving and will not affect the radar. There is no additional requirement for mitigation and the residual impact of Projects Alpha and Bravo combined during this phase is also acceptable and **Not Significant** in EIA terms.

IMPACT ASSESSMENT: CUMULATIVE

14.102. The EIA Regulations require the assessment of cumulative impacts. This requires consideration and assessment of existing projects, projects under construction and consented or proposed projects identified in relevant development plans and programmes that have the potential to impact cumulatively with the optimised Seagreen Project.

14.103. Cumulative impacts can occur when the impacts from one project on an identified receptor combine (through either spatial or temporal overlap) with similar impacts from other projects on the same receptor. The purpose of considering cumulative impacts is to understand if the impacts from the optimised Seagreen Project parameters (Project Alpha and Project Bravo), when considered together (combined), or cumulatively with other plans and projects are different, or more significant than from the individual projects in isolation. This enables additional mitigation to be identified, as appropriate.

14.104. Cumulative impacts are considered for all stages of the optimised Seagreen Project throughout construction, operation and decommissioning. It should be noted that the Offshore Transmission Asset is already licensed and is unchanged, therefore this is considered alongside the other identified projects and plans.

14.105. Identification of relevant projects and developments has been informed by scoping and wider consultation, with reference to the 2017 Scoping Opinion and as set out within Chapter 7 (Scope of EIA Report). Potential cumulative impacts are considered within the assessment set out below. The wind farms specified in the scoping opinion are:

- Worst case scenario of Inch Cape (2014 [originally consented project]) or Inch Cape (2017 scoping report);
- Worst case scenario of Neart na Gaoithe (2014 [originally consented project]) or Neart na Gaoithe (2017 scoping report);
- Kincardine Offshore Wind Farm;
- European Offshore Wind Deployment Centre;

- Hywind Scotland Pilot Park;
- Forthwind Offshore Wind Farm (2016 consent);
- Forthwind Offshore Wind Demonstration Project;
- Blyth Offshore Wind Farm – 2 turbines;
- Blyth Offshore Wind Demonstration Project – 15 turbines;
- Beatrice Offshore Wind Farm;
- Worst case scenario of Moray Offshore East Development or Moray East Offshore Wind Farm – Alternative Design;
- Moray West Offshore Wind Farm; and
- Offshore Renewable Energy Catapult Levenmouth.

14.106. Wind farms may have cumulative impacts on radar, due to either technical or operational reasons. An example of a technical cumulative impact would be radar screen clutter where an increase in the wind farm area could cause an increase in the area of radar screen clutter. An example of an operational cumulative impact might be that an air traffic controller could readily accept the small impact of one wind farm yet could not accept the increased workload caused by the effects of multiple wind farms. The potential cumulative impacts of each of the above developments have been considered.

14.107. Cumulative technical assessments usually consider all wind turbines, aircraft and other potential targets that could impact a particular radar installation. The range of some of the radar assessed within this EIA Report, extends beyond 200 nautical miles (364km), meaning that the area to be assessed cumulatively covers the majority of northern Britain and is too large to undertake a useful cumulative assessment.

14.108. Cumulative operational assessments usually consider minimum horizontal separation distances between aircraft and wind turbines – typically 5 nautical miles (9.3km). For offshore developments operational cumulative assessments may typically extend to neighbouring wind farm developments within 15 nautical miles (28km). Neighbouring wind farm developments within 15 nautical miles of the optimised Seagreen project are Inch Cape and Neart na Gaoithe.

14.109. In this case the assessed optimised Seagreen Project has an area of more than 390km^2. This means that the development is likely to be deemed unacceptable in the event that there is a significant technical impact on the radar in an area of operational importance – irrespective of the impacts of any neighbouring wind developments including Inch Cape and Neart na Gaoithe. In the event that the radar impact is deemed unacceptable then mitigation will be necessary – again irrespective of the impact of any neighbouring wind developments.

14.110. In this case the determination of whether radar impact is acceptable and the determination of whether mitigation will be required are not dependent on the existence, or radar impact, of other wind farm developments. Therefore, with the implementation of required mitigation the impact of the optimised Seagreen Project cumulatively with other developments would be acceptable and **Not Significant** in EIA terms.

14.111. Specific radar mitigation solutions for one wind farm may also be employed to mitigate other wind farms. The cumulative issue of mitigation sharing is beyond the scope of this EIA chapter as the design and planning of any mitigation solutions are unlikely to be finalised prior to consent being granted.

14.112. Whilst no specific technical or operational requirement for cumulative assessment of impact has been identified, it may be advantageous to implement shared radar technical mitigation solutions for the proposed optimised Seagreen, Neart na Gaoithe and Inch Cape offshore wind developments.

INTERRELATIONSHIPS

14.113. Interrelationships describe the potential interaction of multiple project impacts upon one receptor and have a spatial and/or temporal component. Impacts may occur throughout different phases of the project (construction, operation or decommissioning) and/or different project effects may have spatial overlap and may interact to create a more significant impact on a receptor than when considered in isolation. Interrelated impacts may be short term, temporary or longer term over the lifetime of the Project.

14.114. No interrelated impacts have been identified for Military and Civil Aviation when considered with other topic assessments.

TRANSBOUNDARY IMPACTS

14.115. Aviation receptors are treated as standalone issues and therefore no transboundary impact are identified.

MITIGATION AND MONITORING

14.116. There are no outline monitoring proposals required for Military and Civil Aviation. Mitigation solutions will be required and consultation with NATS and the MOD is ongoing to ensure appropriate solutions are implemented prior to construction or operation of the Project.

IMPACT ASSESSMENT SUMMARY – THE OPTIMISED SEAGREEN PROJECT

14.117. This chapter has assessed the potential impacts on Military and Civil Aviation of the construction, operation and decommissioning phases of the optimised Seagreen Project, both in isolation and cumulatively. Where significant impacts have been identified, additional mitigation has been considered and incorporated into the assessment. Table 14.13 summarises the impact assessment undertaken and the conclusion of residual impact significance, following the application of additional mitigation.

14.118. The 2012 Offshore ES identified potentially unacceptable impacts from Project Alpha and Project Bravo on two types of radar (military and MOD air defence radar). A commitment was made to the development of technical mitigation solutions with the MOD to address each of these potential impacts, resulting in a conclusion of no significant impacts.

14.119. The 2018 assessment, as summarised above, has identified potentially unacceptable impacts from Project Alpha and Project Bravo on the civil NATS En-route radar at Perwinnes, military radar (air traffic control) and MOD air defence radar. A commitment is made to technical mitigation solutions to be developed with NATS and the MOD to address each of these potential impacts. With these mitigation measures in place these potential impacts will be reduced to acceptable and not significant in EIA terms.

14.120. With regards to cumulative impact assessment both the 2012 Offshore ES and 2018 assessments identify the potential for cumulative impacts on radar. However, with the implementation of suitable mitigation measures the potential impacts would be reduced acceptable and therefore not significant.

Table 14.13 Summary of Impacts

Receptor	Potential Impact	Phase (C, O or D)	Impact (pre-Mitigation)	Mitigation Measures	Residual Impact
Project Alpha					
Low flying	Presence of cranes and stationary turbines	C, D	Acceptable	None required	Not significant
Civil radar (airport)	Radar Impact	O	Acceptable	None required	Not significant
Military radar (air traffic control)	Radar Impact	O	Impact on Leuchars radar potentially unacceptable	Technical mitigation solution to be implemented if required	Not significant
En-Route radar	Radar Impact	O	Impact on Perwinnes unacceptable	Mitigation will be required	Not significant
MOD air defence radar	Radar Impact	O	Impact on Buchan and Brizlee Wood radar potentially unacceptable	Mitigation likely to be required	Not significant
Low flying	Presence of wind turbines	O	Acceptable	None required	Not significant
Cumulative	Radar Impact	O	Acceptable	None required	Not significant (See para. 14.107)
Project Bravo					
Low flying	Presence of cranes and stationary turbines	C, D	Acceptable	None required	Not significant
Military radar (air traffic control)	Radar Impact	O	Impact on Leuchars radar potentially unacceptable	Technical mitigation solution to be implemented if required	Not significant
En-Route radar	Radar Impact	O	Impact on Perwinnes unacceptable	Mitigation will be required	Not significant
MOD air defence radar	Radar Impact	O	Impact on Buchan and Brizlee Wood radar potentially unacceptable	Mitigation likely to be required	Not significant
Low flying	Presence of wind turbines	O	Acceptable	None required	Not significant
Cumulative	Radar Impact	O	Acceptable	None required	Not significant (see para. 14.107)

Receptor	Potential Impact	Phase (C, O or D)	Impact (pre-Mitigation)	Mitigation Measures	Residual Impact
Project Alpha and Project Bravo Combined					
Low flying	Presence of cranes and stationary turbines	C, D	Acceptable	None required	Not significant
Civil radar (airport)Military radar (air traffic control)	Radar Impact	O	Impact on Leuchars radar potentially unacceptable	Technical mitigation solution to be implemented if required	Not significant
En-Route radar	Radar Impact	O	Impact on Perwinnes unacceptable	Mitigation will be required	Not significant
MOD air defence radar	Radar Impact	O	Impact on Buchan and Brizlee Wood radar potentially unacceptable	Mitigation likely to be required	Not significant
Low flying	Presence of wind turbines	O	Acceptable	None required	Not significant
Cumulative	Radar Impact	O	Acceptable	None required	Not significant (see para. 14.107)
Key: C = Construction, O = Operational, D = Decommissioning					

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