

CHAPTER 22: MITIGATION AND MONITORING

INTRODUCTION

- 22.1. This chapter of the ES summarises the potential mitigation described in the topic chapters and provides an overview of the future monitoring approach to be adopted by Seagreen.
- 22.2. All appendices referred to in this chapter can be found in Volume III: Appendices.

Approach to mitigation

- 22.3. In this ES the impact assessment chapters have considered worst case scenarios for each impact assessment using a Rochdale Envelope approach. This process involved a rigorous iterative design and assessment stage whereby the design parameters were tested and changed to reduce the residual impacts on key receptors. Mitigation by design was also introduced using the ZAP process whereby data gathered in 2010 and 2011 was analysed to refine the site selection and definition of the offshore wind farm projects within the Zone.
- 22.4. The key mitigations by design are:
- sites located to the east of the scalp bank to reduce potential impacts on seabirds, marine mammals and on commercial fishing activity in the Zone and reduce cumulative and in combination effects with the two STW projects.
 - Fewer, larger WTGs with greater separation distances chosen to reach target capacity to reduce the potential impacts on seabirds.
 - bury the array cables and export cables wherever feasible. Based on currently available information it is considered possible that up to 90% burial could be achieved and where cable burial cannot be achieved protection measures will be installed such as rock armouring or placement of concrete mattresses.
- 22.5. During the subsequent detailed design stage some of the residual impacts will be reduced (i.e. there will be further mitigation by design) and consequently the current mitigations, which are stated in this ES will change as the design evolves. Seagreen are committed to working with the relevant regulatory authorities, consultees and stakeholders to develop a suite of mitigation measures and hence application conditions which allow the Seagreen Project to be developed, installed, operated and decommissioned without resulting in significant environmental impacts.
- 22.6. The mitigation measures summarised here apply equally to Project Alpha, Project Bravo and the Transmission Asset Project, unless separately specified.

Approach to monitoring

- 22.7. Seagreen will ensure the development of an appropriate monitoring programme to review the effectiveness of the measure proposed by way of mitigation, and to identify and address possible effects that significantly differ from those predicted, or that were not predicted, in the assessments presented in this ES, and so enable an appropriate response to be considered. The programme will address such issues (amongst others) as effects on birds transiting or otherwise exploiting the Project Alpha and Project Bravo areas, marine mammals, other marine biological resources, water sedimentation, effects on commercial fish stocks and commercial fishing activities, as well as maritime traffic.

- 22.8. This approach will be developed in consultation with the regulatory authorities, consultees and stakeholders, as appropriate. It will be based on the establishment of an appropriate baseline, informed by specific surveys, as indicated in the technical chapters of this ES, and tailored to the final construction methods to be adopted from the Rochdale Envelope at the final design stage (FEED). Any specific monitoring arrangements (and any actions arising from them) will be compliant with all relevant legislation and license requirements, and agreed with the relevant statutory consultees and regulatory authorities (and/ or other stakeholders) and will be co-ordinated and implemented via the relevant Seagreen Project Construction Method Statements and Environmental Management Plans.
- 22.9. No specific monitoring arrangements have been detailed in this chapter. Arrangements appropriate to each technical discipline and construction activity will be agreed with the relevant regulatory authorities and other stakeholders, and in accordance with any legal or licensing requirements prior to construction.

PHYSICAL ENVIRONMENT MITIGATIONS

Physical Environment

- 22.10. Predicted direct impacts to the bedform will be primarily mitigated through use of the smaller diameter GBS foundations (54m² rather than 72m²) for the major infrastructure where possible and subject to detailed design criteria and on a case by case basis. The need for scour protection will be considered on a case by case basis. Where possible, jacket substructure / foundations will be preferred to reduce the need for seabed preparation (and limit potential sediment release and consequent contaminant remobilisation). If the need for seabed preparation at any location is determined, a licence will be applied for under the Marine (Scotland) Act 2010 for Dredging and Deposit of Solid Waste in the Territorial Sea and UK Controlled Waters Adjacent to Scotland. This will necessarily consider details of the areas and materials to be dredged and a Best Practicable Environmental Option (BPEO) Assessment for deposit of the materials, including consideration of re-use of material as substructure / foundation ballast, beneficial use and disposal at sea.

Water and Sediment Quality

- 22.11. All contractors will be required by the Applicants to put in place appropriate Construction Environmental Management Plans (CEMP) and Pollution Control and Spillage Response Plans that will be agreed with the regulatory authorities prior to offshore construction activities commencing. These plans will reduce the potential for accidental pollution and in the unlikely event of a pollution incident, should ensure a rapid and appropriate response. Similar plans will be in place for the operational and decommissioning phases.
- 22.12. Best practice guidance will be followed to ensure that potential damage to coastal environmental features by disruption of sediment transport is minimised throughout the proposed construction works. The use of HDD activities for the installation of export cables at the landfall will assist in minimising impact. No rock dumping or surface protection of cables in shallow inshore water is necessary as cables will be buried. The HDD Contractor, through their construction method statement(s) shall commit to contain, handle, and dispose of drilling fluids in accordance with the standard requirements and best practice, and to ensure that a Competent Person (for purposes of the relevant licensing requirements, regulations and standards) is present on site whenever HDD activities are undertaken.

- 22.13. As with the mitigation associated with the physical environment (above), if the need for seabed preparation at any location is determined, a licence will be applied for under the Marine (Scotland) Act 2010 for Dredging and Deposit of Solid Waste in the Territorial Sea and UK Controlled Waters Adjacent to Scotland. This will necessarily consider details of the areas and materials to be dredged and a BPEO Assessment for deposit of the materials, including consideration of re-use of material as substructure / foundation ballast, beneficial use and disposal at sea.
- 22.14. The potential that construction vessels may bring non-native or invasive species to the area will be mitigated by a risk assessment process, taking into account previous vessel locations, activities and planned routes, leading to recommendation for management measures. These will be developed and agreed between Marine Scotland and the contractors prior to work commencing. Any concerns identified will be subject to further consultation with SNH and SEPA to ensure compliance with the Water Framework and Marine Strategy Framework Directive objectives.

BIOLOGICAL ENVIRONMENT MITIGATION

Ornithology

- 22.15. Although no greater than a minor impact is predicted for displacement to birds due to increased boat traffic, guidance will be provided as part of a code of conduct to vessel operators on avoiding ‘rafts’ of birds and feeding aggregates by vessels accessing / servicing Project Alpha and Project Bravo. Good practice by vessel operators is not considered to further substantially reduce impacts, although it would potentially reduce any effect upon individual seabirds during vessel operations.
- 22.16. In respect of noise impacts on prey species, at this stage, no mitigation other than the use of best practice in piling (i.e. soft start) is assumed. Currently the only technically and economically feasible installation methodologies for WTGs require a certain amount of pile driving. Although pile driving mitigations have been developed, there is currently no method suitable for jacket substructure and associated foundations in deep water. However, currently there is extensive work under way within the industry looking into both potential noise mitigation methods for piling as well as alternative non-piled substructure / foundation solutions. Seagreen is actively involved in this process but until new evidence is presented, no mitigation can be adopted. Nearer to the time of construction the application of such methods will be considered where appropriate.
- 22.17. Retaining flexibility in the selection of preferred design options is a vital mitigation in the management of project risks. As such, until final design options are determined as part of the FEED process, including WTG array layouts; the WTG specification and supplier; substructure / foundation type and installation methodology; and the electrical design, it is not possible to establish any mitigation for potential collision impacts or barrier effects. Following detailed design, consideration will be given to micro-sting WTGs within each OWF site to avoid high density areas and reduce collision risk and to potentially establish a flight corridor reducing potential mortality and barrier effects.

Benthic Ecology and Intertidal Ecology

- 22.18. Preconstruction surveys (the scope and extent of which will be agreed with Marine Scotland) will be undertaken to identify presence of rare or important habitats. Micro-siting of WTGs, array cables and ancillary structures, could be undertaken to avoid the areas of the more sensitive habitats (including those that may be identified in pre-construction survey) wherever practicable. Use of smaller GBS foundations, where possible, will reduce impact on the seabed, and consideration will be given to use of jacket substructures associated foundations to limit need for seabed preparation and minimise potential for sediment release and reduce consequent risk of benthic smothering. These considerations will form part of the FEED process. Best practice guidance will be followed to ensure that potential habitat loss is minimised throughout the proposed construction works. The amount of rock, grout bags or mattresses used to protect the cable will be kept to the minimum amount (which may be less than the worst case estimate of 10%) necessary to ensure protection. In line with best practice, vehicle movements in the intertidal area will be limited in number and kept within the minimum practicable working area and consideration will be given to use of temporary tracking in areas of softer sand during the cable installation works.
- 22.19. It is anticipated that surveying for Annex I habitat will be undertaken prior to decommissioning. Should these surveys indicate the presence of any sensitive habitats the Applicants will discuss how to decommission the OWFs with the relevant regulatory authorities and stakeholders to avoid, where possible, impacts upon such habitats.

Natural Fish and Shellfish Resource

- 22.20. Micro-siting of WTG, array cables and ancillary structures could be undertaken to avoid the areas of the more sensitive habitats wherever practicable. Consideration will be given to use of scour protection at some locations (on a case by case basis) to reduce the amount of suspended sediments and associated remobilised contaminants (if present) reducing any effects on fish / shellfish in the immediate localities.
- 22.21. Best practice guidance will be followed to ensure that potential habitat loss is minimised throughout the proposed construction works. The amount of rock, grout bags or mattresses used to protect the cables will be kept to the minimum amount (which may be less than the worst case estimate of 10%) necessary to ensure protection.
- 22.22. At this stage no mitigation other than the use of best practice in piling (i.e. 'soft start') is assumed to mitigate noise impacts. Seagreen is considering alternatives to piling, in addition to closely monitoring and engaging in the development of new piling mitigation technologies. Nearer to the time of construction the application of such methods will be considered where appropriate, as part of the FEED process.

Marine Mammals

- 22.23. A Marine Mammal Mitigation Plan (MMMP) will be developed in consultation with Marine Scotland and SNH, once the final design process has been completed.
- 22.24. In respect of potential behavioural and auditory injury impacts on marine mammals, best practice piling methods (i.e. soft start, ramp up) will be adopted. In addition the provision of a Marine Mammal Observer (MMO) and/or Passive Acoustic Monitoring (PAM) following JNCC guidelines is likely to be part of the licensing requirement. This should allow for an exclusion zone around the source of pile driving of up to 500m. The use of Acoustic Deterrent Devices (ADDs), if deemed appropriate at the time of design and implementation of a mitigation plan, will be considered as a likely alternative or addition to the provision of MMOs.

- 22.25. As already stated previously for natural fish and shellfish resource; at present the only technically and economically feasible installation methodologies for WTGs require a certain amount of pile driving and although pile driving mitigations have been developed, there is currently no method suitable for jacket substructure / foundations in deep water. The possibility of a reduction in noise at source has been considered in the noise propagation modelling (ES Volume III Appendix H6, Section 6-6). The mitigation modelling was designed to investigate the effect of different degrees of attenuation of impact ranges, and the results are presented as an indication of potential reductions in range. At the time of writing the ES, noise reduction at source is not considered to be at a technologically advanced stage, to quantify and apply in the case of this development, and no reduction in the predicted impacts has been considered.
- 22.26. However, there is extensive work currently under way within the industry looking into both potential noise mitigation methods for piling as well as alternative non-piled substructure / foundation solutions. Seagreen is actively involved in this process but until new evidence is presented no mitigation can be adopted. Nearer to the time of construction, the application of such methods will be considered where appropriate.

HUMAN ENVIRONMENT MITIGATION

Commercial Fisheries

- 22.27. There will be rolling safety zones of up to 500m around each major construction activity, from which all non-construction associated vessels would be excluded for the duration of the construction phase (up to 4 years). The fisheries assessment concluded that until the appropriate post-installation surveys have been undertaken to confirm the ‘over-trawlability’ of seabed around cables, it is considered that the safety risks during and post-construction phase to fishing vessels will be outside of acceptable limits.
- 22.28. It is proposed that a regional Working Group is established to facilitate future engagement of the fishing industry by FTOWDG. This will likely include representatives of all the fishing activities identified in the Forth and Tay area, FTOWDG developers, Marine Scotland and The Crown Estate. The objectives of the Working Group may include, but not necessarily be limited to:
- the development of collaborative mitigation options; and
 - defining aspects of construction management plans which can feasibly be standardised.
- 22.29. In addition to the mitigation measures described for the construction phase, dialogue between the fishing community and the Applicants will be ongoing throughout the operational phase. It is anticipated that the Working Group will provide a forum for ongoing operational engagement, including:
- protocol for the navigation of OWF operations and maintenance vessels to and from the site (i.e. agreement of transit lanes to minimise interference to fishing activities); and
 - established procedures in the event of interactions between OWF operation activities and fishing activities (i.e. claims for lost and/ or damaged gear).
- 22.30. Mitigation measures in respect of shipping and navigation safety concerns as presented in below is also considered relevant in respect of commercial fisheries operations.

Shipping and Navigation

22.31. Mitigation measures that will be required following the assessment of shipping and navigation are:

- promulgation of information and warnings through Notices to Mariners, Kingfisher publications, fisheries liaison, local recreation clubs and marinas and further appropriate media on construction activities, cable installation works and other wind farm matters;
- guard vessels where appropriate to aid emergency situations and warn vessels;
- application for and use of safety zones to protect the construction/ decommissioning site;
- appropriate means to notify and provide evidence of the infringement of construction safety zones;
- use of vessels that are 'fit for purpose' for the construction activities including marked in accordance with International Regulations for the Prevention of Collisions at Sea (COLREGS) and fitted with an AIS transponder to prevent them becoming a risk factor;
- aids to Navigation in line with International Association of Lighthouse Authorities (IALA) O-139 (IALA, 2008) and MCA / NLB Requirements (which will include a system of routine inspection and maintenance of lights and markings);
- additional temporary buoyage if required to assist safe navigation. This would be based on guidance from NLB and would assist navigation around partially constructed peripheral structures which may not be properly lit until fully constructed;
- creation of an Emergency Response Co-operation Plan (ERCoP) with the relevant Maritime Rescue Co-ordination Centre (MRCC) from construction phase onwards, including MCA standards and procedures for WTG shut-down in the event of a search and rescue, counter pollution or salvage incident in or around an OWF;
- monitoring by radar, AIS and Closed Circuit Television (CCTV) or other agreed means;
- fenders / bumper bollards installed on structures;
- clear notification of works (especially pre charting of cables);
- subsea cables will be buried or trenched where possible to provide protection from dragged and dropped anchors and dropped objects;
- where burial/ trenching is not possible, cables will be protected by other means such as rock dumping and concrete mattresses;
- burial (where possible) of array cables and post-installation surveys on array cables to confirm 'over-trawlability' of seabed;
- cable details will also be provided to the United Kingdom Hydrographic Office (UKHO) for inclusion on Admiralty Chart;
- any cables installed within the cable corridor will be notified to Kingfisher Information Services and Cable Awareness (KISCA) for inclusion in cable awareness charts and plotters for the fishing industry; and
- cable burial (where possible) and bundling to reduce the effect of electromagnetic interference.

Seascape, Landscape & Visual Amenity

- 22.32. No mitigation is proposed in respect of temporary construction (or decommissioning) activities in Project Alpha, Project Bravo or the Transmission Asset Project other than industry best practice. Consideration will be given to limiting light spill (by directional lighting, directed downwards) from construction vessels involved in cable laying and related activities at night within 2km of the shore, to avoid visual intrusion at residential locations.
- 22.33. No mitigation is proposed in respect of any potential effects predicted from the operation of Project Alpha or Project Bravo, due to their distance from the shore (at 27km and 38km respectively).

Archaeology and Cultural Heritage

- 22.34. Mitigation leading to preservation *in situ* will be preferred where possible. Where cultural heritage assets may potentially be subject to direct effects, infrastructure may be micro-sited and temporary exclusion zones implemented to prevent invasive activities (such as WTG and array cable installation or anchoring of vessels or deployment of jack-up legs) from damaging those assets. Exclusion zones of at least 100m will be implemented around cultural heritage assets defined in the assessment as of high sensitivity and 50m around assets defined as of medium sensitivity (see assets listed in Chapter 17: Archaeology and Cultural Heritage of the ES).
- 22.35. In order to mitigate the risk of damage to any unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeological Service, in their capacity as advisors to Angus Council. This will allow investigation and recording of any such unexpected remains, leading to preservation by record.
- 22.36. These measures will form part of the CEMP.

Military and Civil Aviation

- 22.37. Seagreen are committed to ongoing dialogue with stakeholders to agree mitigations to ensure that there are no significant residual impacts.
- 22.38. Mitigation will consist of:
- publication of the construction and site details through the mandated and accepted NATS AIS procedures should ensure complete dissemination of all necessary information to all air users;
 - the Seagreen Project will be clearly defined on all aviation charts in accordance with MOD and CAA requirements; and
 - Article 220 of the UK Air Navigation Order 2009, which requires that each WTG is fitted with medium intensity (minimum 2,000 candelas) steady red lighting on the top of the nacelle such that the light or lights are visible from all directions and that such lighting is displayed at night.
- 22.39. In the event that RAF Leuchars (and its associated radar) is closed in 2013, no mitigation will be required in respect of radar used at this facility. In the event that the facility's operational life is extended, a technical radar mitigation solution will be agreed with the MOD.

22.40. A number of technical mitigation solutions are currently being developed within the industry to address potential wind farm impacts and are likely to become available in time to provide mitigation for the Project Alpha and Project Bravo WTGs when they become operational. These include:

- creation and installation of in-fill radar solution;
- re-configuration of the system to enhance the utilization of the radars in the network;
- re-configuration of the system to remove clutter through blanking; and
- upgrades to the radar.

Other Marine Users and Activities

22.41. Consideration has been given to mitigation for other marine users and activities (primarily recreational and commercial transport users) in relation to mitigation for maritime hazards, as discussed in Chapter 15: Shipping and Navigation of the ES. The mitigation measures summarised in shipping and navigation above are considered to apply here.