



Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 2, Chapter 14: Inter-relationships

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Abbreviations and acronyms

TERM	DEFINITION
AEZ	Archaeological Exclusion Zone
AyM	Awel y Môr Offshore Wind Farm
CEA	Cumulative Effects Assessment
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
IPC	Infrastructure Planning Commission
LVIA	Landscape and Visual Impact Assessment
MCMP	Marine Pollution Contingency Plan
MDS	Maximum Design Scenario
MMMP	Marine Mammal Mitigation Protocol
PEIR	Preliminary Environmental Information Report
PEMP	Project Environmental Management Plan
PINS	The Planning Inspectorate
SoS	Secretary of State
SLVIA	Seascape, Landscape and Visual Impact Assessment
SSC	Suspended Sediment Concentration
WSI	Written Scheme of Investigation
ZoI	Zone of Influence

15 Inter-relationships

15.1 Introduction

- 1 This chapter of the Environmental Statement (ES) has been drafted by GoBe Consultants Ltd. on behalf of the Applicant and summarises the assessment of inter-related effects across the physical, biological and human environments during the construction, operation and decommissioning phases of the onshore and offshore aspects of the project.
- 2 Inter-relationships can be defined as multiple effects on the same receptor group arising from the development of the Awel y Môr Offshore Wind Farm (AyM), where a number of separate effects occur on a single receptor, leading to an additive effect beyond that described for each individual effect considered.
- 3 The chapters of the ES identify the potential environmental impacts arising from AyM in respect of specific environmental parameters. These chapters have also been structured so as to identify and assess the potential for inter-relationships and any associated inter-related effects that may result.

15.2 Statutory and policy context

- 4 The Environmental Impact Assessment (EIA) Directive (European Council Directive 85/337/EEC) (the 'EIA Directive'), transposed into UK law via the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and the Marine Works (Environmental Impact Assessment) Regulations 2007 (collectively referred to as the 'EIA Regulations'), requires that inter-relationships be considered. Annex III of the EIA Directive states that the following should be included in an ES:

'A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.'

- 5 This chapter has been compiled following guidance from the Planning Inspectorate (PINS) on the need to ensure that inter-related effects are fully addressed. The advice is outlined in PINS Advice Note Nine (PINS, 2018), which states:
- 6 *'Where the Applicant chooses to follow a parameters-led assessment to establish the worst-case scenario for the ES, they should ensure that the applicable parameters are explained and clearly set out in order to:*
- ▲ *Ensure that interactions (interactions between aspect assessments includes where a number of separate impacts, e.g. noise and air quality, affect a single receptor such as fauna) between aspect (the Planning Inspectorate refers to 'aspects' as meaning the relevant descriptions of the environment identified in accordance with the EIA Regulations) assessments are taken into account relevant to the worst case scenario(s) established and that careful consideration is given to how these are assessed; and*
 - ▲ *Ensure that the assessment of the worst-case scenario(s) addresses impacts which may not be significant on their own but could become significant when they inter-relate with other impacts alone or cumulatively with impacts from other development (including those identified in other aspect assessments).'*
- 7 Paragraph 4.2.6 of the Overarching NPS for Energy (NPS EN-1) (DECC, 2011) also states that:
- 8 *'The Infrastructure Planning Commission (IPC) [now the relevant Secretary of State (SoS)] should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy and community as a whole, even though they may be acceptable when considered in an individual basis with mitigation measures in place.'*
- 9 The equivalent Paragraph 4.2.4 of the draft NPS EN-1 also states that:
- 10 *'The Secretary of State should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy, or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place'.*

15.3 Consultation

- 11 Consultation is a key part of the DCO pre-application process. Consultation regarding the EIA, including inter-related effects, has been undertaken with various statutory and non-statutory stakeholders, through the agreed Evidence Plan process and other consultation activities. A formal Scoping Opinion was sought from the SoS following submission of the Scoping Report (innogy, 2020), which was received in July 2020.
- 12 AyM's statutory consultation period under Section 42 of the Planning Act 2008 ran from 28 August 2021 to 11 October 2021, a period of six weeks. The Preliminary Environmental Information Report (PEIR) was published as part of the formal consultation which provided the results of the EIA work undertaken to date. A further Section 42 consultation ran between 1 February 2022 and 2 March 2022, targeted on the amendments to the Order Limits made after the end of the PEIR consultation.
- 13 A summary of the responses specifically relevant to the inter-related effects assessment is given in Table 1 below. It should be noted however that comments received within the context of the individual topic-specific assessments, some of which include commentary on the inter-related effects assessments of those topic areas, are discussed within the relevant topic-specific ES chapters. Table 1 provides a summary of the key themes of feedback received in relation to inter-related effects and how the feedback has been considered in the ES. A full list of comments received during the formal consultation period, and the responses to those comments, is provided in the Consultation Report (application ref: 5.1).

Table 1: Summary of consultation relating to the inter-related effects assessment.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
<p>NRW Section 42 response October 2021</p>	<p>Volume 2, Chapter 14: Inter-relationships Page 17-19, Table 4: Inter-related effects assessment – fish and shellfish ecology. Receptor led effect text. As NRW do not agree or disagree with the conclusions made on the impacts to fish and shellfish receptors from noise, NRW are unable to agree to the conclusions made for inter-related effects. Furthermore, NRW advise that further evidence and rationale is provided for the statements made in relation to inter-related impacts, such as effects being mutually exclusive and that fish displaced from areas due to noise impacts during piling will subsequently not be around to also be impacted by other pathways such as additional drilling or increases in SSC.</p>	<p>See Volume 2, Chapter 6: Fish and Shellfish Ecology (application ref: 6.2.6) for updates made to the noise assessment. Further evidence has been provided in Table 5 in relation to mutually exclusive effects.</p>

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	<p>Table 5: Inter-related effects assessment – marine mammal ecology, page 20</p> <p>As mentioned in the comments on PEIR Volume 2, Chapter 7: Marine Mammals section 1.5.1, NRW suggest the sensitivity of all species to PTS from piling is upgraded from the levels listed.</p>	<p>See Volume 2, Chapter 7: Marine Mammals (application ref: 6.2.7) for updates made to the sensitivity assessments for all species.</p>

15.4 Approach and methodology

15.4.1 Overview

- 14 This assessment of inter-related effects considers only those effects as a result of AyM and not from other projects (which are considered within the Cumulative Effects Assessment (CEA)). The approach to inter-relationships has been developed with specific regard to the guidance referred to above. Further detail regarding the methodology applied across the ES is described in Volume 1, Chapter 3: EIA Methodology (application ref: 6.1.3).
- 15 Inter-related effects can be divided into two categories, described below:
- ▲ **Project-lifetime effects:** Assessment of the scope for effects that occur throughout more than one project phase (i.e. construction, operation and decommissioning) to interact to potentially create an effect of greater significance than if assessed just within individual project phases. For example, increases to suspended sediment concentrations from activities across all three of the project phases stated above may combine to create an additive effect of greater significance than these impacts considered alone in each discrete project phase.
 - ▲ **Receptor-led effects:** Assessment of the scope for all effects to interact (spatially and temporally) to create an effect on a receptor of greater significance than when the effects are considered in isolation. For example, effects due to increased noise and poorer air quality during the construction phase together could have an effect of greater significance on a residential receptor than each impact considered in isolation. The receptor-led effects assessment also considers whether a project lifetime inter-related effect is predicted for that impact.
- 16 The inter-related effects assessment thereby incorporates the findings of the individual assessment chapters to describe potential additional effects that may be of greater significance when compared to individual effects acting on a single receptor (or group). If there are additional effects, these are considered additively and qualitatively using expert judgement. The proposed approach is summarised in the following steps. For each EIA topic chapter:

- ▲ Identification of relevant receptors from assessments undertaken for individual EIA technical topics. This involves high-level description of the potential to produce interrelated effects on the topic area being assessed.
 - ▲ Identification of the impact source and pathways that could affect that receptor and where those pathways are described and assessed. This involves cross referencing to other chapters and the impacts assessed within them relevant to the inter-related effects assessment for that topic. For project-lifetime effects, it is also determined whether there is potential for inter-related effects from the same impact across multiple project phases.
 - ▲ Production of an inter-related effects assessment within the technical chapter, tabulating potential inter-related effects (both project-lifetime and receptor-led effects) and providing the relevant assessment narrative.
- 17 Effects that represent no change to the baseline (i.e. no impact) are unlikely to have inter-related effects when combined with other impacts and can be scoped out of the inter-related effects assessment. However, where impacts that have an impact significance of negligible or higher, interactions of greater significance than the impacts in isolation may occur. These are then considered through expert judgement.
- 18 In relation to project-lifetime effects, those that only occur over one project phase (e.g. just the construction phase) have no potential to interact with impacts of the same nature over multiple project phases and can therefore be scoped out of assessment. Effects that may be seen in the construction and decommissioning phases (but not the operational phase) are considered to be isolated and therefore recovery between these two phases is expected. It is not considered that there is the potential for inter-related effects where this situation arises, however expert judgement is applied on a case-by-case basis.
- 19 It should be noted that some elements of the impact assessment inherently consider inter-related effects. For example: the effects on fish and shellfish ecology have potential impacts for both marine mammals and offshore ornithology in terms of potential loss of prey resource. Where these potential inter-related effects are identified as being inherently considered in the impact assessment, this is described within the individual topic chapters.

15.4.2 Scope of the inter-related effects assessment

- 20 All ES chapters include a consideration of inter-related effects and as noted above, many of the individual topic chapters address elements of inter-related effects by their nature. This holistic approach ensures that the EIA is comprehensive and assessed all relevant potentially significant effects upon all relevant receptors.
- 21 This chapter therefore summarises the consideration of inter-related effects already set out in the topic-specific chapter but also, where appropriate, gives further detail of how those interactions may give rise to additional potential inter-related effects. Given the nature of AyM and the consultation to date, there are a number of cases where potential impacts have been scoped out of the EIA altogether, which are not given further consideration in the inter-related effects assessment.
- 22 A list of topics excluded from the inter-related effects assessment, together with justification, is given in Table 2.

Table 2: Topics scoped out of the inter-related effects assessment.

TOPIC	JUSTIFICATION
Marine Geology, Oceanography and Physical Processes (Volume 2, Chapter 2; application ref: 6.2.2)	The different physical processes studied are already inter-related; in particular, sediment transport is dependent on currents and waves and therefore these linked processes have already been considered within the assessment. In turn, this information on changes to physical processes has been used to inform other ES topics such as Offshore Ornithology (Volume 2, Chapter 4; application ref: 6.2.4), Benthic and Intertidal Ecology (Volume 2, Chapter 5; application ref: 6.2.5) and Fish and Shellfish Ecology (Volume 2, Chapter 6; application ref: 6.2.6). Assessments have been undertaken separately within these individual topic chapters and are not reported here as additional inter-relationships.
Offshore Ornithology	The potential for inter-related effects that could arise between project activities are those that have effect

TOPIC	JUSTIFICATION
<p>(Volume 2, Chapter 4; application ref: 6.2.4)</p>	<p>pathways that operate through food chains. Such inter-relationships are already addressed within Volume 2, Chapter 4 (application ref: 6.2.4) as indirect impacts on prey. The assessment of these impacts draws on assessments on the prey resources themselves in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (application ref: 6.2.5), and Volume 2, Chapter 6: Fish and Shellfish Ecology (application ref: 6.2.6).</p>
<p>Commercial Fisheries (Volume 2, Chapter 8; application ref: 6.2.8)</p>	<p>Inter-related effects on commercial fisheries are considered with respect to Fish and Shellfish Ecology (Volume 2, Chapter 6; application ref: 6.2.6) and Shipping and Navigation (Volume 2, Chapter 9; application ref: 6.2.9).</p> <p>The commercial fisheries assessment inherently considers impacts on fish resource through assessment of displacement or disruption to commercially important fish and shellfish receptors, drawing on the assessment in Volume 2, Chapter 6: Commercial Fisheries; application ref: 6.2.6.</p> <p>An assessment of the inter-related effects on shipping and navigation receptors is an inherent part of the formal Navigational Risk Assessment (NRA) in Volume 4, Annex 9.1 (application ref: 6.4.9.1). It considers the potential impact of AyM construction vessels interacting with fishing vessels.</p>
<p>Shipping and Navigation (Volume 2, Chapter 9; application ref: 6.2.9)</p>	<p>An assessment of inter-related effects on shipping and navigation is an inherent part of the formal NRA presented in Volume 4, Annex 9.1 (application ref: 6.4.9.1). The key inter-relationships are with commercial fisheries which, as described above, has been excluded from further consideration in the inter-related effects assessment.</p>

TOPIC	JUSTIFICATION
<p>Other Marine Users and Activities (Volume 2, Chapter 12; application ref: 6.2.12)</p>	<p>The assessment of potential effects on other marine users and activities presented in Volume 2, Chapter 12 (application ref: 6.2.12) of the ES inherently considers the inter-relationships between biological and human environment receptors.</p> <p>The assessment considers potential impacts on charter angling, drawing on information from the fish and shellfish ecology assessment (Volume 2, Chapter 6; application ref: 6.2.6) and the commercial fisheries assessment (Volume 2, Chapter 8; application ref: 6.2.8).</p> <p>The assessment also considers disruption to other human activities such as offshore wind, subsea cables and oil and gas through reference to the assessments of shipping and navigation (Volume 2, Chapter 9; application ref: 6.2.9) and Military and Civil Aviation (Volume 2, Chapter 13; application ref: 6.2.13).</p> <p>Therefore, inter-relationships on other marine users and activities are not considered further here.</p>
<p>Aviation and Radar (Volume 2, Chapter 13; application ref: 6.2.13)</p>	<p>Volume 2, Chapter 13: Aviation and Radar (application ref: 6.2.13) considers that the greatest potential for inter-related effects occur due to the creation of aviation obstacles. Air Traffic Control provision and the rules of the air (including the 'see and be seen' principle) will reduce the potential for inter-relationships to occur, and it was therefore concluded that there would be no inter-related effects of greater significance than when considered in isolation, and therefore inter-related effects on aviation and radar receptors are not considered further here.</p>
<p>Socioeconomics (Volume 3, Chapter 3;</p>	<p>The consideration of inter-relationships between socioeconomics, tourism and recreation is given throughout Volume 3, Chapter 3: Socioeconomics and</p>

TOPIC	JUSTIFICATION
<p>application ref: 6.3.3)</p> <p>Tourism and Recreation (Volume 3, Chapter 4; application ref: 6.3.4)</p>	<p>Volume 3, Chapter 4: Tourism and Recreation (application refs: 6.3.3 and 6.3.4, respectively) and is therefore not considered further here.</p>
<p>Ground Conditions and Land Use (Volume 3, Chapter 6; application ref: 6.3.6)</p>	<p>The assessments of potential impacts on ground conditions, land use, hydrology and flood risk are inherently interlinked, as well as being linked to air quality, terrestrial ecology and noise and vibration. Those assessments given in Volume 3, Chapter 6: Ground Conditions and Land Use and Volume 3, Chapter 7: Hydrology and Flood Risk (application refs: 6.3.6 and 6.3.7, respectively) include a consideration of the likely inter-related effects and concluded that there would not be any significant inter-relationships, provided that standard mitigation measures are followed.</p>
<p>Hydrology and Flood Risk (Volume 3, Chapter 7; application ref: 6.3.7)</p>	
<p>Onshore Archaeology and Cultural Heritage (Volume 3, Chapter 8; application ref: 6.3.8)</p>	<p>The onshore archaeology and cultural heritage assessment considers the inter-relationship between cultural setting and visual impacts as assessed in Volume 2, Chapter 10: SLVIA (application ref: 6.2.10) and Volume 3, Chapter 2: SLVIA (application ref: 6.3.2). This forms an inherent part of the assessment, and therefore a further inter-related effects assessment is not required.</p>
<p>Traffic and Transport (Volume 3, Chapter 9;</p>	<p>The assessment of air quality given in Volume 3, Chapter 11: Air Quality (application ref: 6.3.11) includes consideration of the likelihood of air quality effects associated with traffic and transport, and is therefore</p>

TOPIC	JUSTIFICATION
application ref: 6.3.9)	inherently interlinked with Volume 3, Chapter 9: Traffic and Transport (application ref: 6.3.9).
Noise and Vibration (Volume 3, Chapter 10; application ref: 6.3.10)	The traffic and transport assessment inherently considers effects in relation to both air quality and noise. The health impact assessment inherently considers inter-relationships between topics including noise and vibration and air quality against established health standards.
Air Quality (Volume 3, Chapter 11; application ref: 6.3.11)	Therefore, inter-related effects on these topic areas are already assessed within the topic-specific chapters and are not considered further here.
Public health (Volume 3, Chapter 12; application ref: 6.3.12)	

15.5 Assessment of inter-related effects

23 The assessment of inter-related effects therefore considers the following receptors, with assessments presented in Table 3 to Table 10,

- ▲ Offshore chapters:
 - Marine water and sediment quality;
 - Benthic subtidal and intertidal ecology;
 - Fish and shellfish ecology;
 - Marine mammal ecology;
 - Seascape, Landscape and Visual Impact Assessment (SLVIA);
 - Offshore archaeology;
- ▲ Onshore chapters:
 - Landscape and Visual Impact Assessment (LVIA); and
 - Ecology and nature conservation.

Table 3: Inter-related effects assessment – marine water and sediment quality.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Deterioration of water quality due to re-suspension of sediments	Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (application ref: 6.2.2); and	The assessment concludes that these impacts across all phases would be of negligible to minor adverse significance, which is not significant in EIA terms. There is limited scope for inter-related effects to occur as a result of interactions between impacts on water and sediment quality. These impacts are predicted to occur directly as a result of impacts to marine physical processes.
	Accidental release of pollutants	Volume 2, Chapter 3: Marine Water and Sediment Quality (application ref: 6.2.3).	Due to the adherence to standard control measures and implementation of a Project Environmental Management Plan (PEMP) that will incorporate a Marine Pollution Contingency Plan (MPCP), it is not expected that this impact will result in inter-related effects of greater significance than those assessed in isolation. The PEMP will be secured as a condition of the Marine Licences.

Receptor-led effects

There is limited potential for temporal and spatial interactions between direct and indirect impacts to water and sediment quality. The scope for inter-related effects is predicted to arise through the combined effects of deterioration in water quality as a result of the re-suspension of sediments, and the accidental release of contaminants, which could in theory lead to impacts of a greater significance than when the two impacts are considered in isolation.

However, as described above, the implementation of a PEMP which will include a MPCP will ensure that in the unlikely event of accidental release of pollutants, measures will be in place to ensure that it does not result in significant effects. Therefore, it is not considered that this inter-relationship will result in effects of greater significance than the two impacts considered in isolation.

Inter-relationships between marine water and sediment quality and biological receptors are considered in the tables below.

Table 4: Inter-related effects assessment – benthic subtidal and intertidal ecology.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	<p>Temporary habitat disturbance</p> <hr/> <p>Long-term habitat change due to introduction and subsequent removal of infrastructure</p>	<p>Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (application ref: 6.2.2); and</p> <p>Volume 2, Chapter 5: Benthic, Subtidal and Intertidal Ecology (application ref: 6.2.5).</p>	<p>The assessment concludes that these impacts across all phases were of minor adverse significance, which is not significant in EIA terms.</p> <p>When habitat loss or disturbance is considered additively across all three phases of development, the total area of habitat affected is larger than when considered in each phase individually. However, the disturbance is taking place within the same site and therefore this spatial area represents repeated rather than additional disturbance. Furthermore, the habitats affected are geographically widespread and are expected to recover within one to ten years of disturbance. Across the project lifetime, disturbance is not expected to occur to the point of irreversibility and once decommissioning is completed, full recovery to the baseline condition is expected within the one-to-ten-year window.</p> <p>Therefore, the project lifetime effects on benthic ecological receptors are not anticipated to result in inter-related effects of greater significance than the assessments conclude for each phase in isolation.</p> <p>With regard to long-term habitat change, the impact relates to the presence of infrastructure placed in the water column, an effect which persists throughout the lifetime of the project. It can therefore be thought of as occurring within a single ‘project lifetime’ phase rather than in three discrete phases. Once decommissioned, the environment is expected to return to its baseline condition within one to ten years and therefore no inter-related effects of greater significance than those considered in isolation are predicted.</p>
Construction and operation	Increased risk of introduction of spread of marine Invasive and Non-Native Species (INNS)		<p>The assessment concludes that these impacts across all phases were of negligible adverse significance, which is not significant in EIA terms.</p> <p>There is limited potential for inter-related effects to occur as a result of the presence of infrastructure and project vessels across the construction and operation phases, both due to the negligible significance associated with these impacts and the embedded mitigation of a biosecurity plan and adherence to best practice guidance to minimize the introduction and spread of INNS. It is therefore not anticipated that there will be any inter-related effects of greater significance than those occurring in isolation.</p>
Construction and decommissioning	Increases in Suspended Sediment Concentration (SSC) and deposition		<p>The assessment concludes that these impacts across all phases were of minor adverse significance, which is not significant in EIA terms.</p> <p>The majority of seabed disturbance (resulting in the highest increases in SSC and deposition) will occur during the construction phase, and to a lesser extent the decommissioning phase depending on the methods employed. Effects are expected to be intermittent, discrete and temporary. Furthermore, the seabed habitats affected are expected to recover fully within one to ten years of the activity, and so full</p>

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
			recovery from construction disturbance is expected by the time the project is decommissioned. Therefore, it is considered that there is no potential for inter-related effects of greater significance than the effects assessed in isolation.

Receptor-led effects

There is the potential for spatial and temporal interactions between the effects arising from habitat loss/ disturbance and increases SSC and sediment deposition during the project lifetime.

The greatest potential for inter-related effects is predicted to occur through the interaction of both temporary and permanent habitat loss/ disturbance from foundation installation/ jack-up vessels/ anchor placement/ scour, indirect habitat disturbance due to sediment deposition and indirect effects of due the presence of infrastructure in the operational wind farm.

With respect to this interaction, these individual impacts were assigned a significance of minor adverse as standalone impacts and although potential combined impacts may arise (i.e. spatial and temporal overlap of direct habitat disturbance), it is predicted that this will not be any more significant than the individual impacts in isolation. This is because the combined area of habitat potentially affected would be very limited, the biotypes affected are widespread, and where temporary disturbance occurs, full recovery of the benthos is predicted within one to ten years of disturbance. As such, these interactions are predicted to be no greater in significance than that for the individual effects assessed in isolation.

Table 5: Inter-related effects assessment – fish and shellfish ecology.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Impacts on fishing pressure leading to displacement	<p>Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (application ref: 6.2.2);</p> <p>Volume 2, Chapter 3: Marine Water and Sediment Quality (application ref: 6.2.3);</p> <p>Volume 2, Chapter 6: Fish and Shellfish Ecology (application ref: 6.2.6);</p>	<p>The assessment concludes that these impacts across all phases were of negligible adverse significance, which is not significant in EIA terms.</p> <p>Fishing pressure may be displaced across multiple phases of development as a result of temporary safety zones and the presence of infrastructure. The commercial fisheries assessment presented in Volume 2, Chapter 8: Commercial Fisheries (application ref: 6.2.8) concluded that the only significant effects to fishing activity would be to static potting gear, and that these would be offset by justifiable disturbance payments and through the development of a Fisheries Co-existence and Liaison Plan which will be secured as a condition of the Marine Licences. All other fishing activities are expected to be able to continue with minimal disturbance within the project area. This, combined with the negligible adverse significance assessed for fish and shellfish ecology, means that no inter-related effects of greater significance than those considered in isolation.</p>
Construction and decommissioning	Mortality, injury, behavioural changes and auditory masking arising from noise and vibration	<p>Volume 4, Annex 6.2: Underwater Noise Technical Report (application ref: 6.4.6.2); and</p> <p>Volume 2, Chapter 8: Commercial Fisheries (application ref: 6.4.8).</p>	<p>The assessment concludes that these impacts across all phases were of minor adverse significance, which is not significant in EIA terms.</p> <p>The majority of disturbance from underwater noise is predicted to result from piling during the construction phase. Depending on the methods employed, noise during the decommissioning phase is expected to be of a much lower level (however still of minor adverse significance based on the Maximum Design Scenario (MDS) approach. Therefore, effects on fish and shellfish receptors from underwater noise in the construction and decommissioning phases are not expected to result in effects of greater significance than when considered in isolation.</p>
	Direct damage and disturbance		<p>The assessment concludes that these impacts across all phases were of minor adverse significance, which is not significant in EIA terms.</p> <p>When disturbance is considered additively across all three phases of development, the total area affected is larger than when considered in each phase individually. However, the majority of disturbance is expected to take place in the construction phase, with little repeat disturbance. Furthermore, the habitats disturbed are widespread throughout the region and are expected to fully recover by the time of decommissioning.</p> <p>Therefore, across the project lifetime, effects on fish and shellfish receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.</p>

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
	Temporary increases in SSC and deposition		<p>The assessment concludes that these impacts across all phases were of negligible to minor adverse significance, which is not significant in EIA terms.</p> <p>The majority of seabed disturbance, increased SSC and deposition will occur within the construction phase. Depending on the methods employed at the time, disturbance during decommissioning is expected to be far less as activities such as sandwave clearance and seabed preparation will not be required. Receptors and associated spawning and nursery grounds potentially affected are predicted to recover between construction and decommissioning and therefore, across the project lifetime, no inter-related effects of greater significance than those considered in isolation are predicted to occur.</p>

Receptor-led effects

The greatest scope for potential inter-related impacts is predicted to arise through the interaction of direct damage and disturbance, increased SSC and deposition and underwater noise effects.

With respect to this interaction, these individual impacts were assigned a significance of **negligible to minor adverse** as standalone impacts and although potential inter-related impacts may arise, it is important to recognise that some of the activities are potentially mutually exclusive. Underwater noise from piling is predicted to result in displacement of mobile fish species to a greater extent than the Zone of Influence (Zol) for SSC and deposition effects. This means that assuming there is temporal overlap of piling and SSC generating activities, these species will not be exposed to the greatest predicted increases in SSC from seabed preparation and drilling in the array area, because they will have already been displaced to beyond the Zol because of noise disturbance. Similarly, any potential behavioural effects would likely occur over the same areas as habitat loss/ disturbance, and therefore these effects would not be additive. Therefore, effects of greater significance than the individual impacts in isolation are not predicted.

However, where these activities do not take place concurrently, there is potential for receptor-led effects to occur. With respect to this interaction, the individual effects were assigned a significance of up to minor adverse as standalone impacts and although potential combined impacts may arise, it is predicted that they will not be any more significant than the individual impacts in isolation. This is because the affected habitats are widespread, with ample unaffected habitat available for displaced receptors. The impacts are also predicted to be temporary, with full recovery anticipated after the cessation of activities. As such, this interaction is predicted to be no greater in significance than for the individual effects assessed in isolation.

Table 6: Inter-related effects assessment – marine mammal ecology.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Effects due to vessel interaction/ disturbance	<p>Volume 2, Chapter 3: Marine Water and Sediment Quality (application ref: 6.2.3);</p> <p>Volume 2, Chapter 6: Fish and Shellfish Ecology (application ref: 6.2.6);</p>	<p>The assessment concludes that these impacts across all phases were of negligible to minor adverse significance, which is not significant in EIA terms.</p> <p>The construction and decommissioning phases are expected to occur approximately 25 years apart, and therefore there is no potential for inter-related effects between these two phases in terms of vessel disturbance, where the number of vessels, and therefore the potential for vessel interactions, is highest. During operation, the numbers of vessels required on site will be far lower than during construction and decommissioning, though it will occur over a longer time period. Due to the levels of significance predicted, and the adherence to best practice guidelines, it is not expected that inter-related effects on marine mammals of greater significance than those considered in isolation.</p>
	Effects due to impacts to prey resources	<p>Volume 4, Annex 6.2: Underwater Noise Technical Report (application ref: 6.4.6.2);</p> <p>Volume 2, Chapter 7: Marine Mammals (application ref: 6.2.7); and</p>	<p>The assessment concludes that these impacts across all phases were of negligible adverse significance, which is not significant in EIA terms.</p> <p>Impacts to fish and shellfish resources will not result in an ongoing, additive loss of prey resource. Rather, it would result in an initial loss, followed by recovery, leading to no long-term or large-scale loss of prey.</p> <p>This, combined with the negligible significance assessed for this impact, means that no inter-related effects of greater significance than those assessed in isolation are predicted.</p>
Construction and decommissioning	Effects due to underwater noise	<p>Volume 2, Chapter 9: Shipping and Navigation (application ref: 6.2.9).</p>	<p>The assessment concludes that these impacts across all phases were of negligible to minor adverse significance, which is not significant in EIA terms.</p> <p>Piling of driven foundations will be the main source of underwater noise on the construction phase, and underwater noise during decommissioning is expected to occur at a far lower level, depending on the decommissioning methods employed. Disturbance from underwater noise is predicted to be temporary, discrete, and intermittent throughout the construction phase, and full recovery is expected between construction and decommissioning. Furthermore, the commitment to developing a Marine Mammal Mitigation Protocol (MMMP) will ensure that no lasting injurious effects occur on marine mammals. The piling MMMP will be secured as a condition in the Marine Licences.</p> <p>Therefore, no inter-related effects of greater significance than those considered in isolation are predicted to occur.</p>

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
	Effects due to impacts to water quality		<p>The assessment concludes that these impacts across all phases were of negligible adverse significance, which is not significant in EIA terms.</p> <p>Effects due to changes to water quality will only occur in the construction and decommissioning phases, and full recovery is expected during the operation phase. As such, project lifetime effects are not expected to result in inter-related effects of greater significance than those considered in isolation.</p>

Receptor-led effects

There is the potential for spatial and temporal interactions between underwater noise, vessel interactions, effects on prey species and water quality effects during the lifetime of AyM.

The greatest scope for interaction of different effects on marine mammal ecology is during the construction phase, when the most significant impact to marine mammals (i.e. underwater noise from piling) is likely to interact with other impacts. Therefore, the greatest scope for potential inter-related effects is likely to arise through the interaction of noise, vessel interactions and effects on prey species.

With respect to this interaction, the individual impacts were assigned a significance of negligible to minor as standalone impacts and although combined impacts may arise it is important to note that some of these activities are potentially mutually exclusive. For example, underwater noise from piling will result in the displacement of marine mammals from the array area which will in turn mean that these species will not be exposed to effects of changes in water quality or reduction in prey species within that area. They will also be displaced from the areas of highest vessel traffic within the AyM array area. The situation may also arise where any potential disturbance to prey species is offset by the fact that as marine mammals are temporarily displaced from areas around piling, the fish that form part of their diet may also be temporarily displaced, remaining available for marine mammal feeding. Overall, effects on prey species (fish and shellfish) have been assessed as being of negligible adverse significance, and therefore there is limited potential for any receptor-led effects of greater significance than those assessed in isolation.

Table 7: Inter-related effects assessment – SLVIA.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Seascape, landscape and visual effects	Volume 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment (application ref: 6.2.10); and Volume 3, Chapter 8: Onshore Archaeology and Cultural Heritage (application ref: 6.3.8).	<p>The assessment presented in Volume 2, Chapter 10 (application ref: 6.2.10) has predicted a series of effects on seascape, landscape and a number of viewpoints ranging from minor (not significant in EIA terms) to major (significant in EIA terms).</p> <p>With respect to the project life cycle, there is scope for inter-related effects to arise related to seascape, landscape and visual effects in the construction, operation and decommissioning phases as significant effects on several receptors are predicted throughout the project lifetime. Considering that long-term effects are expected in the operational phase, with short-term effects in the construction and decommissioning phases, it is unlikely that the short-term effects will significantly add to the long-term effects over the whole project lifetime. Furthermore, the impacts relate to the presence of infrastructure, an effect which persists throughout the lifetime of the project until decommissioned. It can therefore be thought of as occurring within a single 'project lifetime' phase rather than in three discrete phases. It is therefore concluded that no inter-related effects of greater significance than those in isolation will occur.</p> <p>With regard to landscape and visual receptors, the assessment undertaken has included an extensive range of viewpoints at agreed locations around the north Wales coast. Using the most sensitive receptors throughout, combined with the MDS approach, the assessment therefore provides a fully comprehensive and representative assessment of the highest potential change from the current baseline conditions that could arise from the development of the project.</p> <p>The assessment undertaken is inherently inclusive of inter-relationships as it includes all aspects of the character of an area, including human activity, historic and cultural setting, and the local ecology. The subdivision of all receptors into specific types represents a focusing of impact assessment from the wider and inter-related consideration of the potential for the project to change the character and amenity of the region. The assessment considers all aspects as derived by the site photography and visualisations. It is therefore considered that no additional inter-related effects are likely to occur beyond those already identified.</p>

Receptor-led effects

There is potential for spatial and temporal interaction between the direct and indirect impacts to seascape, landscape and visual receptors outlined above. The greatest scope for potential inter-related impacts is predicted to arise through the interaction of impacts on the visual receptors known to be present within the Seascape, Landscape and Visual study area.

With respect to this interaction, combined effects on visual receptors will vary temporally and spatially across the study area according to the activities being undertaken. Construction effects will cease upon completion of construction and will give way to operational phase effects which will be fully reversible when the project is decommissioned. Therefore, the significance of these combined effects on visual receptors will not be of any greater significance than the effects when assessed in isolation. As stated above, the assessment of effects to seascape, landscape and visual receptors is inherently inclusive of inter-related effects.

Table 8: Inter-related effects assessment – offshore archaeology.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Loss of archaeological receptors due to penetration, compression and scour effects	Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (application ref: 6.2.2); and	The assessment concludes that these impacts across all phases were of negligible to minor adverse significance, which is not significant in EIA terms, or minor to moderate (significant in EIA terms) beneficial significance There is limited scope for significant inter-related effects on archaeological resources as a result of the interactions between the impacts as any such effects will be avoided via the implementation of mitigation through the Written Scheme of Investigation (WSI). On that basis, it is considered that no additional inter-related effects of greater significance than those assessed in isolation will occur.
Construction and decommissioning	Loss of archaeological receptors due to compression and draw down effects	Volume 2, Chapter 11: Offshore Archaeology and Cultural Heritage (application ref: 6.2.11).	

Receptor-led effects

There is the potential for spatial and temporal interactions between direct and indirect impacts to marine archaeological receptor. The scope for inter-related effects is predicted to arise through combined effects on different elements of the historic environment, and through direct physical impacts on heritage assets interacting with indirect impacts from sediment deposition which may lead to further damage to the same receptor via increased exposure.

The mitigation measures proposed for AyM, which includes the implementation of Archaeological Exclusion Zones (AEZs) to avoid sites of identified archaeological significance, will minimise combined effects on different elements of the historic environment. It is therefore predicted that any inter-related effect will not be of any greater significance than those already assessed in isolation.

Table 9: Inter-related effects assessment – LVIA.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Landscape and visual effects	Volume 3, Chapter 2: Landscape and Visual Impact Assessment (application ref: 6.3.2); and Volume 3, Chapter 8: Onshore Archaeology and Cultural Heritage (application ref: 6.3.8).	<p>The assessment presented in Volume 3, Chapter 2 (application ref: 6.3.2) has predicted a series of effects on landscape and a number of viewpoints ranging from minor (non-significant in EIA terms) to moderate (significant in EIA terms).</p> <p>With respect to the project lifecycle, there is scope for inter-related effects to arise related to the landfall, onshore ECC and substation. However, the initial impacts from the construction will decrease in significance as the project moves into the operation phase. Decommissioning activities will incur impacts to landscape and visual receptors whilst plant is on site, however the effect is temporary as in the construction phase.</p> <p>With respect to landscape and visual receptors, the assessment undertaken has included a wide range of viewpoints at agreed locations in the study area. Using the most sensitive receptors throughout, combined with the MDS approach, the assessment provides a fully comprehensive and representative assessment of the highest potential change from the current baseline conditions that could arise from the development of the project.</p> <p>The assessment undertaken is inherently inclusive of inter-relationships as it includes all aspects of the character of an area, including historic setting, human activity and the local ecology. The subdivision of all receptors into specific types represents a focusing of impact assessment from the wider and inter-related consideration of the potential for the project to change the character and amenity of the region. This assessment considers all aspects as derived by the site photography and visualisations. It is therefore considered that no additional inter-related effects are likely to occur beyond those already assessed.</p>
Receptor-led effects			
<p>There is potential for spatial and temporal interaction between the direct and indirect impacts to landscape and visual receptors outlined above. The greatest scope for potential inter-related impacts is predicted to arise through the interaction of impacts on the visual receptors known to be present within the landscape and visual study area.</p> <p>With respect to this interaction, combined effects on visual receptors will vary temporally and spatially across the study area according to the activities being undertaken. Construction effects will cease upon completion of construction and will give way to operational phase effects which will be fully reversible when the project is decommissioned. Therefore, the significance of these combined effects on visual receptors will not be of any greater significance than the effects when assessed in isolation.</p>			

Table 10: Inter-related effects assessment – ecology and nature conservation.

DEVELOPMENT PHASE	NATURE OF INTER-RELATED EFFECT	RELEVANT ES DOCUMENTS	INTER-RELATED EFFECTS ASSESSMENT
Project lifetime effects			
Construction, operation and decommissioning	Disturbance or damage to ecological features	Volume 3, Chapter 5: Onshore Biodiversity and Nature Conservation (application ref: 6.3.5)	The assessment presented in Volume 3, Chapter 5 (application ref: 6.3.5) has predicted a series of effects on ecology and nature conservation ranging from minor (non-significant in EIA terms) to major (significant in EIA terms).
Construction and decommissioning	Temporary habitat loss/ disturbance		There is potential for inter-related effects to occur across the project lifetime, though in the operation phase these will largely be associated with the operation and maintenance of the onshore substation rather than the onshore ECC or landfall. As such, due to the recovery time between construction and decommissioning, no inter-related effects of greater significance than considered in isolation are predicted to arise from the landfall or onshore ECC. The outcomes of the assessment have informed the development of mitigation measures which will reduce or offset potentially significant effects. As such, it is concluded that there is no potential for inter-related effects of greater significance than those considered in isolation.
	Accidental death and injury of ecological receptors		

Receptor-led effects

The greatest scope for inter-related effects is expected to occur as a result of interactions between habitat loss and disturbance effects. This interaction may lead to effects of greater significance than the effects considered in isolation.

With respect to this interaction, the potential for inter-related effects is greatest during construction, whilst this will decrease rapidly as the project moves to operation. During decommissioning, if all project infrastructure is removed, effects will be similar to the construction phase, depending on the methods employed. The outcomes of the assessment have informed the development of mitigation measures which will reduce or offset potentially significant effects.

15.6 Conclusions

- 24 This chapter has defined the potential inter-related effects considered to arise from AyM. This has enabled an assessment of the potential inter-related effects on a range of receptor groups to be completed. The assessment has been based on information drawn from the individual chapters of the ES, with the identification of potential inter-related effects being based on qualitative assessment and using expert judgement.
- 25 The assessment has been undertaken in compliance with the EIA Regulations and specific guidance produced by PINS, noting that inter-related effects have, in many cases, already been assessed either inherently or explicitly within the topic-specific chapters.
- 26 Overall, the inter-related effects assessment for AyM has not identified any significant effects that are not already identified in the topic-specific chapters. Whilst inter-related effects have been identified in this chapter, the assessment has not identified any that are predicted to lead to effects of greater significance compared to those identified in isolation.

15.7 References

DECC (2011) Overarching National Policy Statement for Energy (EN-1)

PINS (2018) Advice Note Nine (version 3): Rochdale Envelope. [Online]
Available at: <https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/>

Errata List

Table 2

In ExQ1.12.7, the ExA noted an error in a document reference within Table 2 on page 13.

Under the 'Topic' section 'Commercial Fisheries (Volume 2, Chapter 8; application ref: 6.2.8)', the corresponding 'Justification' section text should read as follows:

"...drawing on the assessment in Volume 2, Chapter 8: Commercial Fisheries; (PINS ref: APP-054). ..."



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