MUIR MHÒR
OFFSHORE WIND FARM

A joint venture between Fred. Olsen Seawind & Vattenfall

Additional Information Report

Muir Mhòr Offshore Wind Farm

Additional Information Report

Chapter 7: Revisions Following Consultee Input

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Glossary

Term	Definition
Applicant	Muir Mhòr Offshore Wind Farm Limited.
Array Area	The area in which the generation infrastructure (including Wind Turbine Generators and associated foundations and Inter-array Cables), Offshore Electrical Platform(s), and an Interconnector cable will be located.
E2	The ScotWind Plan Option Area where the Proposed Development is located.
EIA Regulations	Collectively the term used to refer to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, The Marine Works (Environmental Impact Assessment) Regulations 2007, and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
Floating Foundations	The floating structures on which the Wind Turbine Generators are installed.
Foundation anchors	The mooring structures which anchor the Floating Foundations to the seabed connected to the foundation mooring.
Inter-array Cables	Cables which link the Wind Turbines Generators to each other and the Offshore Electrical Platform(s).
Interconnector cable	Cable which links the Offshore Electrical Platforms to one another, allowing for power to be transferred between the platforms.
Landfall	The area between Mean High Water Springs and Mean Low Water Springs where the Offshore export cables are brought onshore.
Offshore Electrical Platform (OEP)	Offshore platform consisting of High Voltage Alternating Current equipment, details depending on the final electrical set up of the Project.
Offshore Export Cable Corridor (ECC)	The area within which the Offshore export cable(s) will be installed.
Offshore export cable(s)	The subsea electricity cable circuits running from the Offshore Electrical Platform(s) to the landfall which will transmit the electricity generated by the offshore wind farm to the onshore export cables for transmission onwards to the onshore substation and the national electrical transmission system along with auxiliary cables such as fibre optic cables.
Offshore transmission infrastructure	The proposed transmission infrastructure comprising: Offshore Electrical Platform(s) and associated foundations and substructures; the interconnector cable, the Offshore export cables; and the landfall area up to Mean High Water Springs.
Project	Muir Mhòr Offshore Wind Farm – comprises the wind farm and all associated offshore and onshore components.
Proposed Development	The offshore Muir Mhòr Offshore Wind Farm project elements to which the Offshore Environmental Impact Assessment Report relates.
Wind Turbine Generator (WTG)	The wind turbines that generate electricity consisting of tubular towers and blades attached to a nacelle housing mechanical and electrical generating equipment.

Acronyms and Abbreviations

Term	Definition
AIR	Additional Information Report
CES	Crown Estate Scotland
ECC	Export Cable Corridor
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plans
EU	European Union
GDP	Gross Domestic Product
GNS	Greater North Sea
GVA	Gross Value Added
GW	Gigawatt
HRA	Habitat Regulations Appraisal
IAC	Inter-array Cables
ICES	International Council for the Exploration of the Sea
JV	Joint Venture
MCAA	Marine and Coastal Access Act
MD-LOT	Marine Directorate– Licensing Operations Team
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MPA	Marine Protected Area
MU	Management Unit
MW	Megawatt
nm	Nautical Miles
NTS	Non-Technical Summary
O&M	Operation and Maintenance
OEP	Offshore Electrical Platform
OWF	Offshore Wind Farm
PO	Plan Option
RIAA	Report to Inform Appropriate Assessment
SMP	Sectoral Marine Plan
UK	United Kingdom
WPA	Whole Project Assessment
WTG	Wind Turbine Generator

7. REVISIONS FOLLOWING CONSULTEE INPUT

7.1. INTRODUCTION

7.1.1. Following submission of the Environmental Impact Assessment Report (EIAR) in November 2024 and review of consultee responses, the Applicant identified two topic areas that required additional assessment and discussion to further support the license application.

- Volume 2, Chapter 17: Socioeconomics, Tourism and Recreation of the EIAR had not fully incorporated the potentially significant residual effects with respect to 'reduction in access to, or exclusion from established fishing grounds within the Array Area'; and
- NatureScot had provided comment on Volume 2, Chapter 12: Marine Mammals of the EIAR, relating to the density used in the quantitative assessment for bottlenose dolphins in the Greater North Sea (GNS) Management Unit (MU): "*Section 7.5.1 gives incorrect numbers of SCANS III Block R estimates for abundance (147) and density (0.0023 per km^2*).

7.1.2. The Applicant acknowledges both issues require further revision and clarification as part of this Additional Information Report (AIR). Relevant re-assessment and discussion is provided in Section 7.2 and Section 7.3 below.

7.2. SOCIO-ECONOMICS COMMERCIAL FISHERIES UPDATE

7.2.1. During both its construction phase and its operation and maintenance phase the Proposed Development is expected to have effects on the following commercial fisheries receptors, which are significant in Environmental Impact Assessment (EIA) terms:

- A moderate adverse residual effect on UK demersal otter trawl, due to the importance of haddock fishing in the area; and
- A moderate adverse residual effect on UK pelagic otter trawl and purse seine, due to the importance of herring fishing in the area, particularly in the southwest of the Array Area.

7.2.2. The sections below incorporate these significant residual commercial fisheries effects into the socio-economic assessment and provide updated scoring and discussion of any residual socio-economic effects.

7.2.3. This has been achieved by revisiting the worst-case scenario for potential losses to the commercial fisheries sector and the wider economy. The assessment has considered the value of fish that would have been caught within the Array Area, the potential for the displacement of that catch, and the knock-on impacts of this reduction in catch in both the supply chain and in the downstream fish processing industry. Impacts have been quantified in terms of Gross Value Added (GVA), employment, and measured against the economic activity that is generated by the fish landed at Peterhead.

METHODOLOGY

IMPACT ON COMMERCIAL FISHERIES

7.2.4. Assessing the impact of the Proposed Development on commercial fisheries requires a determination of the baseline of the affected area (e.g. the value of fish caught) as well as the wider sector. The potential change in turnover from reduced fishing has then been estimated, based on the level of turnover in the affected areas and the expected reduction. This will consider the level of displacement, i.e. whether this activity will take place elsewhere as fishers spend time in other fishing grounds.

SENSITIVITY

7.2.5. The sensitivity of a sector is linked to how well it is able to absorb change, which relates to its resilience and agility. Factors that affect this include the scale of the sector and the diversity of income sources within it. The criteria for determining sensitivity are provided in Table 7.1.

Table 7.1 Definition of Sensitivity for an Economic Sector

Sensitivity Value	Description
Negligible	A sector with negligible sensitivity is very agile and will be able to accommodate changes without affecting its character or overall value.
Low	A low sensitive sector is tolerant of changes without fundamentally altering its present character or value.
Medium	A sector with medium sensitivity has a moderate capacity to absorb changes without fundamentally altering its present character or value.
High	A highly sensitive sector will not be able to absorb changes without fundamentally altering its present character or value.

MAGNITUDE

7.2.6. Between 2000 and 2024, the average level of Gross Domestic Product (GDP) per capita growth in the UK was 1% per annum (International Monetary Fund, 2025). Similarly, between 2000 and 2024 the number of jobs increased by 1% per annum (Office for National Statistics, 2025). The magnitude of any change in a sector should be considered within this context and in relation to the levels of economic activity within a study area. The definitions of magnitude of economic impacts are provided in Table 7.2.

Table 7.2 Definition of Magnitude for an Economic Sector

Magnitude Value	Description
Negligible	An effect would be considered to have a negligible magnitude if it is equivalent to less than a quarter of the typical economic growth per capita. For each study area: • GVA impact is less than 0.25% of the economy; or • Employment supported is less than 0.25% of the total number of jobs.
Low	An effect would be considered to have a low magnitude if it was equivalent to a quarter of the typical economic growth per capita. For each study area: • GVA impact is greater than, or equal to, 0.25% of the economy; or • Employment supported is greater than, or equal to, 0.25% of the total number of jobs.
Medium	An effect would be considered to have a medium magnitude if it was equivalent to half of the typical economic growth per capita. For each study area: • GVA impact is greater than, or equal to, 0.5% of the economy; or • Employment supported is greater than, or equal to, 0.5% of the total number of jobs.
High	An effect would be considered to have a high magnitude if it was equivalent to all the typical economic growth per capita. For each study area: • GVA impact is greater than, or equal to, 1% of the economy; or • Employment supported is greater than, or equal to, 1% of the total number

SIGNIFICANCE

7.2.7. The sensitivity of the receptor and the magnitude of the impact are combined when determining the significance of the effect, as shown in Table 7.3. Effects of moderate or more will be considered 'significant' in terms of EIA regulations.

Table 7.3 Matrix Used for the Assessment of Effect Significance

Sensitivity	Magnitude			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Minor	Minor
Medium	Negligible	Minor	Moderate	Moderate
High	Negligible	Minor	Moderate	Major

BASELINE ENVIRONMENT

RECEPTOR

7.2.8. While the fishing takes place at sea, the economic impact will take place onshore, and this is likely to be focused on a specific sector, e.g. the port from which vessels operate out of as well as fish processing activity. Based on the proximity of the area and the type of fish caught, the receptor considered is Peterhead's fishing and fish processing sector, since Peterhead is the largest port in the North Sea and its fleet all of Scotland's herring.

BASELINE DESCRIPTION

7.2.9. Peterhead Port is the largest fishing port in both Scotland and Europe, accounting for 155,051 tonnes of fish and shellfish in 2022 with a total value of £192.7 million (Marine Scotland, 2025). This was equivalent to 30% of the value of landings by Scottish vessels at all ports (£632.6 million).

7.2.10. Fishers who use Peterhead Port catch a variety of fish and shellfish, and in 2022 the most significant species were mackerel (£76.3 million) followed by nephrops, often known as langoustine, (£22.3 million), haddock (£18.1 million) and herring (£17.2 million) (see Table 7.4).

Table 7.4 Peterhead Port – Value of Landings by Species 2022

Species	Size of Landings (tonnes)	Value (£m)	Share of Value (%)
Mackerel	63,959	76,300	40%
Nephrops	4,471	22,988	12%
Haddock	18,111	18,073	9%
Herring	27,321	17,185	9%
Cod	4,122	15,881	8%
Whiting	6,537	8,543	4%
Other demersal	11,889	26,697	14%
Other pelagic	17,648	4,084	2%
Other shellfish	993	2,968	2%
Total	155,051	192,719	-

Source: Scottish Sea Fisheries Statistics 2023 - Supplementary Tables March 2025 revisions - Table 32

7.2.11. According to Marine Scotland (Marine Scotland, 2025), there were 356 people employed as fishers at Peterhead in 2022 (Table 7.5), equivalent to 8.6% of fisher employment in Scotland, a much smaller share of employment than its share of landings. However, many vessels which land catch at Peterhead are based elsewhere on the east coast of Scotland.

7.2.12. The average value of landings per fisher for all Scottish fishers was £153,700. Vessels based in and around Peterhead use larger and more technologically sophisticated ships than other ports, which enable larger catches with fewer people. In particular, 20% of the fishing fleet

based in Peterhead is longer than 24 metres, compared to 6% for the whole Scottish fleet[1]. Similarly, the vessels that have been identified as having potentially significant effects in the Volume 2, Chapter 13: Commercial Fisheries of the EIAR are also larger than the UK average and 68% of these types of vessels are 24 metres or longer[2]. Therefore, it is likely that turnover per employee will be higher at Peterhead than in Scotland as a whole.

Table 7.5 Fisher Employment 2022

Employment Type	Peterhead	Scotland
Regularly employed	301	3,364
Irregularly employed	55	753
Total	356	4,117

7.2.13. In addition to the number of people employed as fishers in Peterhead, there are also people employed in the fish processing sector, which takes whole fish and shellfish and processes them into fillets and other fish products. In 2022, there were an estimated 850 people employed in Peterhead's fish processing sector (ONS, 2024).

7.2.14. The primary input is fish caught by the Peterhead fishing sector, and companies in Peterhead process high volumes of white fish such as haddock and cod, as well as pelagic fish such as mackerel and herring. Processed fish are mainly exported. The sector has invested significantly in specialist machinery and technology to increase efficiency, including Denholm Seafoods' investment in a £30 million processing facility and cold-store upgrade (Denholm Seafoods, 2023). Most processors use fish processing machinery that can be used across different species (e.g. mackerel and herring).

COMMERCIAL FISHERIES ASSESSMENT

7.2.15. As part of the Volume 2, Chapter 13: Commercial Fisheries of the EIAR, a local study area was defined based on International Council for the Exploration of the Sea (ICES) rectangles. This includes:

- 43E8, where part of the Offshore Export Cable Corridor (ECC) is located in the north-east corner;
- 43E9, where the whole Array Area and part of the ECC is located in the north and north-west corner,
- 44E8, where part of the ECC is located in the south-west corner; and
- 44E9, which neighbours the Array Area to the north.

Significant impacts were identified based on potential disruption to haddock and herring fishing, in particular associated with ICES rectangle 43E9. The average annual value of fish landed in 43E9 between 2018 and 2022 is shown in Table 7.6.

[1] Scottish Sea Fisheries Statistics 2023 - Supplementary Tables March 2025 revisions - Table 40

[2] Scottish Sea Fisheries Statistics 2023 - Supplementary Tables March 2025 revisions - Table 43

Table 7.6

Table 7.6 Average Annual Value of Fish Landed in 43E9, 2018-2022

Species	Average Annual Value (£m)
Herring	1.5
Haddock	1.0
Other	0.4
Total	2.9

ASSESSMENT OF EFFECTS

SENSITIVITY

7.2.16. In 2022, the value of the fish and shellfish landed at Peterhead was £192.7 million. Based on the Business Register and Employment Survey (ONS, 2025), in this year there were 850 people who worked in the fish processing sector in Peterhead (compared to around 7,000 in Scotland). These people tend to work for bulk fish processing companies.

7.2.17. Given the size of and diversity of landings at Peterhead (Table 7.4) and the size and sophistication of its fish processing sector, Peterhead fishing and fish processing sector is likely to be resistant to changes and therefore its sensitivity has been assessed as low.

MAGNITUDE

7.2.18. To assess the magnitude of impact associated with the Proposed Development, it is necessary to assess the change in fish landed, as well as the associated change in value and job creation.

7.2.19. Between 2018 and 2022 the annual average value of fish landed from 43E9 was £2.9 million, mainly haddock and herring. It is not possible to ascertain where this fishing took place, but activity maps suggest that much of the fishing effort took place outside of the Array Area (see Figures 13.5, 13.6 and 13.7 in Volume 2, Chapter 13: Commercial Fisheries of the EIAR.

7.2.20. The Array Area covers 200 km^2. This is equivalent to 6% of the total size of ICES 43E9, which is approximately 3,350 km^2. Assuming that the catch within the Array Area is proportional to the value of landings in 43E9 (3,352 km^2) the reduction in value would be equivalent to 6%. which is equivalent to a reduced turnover of £172,500.

7.2.21. However, it is likely that fishers will respond to a reduction in access to fishing grounds by changing their behaviour and fishing elsewhere (known as displacement). While limited evidence exists on the effects of Offshore Wind Farms (OWFs), studies on Marine Protected Areas (MPAs), which prevent fishing in certain areas, have found that the overall reduction in activity due to MPA is around 12% (Marine Directorate, 2020). Conversely, some studies suggest that OWFs can increase biomass in the ocean and result in larger fish (Bicknell, Gierhart, and Witt, 2025), which may increase landings.

7.2.22. While there is limited evidence to suggest large decreases in activity, it is not possible to know the counterfactual with certainty. Therefore, it has been assumed conservatively that the reduction would be equal to 25% (a 75% displacement rate). On this basis, turnover would be expected to reduce by £43,100.

Table 7.7 Estimating Net Reduction in Fish Catch from Array Area

Proportion of ICES 43E9 Catch in Array Area	**Value (£m)**
Total size of ICES 43E9	3,350 km^2
Size of Array Area	200 km^2
Array area as % total ICES 43E9	6%
Value of Catch in Array Area	
Average Annual Value of Fish Landed from ICES 43E9	£2,900,000
Proportional Annual Value of Fish Landed from Array Area	£172,500
Impact of Displacement	
Assumed level of Array Catch that is caught elsewhere in ICES43E9 or neighbouring areas	75%
Value of Net Loss of Catch	£43,100
Net Reduction in Value of Fish Landings	£43,100

Source: BIGGAR Economics Analysis

7.2.23. The value of fish landed at Peterhead in 2022 was £192.7 million. The net reduction in the value of fish landings because of the Array Area would be equivalent to less than 0.1% of the value of the total landings at Peterhead Port. Based on turnover of average £153,700 per employee, the reduction in catch would reduce employment of fishers by the equivalent of 0.3 jobs, which is less than 0.1% of employment. Because the catch is distributed across several vessels it is likely that this would not result in any changes to employment.

7.2.24. Impacts on the fish processing sector, supply chain and further upstream impacts would be expected to be similarly minimal. Estimates of the number of onshore jobs supported per one fisher at sea ranges from 0.63 (Anderson Solutions Ltd, 2017) to 5 (Scottish Fishermen's Federation, 2025). If the highest multiplier was considered, the employment effects would be the equivalent of an additional 1.5 jobs across the economy. On this basis, the magnitude of impact on Peterhead's fishing sector would be **Negligible.**

ASSESSMENT OF SIGNIFICANCE

7.2.25. The magnitude of the impact on the Peterhead fishing and fish processing sector is deemed to be negligible, and the sensitivity of the receptor is low. The effect will therefore be of **Negligible significance (adverse),** which is not significant in EIA terms.

CONCLUSIONS

7.2.26. This section has provided an updated socio-economic assessment of the significant commercial fisheries effects highlighted in the November 2024 EIAR submission. The worst-case scenarios for potential losses to the commercial fisheries sector and the wider economy have been revisited, and the potential for significant socio-economic outcomes re-assessed.

7.2.27. Volume 2, Chapter 17: Socio-economics, Tourism and Recreation of the EIAR concluded no significant effects with respect to socio-economics, tourism and recreation. The assessment above shows that following full incorporation of the commercial fisheries effects assessed in the EIAR, this conclusion remains the same. **No significant socio-economic** effects associated with commercial fisheries are anticipated.

7.3. MARINE MAMMALS REVISED ASSESSMENT

7.3.1. This section has been produced in response to a comment received by NatureScot on the following application documents:

- Muir Mhòr Offshore Wind Farm Environmental Impact Assessment Report Volume 3, Appendix 12.1: Marine Mammal Baseline Technical Report. Document ID: MMH-GBE-A004-ENV-0006-315 (November 2024)
- Muir Mhòr Offshore Wind Farm Environmental Impact Assessment Report Volume 2, Chapter 12: Marine Mammals. Document ID: MMH-GBE-A004-ENV-0006-205 (November 2024)

7.3.2. The NatureScot comment relates to the density used in the quantitative assessment for bottlenose dolphins in the Greater North Sea (GNS) Management Unit (MU):

"Section 7.5.1 gives incorrect numbers of SCANS III Block R estimates for abundance (147) and density (0.0023 per km^2). The correct numbers should be abundance of 1,924 and 0.0298 per km^2. Instead of the using the Block R estimate, the Developer has chosen to use a density estimate based on the abundance of bottlenose dolphin in the Greater North Sea MU. Whilst not specified, our understanding is that the abundance in the MU has been divided by the area of the MU. This gives a density estimate of 0.003 per km^2, which is considerably lower than the Block R estimate of 0.0298 per km^2. Therefore, we request clarification as to why the SCANS III estimate has not been used and further detail should be provided around what difference this may have made to the outcome of the assessment. Given that the density of animals is still relatively low, it may be that the outcome would not be materially different if the numbers were recalculated, but as it stands it is possible that the impacts have been underestimated."

7.3.3. The Applicant acknowledges that the wrong SCANS III block density was presented in Table 7-5 in Appendix 12.1 (0.0023 dolphins/km^2 was presented instead of 0.0298 dolphins/km^2). The consequence of this was that the GNS MU density value of 0.003 dolphins/km^2 was used in the quantitative assessment, as this appeared to be more conservative than the erroneous value of 0.0023 dolphins/km^2. The SCANS III density surface (Lacey *et al.*, 2022) was not used in the quantitative impact assessment as it predicted a range of densities within the Array Area of 0.001-0.003 dolphins/km^2 and thus it was considered more conservative to use the GNS MU density value of 0.003 dolphins/km^2 throughout.

7.3.4. The assessment for bottlenose dolphins in the GNS MU has now been revised using the SCANS III block densities (Hammond *et al.*, 2021) for blocks overlapping the potentially disturbed area (see Figure 7.1) as requested by NatureScot, including the values of 0.0298 (block R) and 0.0037 (block S) dolphins/km^2. It is worth noting that the SCANS III block densities predict that 1,924 bottlenose dolphins are present in block R, which represents 95%

of the entire GNS MU population (2,022 dolphins). It is also important to note that the newer SCANS IV block densities (Gilles *et al.*, 2023) for bottlenose dolphins were 0.0000 dolphins/km^2 across all relevant blocks. The range of density estimates considered for bottlenose dolphins in the GNS MU are presented in Table 7.8.

Table 7.8 Density Estimates for Bottlenose Dolphins in the GNS MU [erroneous value reported in Appendix 12.1]

Source	Density (#/km2)
GNS MU uniform density estimate	0.003
SCANS III block density estimates (Hammond *et al.*, 2021)	Block S: 0.0037 Block T: 0.0000 Block U: 0.0000 Block R: 0.0298 [0.0023] Block Q: 0.0000
SCANS III density surface (Lacey *et al.*, 2022)	Array Area: 0.001 – 0.003
SCANS IV block density estimates (Gilles *et al.*, 2023)	Block CS-K (equivalent to S): 0.0000 Block NS-E (equivalent to T): 0.0000 Block NS-F (equivalent to U): 0.0000 Block NS-D (equivalent to R): 0.0000 Block NS-G (equivalent to Q): 0.0000

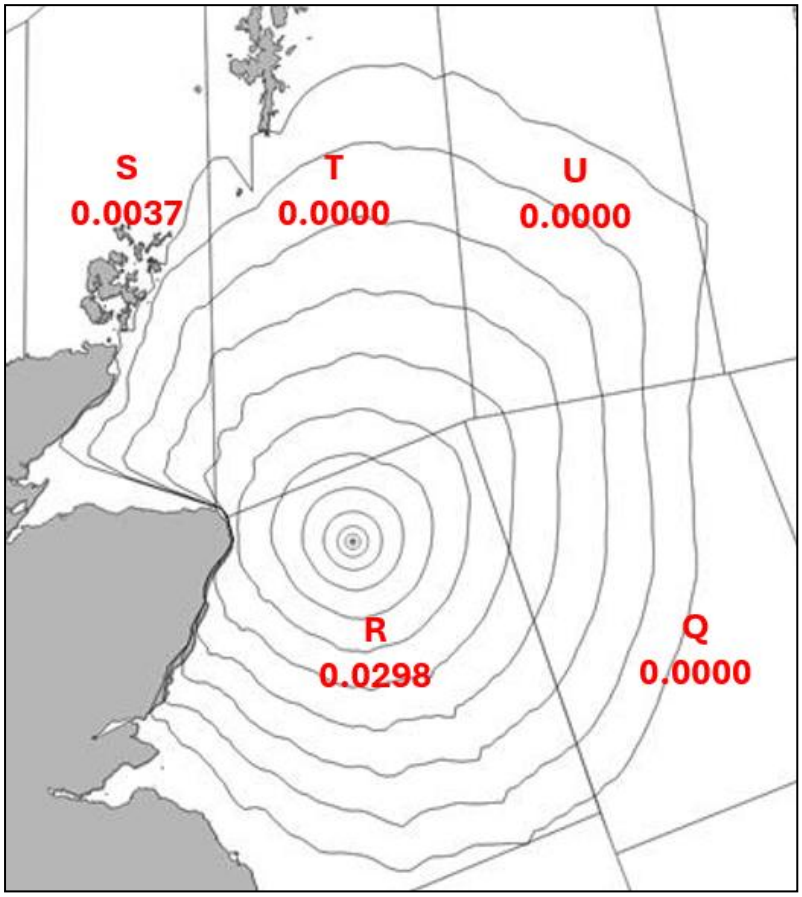

Figure 7.1 Noise Contours (120-180 dB SEL$_{ss}$) for Piling of the NE Anchor at Muir Mhòr Overlain on the SCANS III Blocks

EIAR ASSESSMENT: PROJECT ALONE

7.3.5. Using the density value of 0.003 dolphins/km^2 across the entire GNS MU, Volume 2, Chapter 12: Marine Mammals of the EIAR predicted that 74 bottlenose dolphins would be disturbed per piling day at the NE anchor location using the Graham *et al.* (2017) dose-response function (75 for the OSP jacket) (Table 7.9).

Table 7.9 Number of GNS MU Bottlenose Dolphins Predicted to be Disturbed per Piling day: EIAR Chapter 12

	Graham et al. (2017) Dose-response	
	NE Anchor	**OSP Jacket**
Number of animals disturbed (0.003 dolphins/km^2)	74	75
% MU	3.7%	3.8%

7.3.6. In order to assess if this level of disturbance would result in a predicted population level effect, iPCoD was run. Piling scenario 1 assumed the piling of jacket piles on 24 days and anchor piles on 151 days, resulting in a total of 175 piling days between June 2029 and June 2031 inclusive. The results of the iPCoD modelling, using the dose-response predictions showed that the level of disturbance from the construction of the Proposed Development is not sufficient to result in any changes at the population level to the GNS MU. The impacted population was predicted to continue to increase at a stable trajectory, the same as the un-impacted population, and at 99.4 – 99.5% of the size of the un-impacted population from 1 to 18 years after the end of piling activities (Figure 7.2 and Table 7.10).

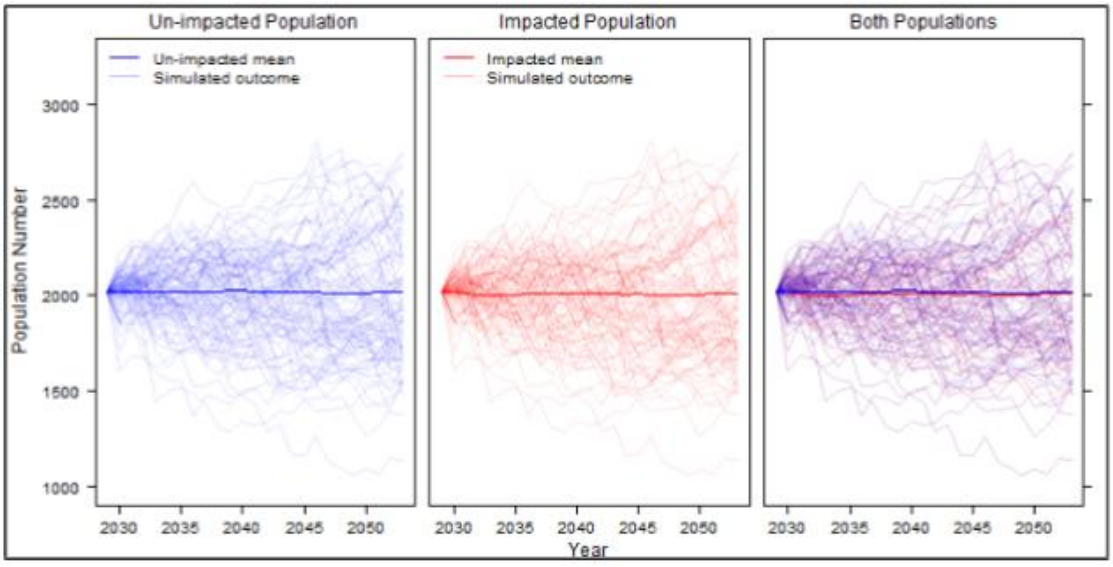

Figure 7.2 Predicted Population Trajectories for the Unimpacted (baseline) and the Impacted Bottlenose Dolphin iPCoD Simulations for the GNS MU: EIAR Chapter 12

Table 7.10 iPCoD Results Using the Disturbance Numbers Obtained from the Dose-response Function: EIAR Chapter 12

	Mean Unimpacted Population Size	Mean Impacted Population Size	Impacted as % of Unimpacted Population Size
Start 2029 (pre-piling)	2024	2024	100%
End 2029 (end piling year 1)	2023	2023	100%
End 2030 (end piling year 2)	2021	2016	99.8%
End 2031 (end piling year 3)	2018	2004	99.3%
End 2032 (1 year after piling ends)	2020	2007	99.4%
End 2037 (6 years after piling ends)	2019	2009	99.5%
End 2043 (12 years after piling ends	2017	2006	99.5%
End 2049 (18 years after piling ends)	2013	2003	99.5%

7.3.7. It was therefore concluded in Volume 2, Chapter 12: Marine Mammals of the EIAR that the impact of disturbance from piling will occur over a large spatial extent, though it is noted that response probabilities at the lower received levels are extremely low. The majority of the predicted response will occur over a medium spatial extent. The duration of the disturbance from a single piling event is low, since studies have shown that harbour porpoise detections return to baseline levels after the cessation of piling (the same is assumed for bottlenose dolphins). The duration of the impact is medium-term as it will occur over three calendar years between March 2029 and October 2031 and the effect will occur intermittently with a maximum of 175 piling days. The probability of the effect is high, while there are limited studies on the responses of bottlenose dolphins to piling there is evidence that small spatial and temporal scale disturbance to bottlenose dolphins can occur as a result of impact piling activities (Graham et al., 2017c). The iPCoD modelling shows the disturbance has a **Low** consequence since there is predicted to be no overall change to the population trajectory. Therefore, since modelling has shown that despite a small proportion of the population being impacted, the population trajectory would not be altered, and thus the impact of disturbance from pile driving is of **Low** magnitude for bottlenose dolphins.

7.3.8. Overall, the magnitude was assessed as **Low**, the sensitivity was assessed as **Low** and therefore the impact significance was assessed as **Negligible (not significant in EIA terms)** (Table 7.11).

Table 7.11 Result of the Assessment of Disturbance From Piling: EIAR Chapter 12

Receptor	Magnitude	Sensitivity	Significance
Bottlenose dolphins (GNS MU)	Low	Low	Negligible (not significant)

AIR ASSESSMENT: PROJECT ALONE

7.3.9. This revised assessment used the SCANS III block density estimates to calculate the number of GNS MU bottlenose dolphins impacted. Since the impact contours overlapped multiple blocks, the portion of the contour within each block was assigned the relevant block density estimate. This predicted that 426 bottlenose dolphins would be disturbed per piling day at the NE anchor location using the Graham *et al.* (2017) dose-response function (458 for the OSP jacket). This is substantially more dolphins than was predicted in the EIAR using the density of 0.003 dolphins/km^2 (Table 7.12).

Table 7.12 Number of GNS MU Bottlenose Dolphins Predicted to be Disturbed per Piling Day Using the Graham et al. (2017) Dose-response Function

	NE Anchor	OSP Jacket	NE Anchor	OSP Jacket
Density (#/km^2)	0.003		SCANS III blocks (0.0000 – 0.0298)	
Number of dolphins disturbed	74	75	426	458
% MU	3.7%	3.8%	21.1%	22.7%

7.3.10. In order to assess if this level of disturbance would result in a predicted population level effect, iPCoD was run. Piling scenario 1 assumes the piling of jacket piles on 24 days and anchor piles on 151 days, resulting in a total of 175 piling days between June 2029 and June 2031 inclusive. The iPCoD modelling shows the disturbance has a **Medium** consequence since there is predicted to be a potential small temporary change to the population trajectory. The modelling has predicted that the population trajectory will decline slightly in response to the pile driving, where the mean impacted population size will decrease to ~97% of the size of the mean un-impacted population size (Figure 7.3). After pile driving ends, the population is predicted to remain at a stable trajectory (noting iPCoD did not include density dependence and thus the population can never increase to baseline following the end of the disturbance impact).

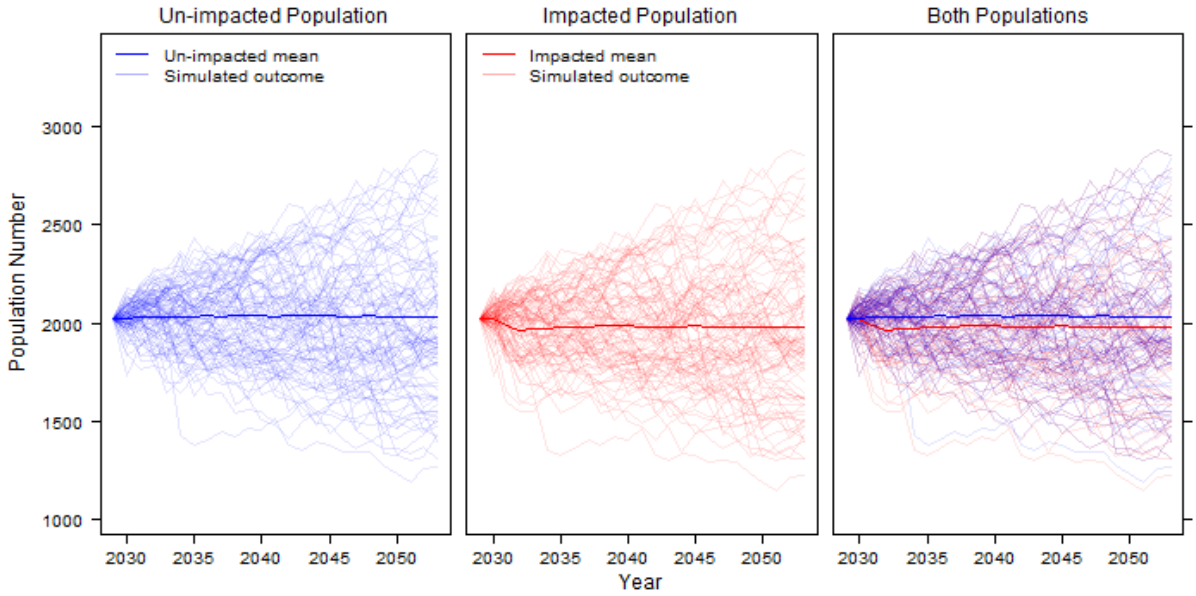

Figure 7.3 Predicted Population Trajectories for the Unimpacted (baseline) and the Impacted Bottlenose Dolphin iPCoD Simulations for the GNS MU: Revised Assessment

Table 7.13 iPCoD Results Using the Disturbance Numbers Obtained From the Dose-response Function: Revised Assessment

	Mean Unimpacted Population Size	Mean Impacted Population Size	Impacted as % of Unimpacted Population Size
Start 2029 (pre-piling)	2,024	2,024	100%
End 2029 (end piling year 1)	2,026	2,026	100%
End 2030 (end piling year 2)	2,027	1,989	98.1%
End 2031 (end piling year 3)	2,028	1,959	96.6%
End 2032 (1 year after piling ends)	2,034	1,970	96.9%
End 2037 (6 years after piling ends)	2,038	1,987	97.5%
End 2043 (12 years after piling ends	2,035	1,980	97.3%
End 2049 (18 years after piling ends)	2,031	1,978	97.4%

7.3.11. It is therefore concluded that the impact of disturbance from piling will occur over a large spatial extent, though it is noted that response probabilities at the lower received levels are extremely low. The majority of the predicted response will occur over a medium spatial extent. The duration of the disturbance from a single piling event low, since studies have shown that harbour porpoise detections return to baseline levels after the cessation of piling (the same is assumed for bottlenose dolphins). The duration of the impact is medium-term as it will occur over three calendar years between March 2029 and October 2031 and the effect will occur intermittently with a maximum of 175 piling days. The probability of the effect is high, while there are limited studies on the responses of bottlenose dolphins to piling there is evidence that small spatial and temporal scale disturbance to bottlenose dolphins can occur as a result of impact piling activities (Graham *et al.*, 2017). Given the modelling has predicted that the population trajectory will decline slightly in response to the pile driving (where the mean impacted population size will decrease to ~97% of the size of the mean un-impacted population size), the impact of disturbance from pile driving aligns with a **Medium** magnitude for GNS MU bottlenose dolphins.

7.3.12. Overall, the magnitude is assessed as **Medium**, the sensitivity was assessed as **Low** and therefore the impact significance is assessed as **Minor (not significant in EIA terms)** (Table 7.14).

Table 7.14 Result of the Assessment of Disturbance From Piling: Revised Assessment

Receptor	Magnitude	Sensitivity	Significance
Bottlenose dolphins (GNS MU)	Medium	Low	Minor (not significant)

ORIGINAL ASSESSMENT: CUMULATIVE

7.3.13. The cumulative assessment presented in Volume 2, Chapter 12: Marine Mammals of the EIAR used project specific EIAR values where available. In the absence of project specific values (i.e.no EIAR was available) a disturbance threshold was assumed (26 km EDR for fixed foundations and 15 km EDR for floating) and combined with the uniform GNS MU density estimate (0.003 dolphins/km2) (Table 7.15).

7.3.14. In order to assess if this level of disturbance would result in a predicted population level effect, iPCoD was run using the values presented in Table 7.16.

Table 7.15 Total Number of Bottlenose Dolphins in the GNS MU Predicted to be Disturbed per Piling day per Project: EIAR Chapter 12

Project	Source	2028	2029	2030	2031	2032	2033	2034
Muir Mhòr	Dose response + 0.003 bnd/km^2		74	74	74	-	-	
Arven	15 km EDR + 0.003 bnd/km^2			2	2	2	2	
Ayre	15 km EDR + 0.003 bnd/km^2		2	2	2	2	2	
Bellrock	15 km EDR + 0.003 bnd/km^2	2	2	2	2			
Berwick Bank	Dose response + SCANS III blocks	-	-	-	102	-	-	
Broadshore	15 km EDR + 0.003 bnd/km^2	2	2	2	2			
Buchan	15 km EDR + 0.003 bnd/km^2	2	2	2				
Caledonia	26 km EDR + 0.003 bnd/km^2	6	6	6				
Cenos	15 km EDR + 0.003 bnd/km^2		2	2	2	2	2	
Morven	15 km EDR + 0.003 bnd/km^2	6	6	6				
Ossian	Not assessed in EIAR				NA	NA	NA	NA
Salamander	Dose response + SCANS III surface	4	-	-				
Scaraben	15 km EDR + 0.003 bnd/km^2		2	2				
Stromar	15 km EDR + 0.003 bnd/km^2	2	2	2				
West of Orkney	Not assessed in EIAR	NA	NA	NA	-			
Bowdun	26 km EDR + 0.003 bnd/km^2		6	6	6	6		

Table 7.16 Number of Bottlenose Dolphins in the GNS MU Disturbed per Piling day per Project in the iPCoD CEA: EIAR Chapter 12

Project	Piling years	# GNS MU dolphins disturbed
Muir Mhòr	2029 - 2031	74 (WTG), 75 (OEP)
Berwick Bank	2026 - 2031	102 (WTG), 64 (OEP)
Arven	2030 - 2033	2
Ayre	2029 - 2033	2
Bellrock	2028 – 2031	2
Broadshore	2028 – 2031	2
Buchan	2028 – 2030	2
Caledonia	2028 – 2030	6
Cenos	2029 – 2033	2
Morven	2026 – 2032	6
Scaraben	2029 – 2030	2
Stromar	2028 - 2030	2

7.3.15. The results of the cumulative iPCoD modelling showed that for GNS MU, although the level of disturbance has the potential to result in changes at the population level, the impacted population is predicted to continue on a stable trajectory at ~97% of the size of the unimpacted population between 2028 – 2045 (Figure 7.4 and Table 7.17).

7.3.16. The impact will occur intermittently over a large spatial extent and medium-term duration (piling at the Proposed Development will take up to three years). The effect of behavioural disturbance is very likely to occur and will occur at moderate frequency (different projects piling at different times). As such, the level of disturbance predicted to occur within the GNS MU between 2028 – 2034 is expected to result in temporary changes in behaviour and/or distribution of individuals at a scale that could result in reductions to lifetime reproductive success to some individuals. The iPCoD modelling has shown that the impacted population is predicted to continue on a stable trajectory at ~97% of the size of the un- impacted population despite the cumulative construction activities. Overall, the cumulative impact of behavioural disturbance from pile driving was considered to be a **Medium** magnitude. It was therefore concluded in Volume 2, Chapter 12: Marine Mammals of the EIAR that the magnitude of the cumulative impact was **Medium**, and the sensitivity of the receptor was **Low**. The cumulative effect was therefore **Minor (not significant in EIA terms)**.

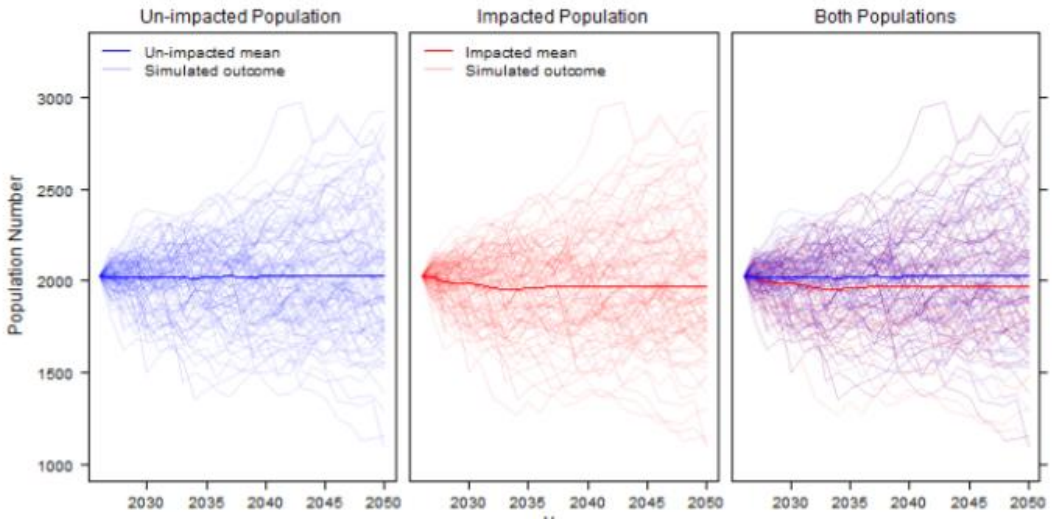

Figure 7.4 Predicted Population Trajectories for the un-impacted (baseline) and Impacted Bottlenose Dolphin GNS MU Cumulative iPCoD Simulation: EIAR Chapter 12

Table 7.17 Predicted Impact of Disturbance From Pile Driving Activities on Bottlenose Dolphins in the GNS MU in the Cumulative Simulation: EIAR Chapter 12

	Mean Unimpacted Population Size	Mean Impacted Population Size	Impacted as % of Unimpacted Population Size
Start 2026 (pre CEA piling)	2,024	2,024	100%
End 2028 (before Muir Mhòr piling)	2,019	1,986	98.4%
End 2031 (end Muir Mhòr piling)	2,022	1,965	97.2%
End 2033 (end CEA piling)	2,013	1,953	97.0%
End 2039 (6 years after CEA piling)	2,026	1,971	97.3%
End 2045 (12 years after CEA piling)	2,028	1,970	97.1%

REVISED ASSESSMENT: CUMULATIVE

7.3.17. This revised cumulative assessment used project specific EIAR values where available. In the absence of project specific values (i.e.: no EIAR was available) a disturbance threshold was assumed (26 km EDR for fixed foundations and 15 km EDR for floating) and combined with the density of the SCANS III block the project is located within (Table 7.18).

7.3.18. In order to assess if this level of disturbance would result in a predicted population level effect, iPCoD was run using the values presented in Table 7.19.

Table 7.18 Total Number of Bottlenose Dolphins in the GNS MU Predicted to be Disturbed per Piling Day per project: Revised Assessment

Project	Disturbance Threshold	Density (#/km²)	2028	2029	2030	2031	2032	2033	2034
Muir Mhòr	Dose response	SCANS III blocks Q, R, S, T, U (0.0000 – 0.0298)		426	426	426	-	-	
Arven	15 km EDR	SCANS III block T (0.0000)			0	0	0	0	
Ayre	15 km EDR	SCANS III block S (0.0037)		3	3	3	3	3	
Bellrock	15 km EDR	SCANS III block R (0.0298)	21	21	21	21			
Berwick Bank	dose response	SCANS III blocks	-	-	-	102	-	-	
Broadshore	15 km EDR	SCANS III block T (0.0000)	0	0	0	0			
Buchan	15 km EDR	SCANS III block T (0.0000)	0	0	0				
Caledonia	26 km EDR	SCANS III block S (0.0037)	8	8	8				
Cenos	15 km EDR	SCANS III block Q (0.0000)		0	0	0	0	0	
Morven	15 km EDR	SCANS III block R (0.0298)	21	21	21				
Ossian	Not assessed in Ossian EIAR					NA	NA	NA	NA
Salamander	dose response	SCANS III surface	4	-	-				
Scaraben	15 km EDR	SCANS III block T (0.0000)		0	0				
Stromar	15 km EDR	SCANS III block S (0.0037)	3	3	3				
West of Orkney	Not assessed in West of Orkney EIAR		NA	NA	NA	-			
Bowdun	26 km EDR	SCANS III block T (0.0000)		0	0	0	0		

Table 7.19 Number of Bottlenose Dolphins in the GNS MU Disturbed per Piling day per Project in the iPCoD CEA: Revised Assessment

Project	Piling Years	EIAR Chapter 12: # GNS MU Dolphins Disturbed	Revised Assessment: # GNS MU Dolphins Disturbed
Muir Mhòr	2029 - 2031	74 (WTG), 75 (OEP)	426 (WTG), 458 (OEP)
Berwick Bank	2026 - 2031	102 (WTG), 64 (OEP)	102 (WTG), 64 (OEP)
Arven	2030 - 2033	2	0
Ayre	2029 - 2033	2	3
Bellrock	2028 – 2031	2	21
Broadshore	2028 – 2031	2	0
Buchan	2028 – 2030	2	0
Caledonia	2028 – 2030	6	8
Cenos	2029 – 2033	2	0
Morven	2026 – 2032	6	21
Scaraben	2029 - 2030	2	0
Stromar	2028 - 2030	2	3

7.3.19. The iPCoD modelling shows the cumulative disturbance can result in a change to the population size. The modelling has predicted that the population trajectory will decline in response to the pile driving, where the mean impacted population size will decrease to ~94.7% of the size of the mean un-impacted population size. After pile driving ends, the population is predicted to remain at a stable trajectory at ~95% of the size of the unimpacted population (noting iPCoD did not include density dependence and thus the population can never increase to baseline following the end of the disturbance impact). (Figure 7.5 and Table 7.20).

7.3.20. The impact will occur intermittently over a large spatial extent and medium-term duration (piling at the Proposed Development will take up to three years). The effect of behavioural disturbance is very likely to occur and will occur at moderate frequency (different projects piling at different times). As such, the level of disturbance predicted to occur within the GNS MU between 2028 – 2034 is expected to result in temporary changes in behaviour and/or distribution of individuals at a scale that could result in reductions to lifetime reproductive success to some individuals. The iPCoD modelling has shown that the impacted population is predicted to decline to ~94.7% of the unimpacted population size. Overall, the cumulative impact of behavioural disturbance from pile driving is precautionarily considered to be of **High** magnitude.

7.3.21. It is therefore concluded that the magnitude of the cumulative impact is **High**, and the sensitivity of the receptor is **Low**. The cumulative effect is therefore **Minor (not significant in EIA terms)**.

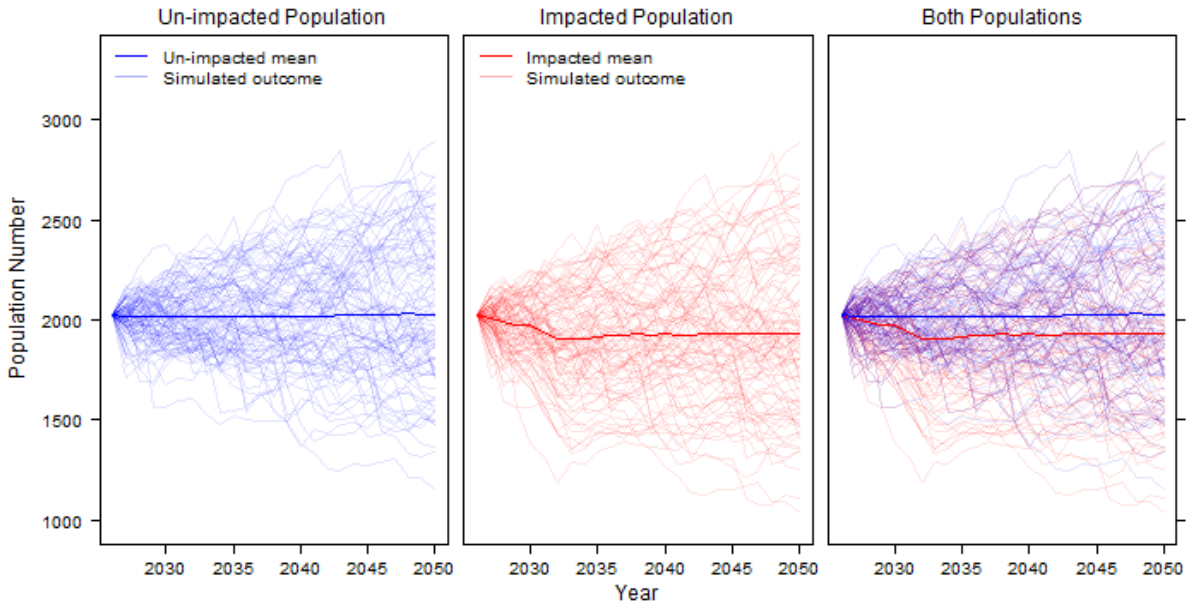

Figure 7.5 Predicted Population Trajectories for the Un-impacted (baseline) and Impacted Bottlenose Dolphin GNS MU Cumulative iPCoD Simulation: Revised Assessment

Table 7.20 Predicted Impact of Disturbance From Pile Driving Activities On Bottlenose Dolphins in the GNS MU in the Cumulative Simulation: Revised Assessment

	Mean Unimpacted Population Size	Mean Impacted Population Size	Impacted as % of Unimpacted Population Size
Start 2026 (pre CEA piling)	2,024	2,024	100.00%
End 2028 (before Muir Mhòr piling)	2,016	1,976	98.02%
End 2031 (end Muir Mhòr piling)	2,017	1,909	94.65%
End 2033 (end CEA piling)	2,015	1,910	94.79%
End 2039 (6 years after CEA piling)	2,021	1,928	95.40%
End 2045 (12 years after CEA piling)	2,028	1,929	95.12%

CONCLUSION

7.3.22. The use of the SCANS III block densities results in substantially more bottlenose dolphins predicted to impacted per piling day at Muir Mhòr in the revised assessment compared to the assessment presented in Volume 2, Chapter 12: Marine Mammals of the EIAR. The use of iPCoD modelling has supported the conclusion that the magnitude of impact should increase from **Low** in Volume 2, Chapter 12: Marine Mammals of the EIAR to **Medium** in the revised assessment. This increases the significance of effect from **Negligible** in Volume 2, Chapter 12: Marine Mammals of the EIAR to **Minor** in the revised assessment, though neither is significant in EIA terms (Table 7.21).

7.3.23. The revised cumulative assessment was undertaken using the SCANS III block densities for other projects rather than the uniform GNS density. The iPCoD modelling has shown that the impacted population is predicted to decline to ~94.7% of the unimpacted population size. The use of iPCoD modelling has supported the conclusion that the magnitude of impact should increase from **Medium** in Volume 2, Chapter 12: Marine Mammals of the EIAR to **High** in the revised assessment. The significance of effect for the cumulative assessment remains the same as it was in Volume 2, Chapter 12: Marine Mammals of the EIAR: **Minor (significant in EIA terms)** (Table 7.21).

7.3.24. Therefore, despite the change in the density estimate for bottlenose dolphins in the GNS MU, the assessment remains **non-significant** both for the project alone and cumulatively with other projects.

7.3.25. It is important to flag that the SCANS IV block densities (Gilles *et al.*, 2023) for bottlenose dolphins were 0.0000 dolphins/km^2 in each of the survey blocks within the piling disturbance noise contours for Muir Mhòr and for the blocks within which the cumulative projects are located. The data from the SCANS IV surveys effectively supersedes the SCANS III data, thus the SCANS IV data are now considered to be the more recent and appropriate values. Thus, the latest SCANS IV data would predict no impact to the GNS MU for bottlenose dolphins from Muir Mhòr alone and cumulatively with other projects.

Table 7.21 Overall Comparison of the Results of the Assessment of Disturbance From Piling in the Original Assessment and the Revised Assessment

Assessment		Magnitude	Sensitivity	Significance
Project Alone	Original Assessment	Low	Low	Negligible (not significant)
	Revised Assessment	Medium	Low	Minor (not significant)
Cumulative	Original Assessment	Medium	Low	Minor (not significant)
	Revised Assessment	High	Low	Minor (not significant)

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