

Our Ref: 6972

13 February 2024

Rebecca Clarkson
Aquaculture Direct
2 Alfred Street,
Mayfield,
Blenheim 7201

Dear Rebecca,

NORTH WESTERN MUSSEL FARM -

North Western Mussels Ltd (NWML) is a joint venture between Gulf Mussel Farms, OP Columbia and Vela Fishing. NWML proposes to develop a large offshore spat-catching/nursery operation at four sites along the western Waikato coast. Wildland Consultants Limited has prepared an ecological assessment report of the potential effects of the farming operation on seabirds, particularly diving birds (Wildlands 2022). A technical review for this report was undertaken by Pieces Consulting and the Waikato Regional Council has provided specific question for Wildlands to address.

The specific questions and response from Wildlands are outline below:

- 1. Please provide a description of seabird species that have been identified as potentially vulnerable to the proposed farming activity and the reasons why (e.g., conservation status, utilisation of the proposed farming sites, behaviour that may make them potentially vulnerable to the proposed farming activities).***

Sections 4.2 – 4.6 in Wildlands (2022) provide seabird species most commonly encountered along the coast and at sea adjacent to the study site. These species include albatrosses, mollymawks, shearwaters, petrels, prions, storm petrels, fulmars, gannets, shags, gulls and terns. Additionally, Tables 2 and 3 of Wildlands (2022) summarise the seabird species identified in eBird and fisheries observer records along the coast and at sea adjacent to the study site and their ecological value. Appendix 1 lists the threat classification (Robertson *et al.* 2021) and the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species.

For these species, direct interaction with farm structures may pose entanglement risk, potentially leading to drowning, especially for diving birds. However, the entanglement risk within a mussel farm is very low, given the thickness of ropes and structures associated with mussel farming, as ropes are held under considerable tension (see Section 5.1 in Wildlands 2022). No seabird deaths due to entanglement in aquaculture facilities are reported in New Zealand (Butler 2003, Connor-McLean *et al.* 2020, Lloyd 2003, Ministry for Primary Industries 2013, Sagar 2013).

Mussel farm structures may limit habitat availability to surface-feeding seabirds, including gulls (*Larus* spp.), terns (*Sternidae* spp.), shearwaters and petrels (family Procellariidae; Ministry for Primary Industries 2013; (see Section 5.2 in Wildlands 2022)). Of the pelagic species, the most plentiful inshore populations are the locally abundant fluttering shearwater, fairy prion, and grey-faced petrel, whose distributions overlap with the proposed farm. However, given the relatively small areas occupied by mussel aquaculture in New Zealand compared to suitable foraging habitat available for seabirds, reduced habitat is considered less than minor (Sagar 2013).

The concentration of small fish around structures can attract foraging birds (Forrest *et al.* 2015; see Section 5.4 in Wildlands 2022). Seabirds, including gulls (*Larus* spp.) and shags (*Phalacrocorax* spp., *Microcarbo* spp.), associate with mussel farms foraging on mussel lines and from the water surface. The use of mussel farms as foraging sites is likely to have a positive or neutral impact on these species, and possibly other seabird species. It seems likely that the proposed spat-catching/nursery farm, while further offshore, will also be used by many bird species for feeding and roosting.

Marine debris ingestion, reduces seabird fitness and increases mortality (see Section 5.7 in Wildlands 2022). Ingestion and entanglement in marine debris can be mitigated by actively minimising loss and retrieving pieces that unintentionally enter the water.

Additionally, attraction to lights may result in collisions with farm structures (Ministry for Primary Industries 2013; see Section 5.8 in Wildlands 2022). This is expanded upon in Point 4 below.

2. Please determine the seabird species or important habitat areas for seabirds affected by the proposal that trigger consideration under policy 11(a)(i)-(vi) and 11(b)(i)-(vi) of the New Zealand Coastal Policy Statement and specify the subsections that apply to each species and habitat.

Section 4.1 in Wildlands (2022) outlines the important habitat areas for seabirds. Karewa Gannet Island (37.972282°S, 174.565973°E; Forest and Bird 2015) is designated as an Important Bird Area (IBA) and is located approximately 18 kilometres southwest of proposed Site D. This site is an Island Wildlife Reserve and is a significant breeding site for the tākapu/Australasian gannet (*Morus serrator*, Not Threatened). This IBA triggers Policy 11 (a)(vi) in the New Zealand Coastal Policy Statement 2010.

The west coast of the North Island, from Waitakere Ranges Regional Park to north of Marokopa, is a proposed extension of IBA triggered by the presence of Australasian Gannet and tara iti/New Zealand fairy tern (*Sternula nereis*, Threatened – Nationally Critical) foraging sites (Forest and Bird 2014). The IBA criteria is A4ii and triggers Policy 11 (a)(vi) in the New Zealand Coastal Policy Statement 2010.

3. Please apply a consistent effects assessment method and provide reasoned conclusions consistent with the assessment method.

At the time of writing the Wildlands (2022) report, Wildland Consultants Ltd was using the EIANZ guidelines. However, these guidelines have been re-assessed and deemed less robust with regards to the marine environment. The New Zealand Coastal Policy Statement 2010 guidance note Policy 11: indigenous biodiversity (Department of Conservation 2019) and the Proposed Waikato Regional Coastal Plan (Waikato Regional Council 2023) have been reviewed regarding the protection of Threatened and At Risk avifauna and their habitats.

The potential adverse effects have been reviewed, with regards to avoiding adverse effects on Threatened and At Risk indigenous avifauna, and whether an effect would have an impact on species at a population, local or genetic level. All species which may utilise the proposed spat farm sites are highly mobile species. The potential effects of mussel farming (and other marine farming operations)

on seabirds (and other biotas) have also been assessed by the Department of Conservation (Butler 2003), Wildland Consultants (Wildlands 2020a, b), Pacific Coastal Ecology (White 2018), Cawthron Institute (Keeley *et al.* 2009), and National Institute of Water and Atmospheric Research (NIWA; Sagar 2013). Table 1 addresses the revised potential adverse effects.

Table 1: The potential effects of mussel farming on seabirds (Sagar 2013, Keeley *et al.* 2009, and White 2018), activity assessment and level of adverse effect has been assessed using the New Zealand Coastal Policy Statement 2010 guidance note Policy 11: indigenous biodiversity (Department of Conservation 2019) and the Proposed Waikato Regional Coastal Plan (Waikato Regional Council 2023).

Potential Effects	Description	Activity Assessment	Level of Adverse Effects
Habitat exclusion	Structures may deter birds from feeding on farms or inhibit movement within a farm.	The potential exclusion area containing surface buoys, backbone lines and dropper lines is approximately 468 hectares. Compared to the available extensive foraging area, it is unlikely to have any impact on seabird species.	Less than minor to negligible
Changes in prey abundance	Epifaunal community on mussels has been recorded to consist of numerous different species. Ammonia excreted by mussels can lead to high productivity of seaweeds on ropes and lines. Fish may be attracted to the farm to feed on organisms growing on ropes, for shelter, or to prey on smaller fish. However, some prey species of seabirds may be reduced within a mussel farm. Mussels consume plankton; phytoplankton depletion may have flow-on effects on prey abundance.	Floating structures can act a fish aggregating devices, potentially increasing prey abundance (e.g. fish and invertebrates). Structures provide roosting areas between fishing bouts. Aggregated small fish may benefit shags, penguins and terns.	Negligible (or positive)
Provision of roosting sites	Allows birds to rest close to foraging sites but away from potential predators.	Structures provide roosting areas between fishing bouts for gulls, shags, and terns. This could have a significant beneficial effect for these species.	Negligible (or positive)
Disturbance and noise	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels may disturb breeding seabirds travelling to and from the farm.	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Less than minor

Foreign debris – ingestion and entanglement	Birds can swallow plastics accidentally or become entangled in loose ropes, which can directly or indirectly impact survival.	The mussel farming industry is overseen by a Sustainable Management Framework which requires cordage, plastics and general waste to be collected and disposed of ashore. This prevents ingestion and entanglement of seabirds.	Minor
Attraction to lights	Lights can attract or disorientate seabirds, causing them to collide with structures.	Marine navigational lights are less problematic than lights within marinas, ports, coastal areas and vessels. Attraction and collision with navigational lights is unlikely due to their small, low structure and shielded light source.	Less than minor
Water pollution	For example, the result of an accidental collision of a larger boat with a farm releasing an oil spill. This is considered a low risk given the flexibility of mussel farm structures are unlikely to cause major damage to vessels.	Vessel boating practises will minimise any oil spills and spill kits will be carried by all vessels	Less than minor to negligible

4. Please clarify whether illumination from special markers is predicted to have adverse effects on coastal nesting species.

Some seabird species (e.g. petrels and shearwaters) can become disorientated or be attracted to artificial lights (see Section 5.8 in Wildlands 2022). Navigation lighting and marks will be installed in accordance with Maritime New Zealand (2008, 2018) and Maritime Transport Act 1994. Where possible, farm navigation lights should flash or rotate rather than remain constant, as this can reduce the potential for disorientation of seabirds (Commonwealth of Australia 2020, Rebke *et al.* 2019).

The ‘special markers’ used to identify the spat farm to vessels have a light intensity that allows them to be visible for five nautical miles. This is the maximum visible distance in clear weather conditions and equates to 9.26 kilometres. The coastline is within 3.1 kilometres, and illumination from the ‘special markers’ will be visible to coastal nesting species. The main concern with birds being attracted to artificial light is stranding on land and being unable to take flight. If there is any attraction of birds to the navigational markers, these birds will be able to return to land or roost or raft until daybreak. Any attraction of seabirds is unlikely to lead to injury or death, as the spat farm structure is small and low. Because of these reasons, the potential effect of navigational lighting is considered to be less than minor and although it will be visible to coastal nesting birds but will not cause an adverse effect.

5. Please explain how the likelihood of effects occurrence (risk) has been considered in the assessment.

This has been addressed in Section 3 above.

6. The seabird assessment by Wildlands states: “no injuries or entanglements have been reported from New Zealand or overseas mussel farms”. Please provide a supporting reference for the statement.

The following references are discussed in Sections 5 and 5.1 of the Wildlands (2022) report and in Table 4.

- Butler D.J. 2003: Possible impacts of marine farming of mussels (*Perna canaliculus*) on king shags (*Leucocarbo carunculatus*). *DOC Science Internal Series 111*. Department of Conservation, Wellington, New Zealand. 29 pp.
- Keeley N., Forrest B., Hopkins G., Gillespie P., Knight B., Webb S., Clement D., and Gardner J. 2009: Sustainable Aquaculture in New Zealand: Review of the ecological effects of farming shellfish and other non-fish species. *Cawthron Institute Report No. 1476*. Prepared for Ministry of Fisheries. 190 pp.
- Lloyd B.D. 2003: Potential effects of mussel farming on New Zealand's marine mammals and seabirds: a discussion paper. Department of Conservation, Wellington, New Zealand. 35 p
- Sagar P. 2013: Literature review of ecological effects of Aquaculture: Seabird interactions. *Report prepared for the Ministry for Primary Industries*. 18 pp.
- White S. 2018: Proposed mussel spat catching facility supplementary ecology report: Ohinau Marine Farms. *Pacific Coastal Ecology*. 73 pp.

7. For any effects identified as being of potential ecological concern, please identify the seabird species this applies to and whether and/or what mitigation and/or monitoring is recommended and proposed.

Table 1: Summary of potential effects from mussel/spat farms on seabirds and mitigating practices to avoid adverse impacts.

Potential source/effect	Species at risk	Mitigating practice	Objective/reason
Ingestion of foreign objects	All diving and surface foraging birds	Maritime New Zealand (2022) provide operational guidelines for general waste management. The farm needs to ensure that it operates in a way that does not create entanglement obstacles or consumption risks for wildlife. Specifically: • Collect, retain and dispose of all cordage debris, plastic strapping, domestic or other nonbiodegradable waste at an approved solid waste facility onshore. • Maintain a Waste Management Plan which is reviewed periodically. • Ensure staff are familiar with the Waste Management Plan and all operations are undertaken in accordance with it. • Supply the Waste Management Plan to any contractors working on the North Western spat mussel farm and ensure they comply with its requirements.	• All cordage debris, plastic strapping, domestic or other nonbiodegradable waste must be collected, retained, and disposed of at an approved solid waste facility onshore.
Attraction to lighting	Procellariiformes	Install navigational lighting accordance Maritime New Zealand (2008, 2018) and Maritime Transport Act 1994. Avoid harvesting spat lines at night. If unavoidable: • Do not use unnecessary lights on board the vessel; • Turn lights off when not required;	• Prevent the attraction or disorientation of seabirds by artificial light sources.

		• Fit all windows on vessels that may be used at night with blackout blinds that are closed before dusk; • Place lights as low as possible and shield lights to prevent horizontal (over 45 degrees) and vertical (towards the sky) spill; • Avoid lights projecting towards reflective surfaces; • Light intensity must be as low as practicable and longer wavelength ("warm white") colour used.	
Vessel disturbance	Coastal nesting and roosting birds, such as gulls, terns and shags	All boats and other water craft involved in construction and operation of the farm should transit coastal colonies at a minimum distance of 200 metres.	• Prevent disturbance of breeding and roosting seabirds along coastal regions and off shore islands. • Vessels can disturb birds and cause them to leave nests, leaving eggs/chicks vulnerable to predation and exposure (heat/cold).

8. Please confirm whether the following recommended mitigation measures are proposed:

- a. Vessels that service the farm blocks use routes that avoid rock stacks, islets and islands used by shags, terns, and gulls for nesting by at least 100 metres; and**
- b. Bird entanglements, regardless of outcome (e.g., injury or mortality), are reported to the Department of Conservation; and**
- c. All cordage, plastics, and general waste are to be collected on-board and disposed of ashore and any accidentally debris discharged to the coastal marine area are to be retrieved as soon as possible; and**
- d. To use flashing or rotating lights rather than constant lights to reduce the potential for disorientation of seabirds.**

Yes, all of these aspects will be implemented. Further details can be found in the following sections of the Wildlands (2022) report:

- a) Section 5.5 Disturbance
- b) Section 5.1 Entanglement in structures
- c) Section 5.7 Ingestion of foreign debris
- d) Section 5.8 Lights causing attraction or disorientation

9. Please clarify the purpose of the seabird mitigation measure to ensure integrity of structures.

Section 8.7 (Wildlands 2022) outlines 'During maintenance and harvesting, all cordage, plastics, and general waste must be collected on-board and disposed of ashore. Any debris that does accidentally fall overboard must be retrieved as soon as possible. This will prevent entanglement, ingestion and pollution of the environment'. However, it is also standard practise for a mussel farm to have an operational management plan that, during maintenance checks of the farm, has mitigation measures that will ensure that all ropes, floats and cables are securely tied and fit for purpose.

10. Please consider whether the proposal to maintain a log of all seabird observations and interactions is operationally feasible and ecologically meaningful’.

Maintaining a log of seabird observations and interactions during spat mussel maintenance and harvesting is operationally feasible and ecologically meaningful. It is important to understand which bird species may utilise the area of proposed operations. Although data is available within the wider area, further observations will provide more baseline data on how birds use mussel spat farms as this is currently limited. It is anticipated that gulls, shags and terns will roost on mussel buoys. Pelagic seabirds may include fluttering shearwater, fairy prion, and grey-faced petrel which are locally abundant. A short survey of birds within the site could be recorded when a vessel approaches the spat farm during construction, maintenance and spat harvest. This could include interactions of birds roosting on structures, buoys and markers, or observed in the water within approximately 100 metres of the farm.

11. They have been asked to provide a draft Seabird Management Plan (SMP). At this stage NWML just want an outline.

A Seabird Management Plan will include the following aspects:

CONTENTS¶			
1. →	INTRODUCTION	→	2¶
2. →	EFFECTS-MANAGED-BY-THIS-MANAGEMENT-PLAN	→	2¶
3. →	MITIGATION-MEASURES	→	2¶
3.1 →	Farm-structures	→	2¶
3.2 →	Debris-management	→	2¶
3.3 →	Lighting-management	→	2¶
3.4 →	Vessel-disturbance-of-breeding-and-roosting-seabirds	→	2¶
3.5 →	Biosecurity-management	→	2¶
4. →	TRAINING-REQUIREMENTS-FOR-SEABIRD-INTERACTIONS	→	2¶
4.1 →	Seabird-identification	→	2¶
4.2 →	Protocols-for-injured, entangled, or dead birds	→	2¶
4.3 →	Monitoring-and-Reporting-of-seabird-observations	→	2¶
4.4 →	Mortality-reviews	→	2¶
4.5 →	Review-requirements	→	3¶
	REFERENCES	→	4¶
	Seabird-Monitoring-Field-Form	→	5¶
	Incident-form	→	6¶
	Specimens-to-be-submitted-for-autopsy	→	7¶

A section of the management plan cover what to do in the unlikely event that a bird was found injured, entangled or dead.

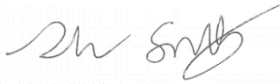
Yours sincerely



Dr Della Bennet
Senior Avifauna Ecologist

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Reviewed and approved for release by:



Des Smith
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References

- Butler D.J. 2003: Possible impacts of marine farming of mussels (*Perna canaliculus*) on king shags (*Leucocarbo carunculatus*). *DOC Science Internal Series 111*. Department of Conservation, Wellington, New Zealand. 29 pp.
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- Department of Conservation 2019: The New Zealand Coastal Policy Statement 2010 guidance note - Policy 11: Indigenous biological diversity. *Department of Conservation*. 62 pp.
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- Lloyd B.D. 2003: Potential effects of mussel farming on New Zealand's marine mammals and seabirds: a discussion paper. Department of Conservation, Wellington, New Zealand. 35 p

- Maritime New Zealand 2018: Marine farm guidelines - navigational safety. 28 pp.
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- Maritime New Zealand 2022: Part 170: Prevention of pollution from garbage from ships. 17 pp.
- Ministry for Primary Industries 2013: Overview of ecological effects of aquaculture. *Ministry for Primary Industries*. 81 pp.
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- Waikato Regional Council 2023: Te Mahere Takutai Moana ā-Rohe o Waikato e Marohitia Nei Proposed Waikato Regional coastal plan. 304 p.
- White S. 2018: Proposed mussel spat catching facility supplementary ecology report: Ohinau Marine Farms. *Pacific Coastal Ecology*. 73 pp.
- Wildland Consultants 2022: Assessment of effects of a proposed mussel spat-catching/nursery operation along the western Waikato Coast on seabirds. *Wildland Consultants Ltd Contract Report No. 6454*. Prepared for North Western Mussels Limited. 40 pp.
- Wildlands 2020a: Pilot study on the use of mussel farms in Pelorus Sound/ Te Hoiere by king shag. *Wildland Consultants Ltd Contract Report No. 5074*. Prepared for the Marine Farming Association Inc and Seafood Innovations Ltd. 68 pp.
- Wildlands 2020b: Assessment of effects for a proposed extension of Mussel Farm 8217 in Tawhitinui Bay on king shag. *Wildland Consultants Ltd Contract Report No. 5398*. Prepared for KuKu Holdings Ltd. 25 pp.

Our Ref: 6972a

31 May 2024

Rebecca Clarkson
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Dear Rebecca,

NORTH WESTERN MUSSEL FARM -

North Western Mussels Ltd (NWML) is a joint venture between Gulf Mussel Farms, OP Columbia and Vela Fishing. NWML proposes to develop a large offshore spat-catching/nursery operation at four sites along the western Waikato coast. Wildland Consultants Limited has prepared an ecological assessment of the potential effects of farming operations on seabirds, particularly diving birds (Wildlands 2022) and provided a short report addressing questions posed by the Waikato Regional Council comments from Pisces Consulting (Wildlands 2024). Pisces Consulting undertook a further technical review regarding the short report responses, and NWML has requested further clarification.

As per the recommendation from the Waikato Regional Council, the responses from Wildlands are outline in table form (Appendix 1) and supplemented with written definitions below. The table identifies the seabirds that were determined by the eBird desktop survey and fisheries observation records and summarises the species ecological value, likelihood of occurrence, behaviour (foraging, roosting or visual spectrum), threat and potential impact/consequence from the proposed farm (e.g. ingestion of foreign objects, attraction to lighting, entanglement, disturbance and noise), and potential adverse effects without mitigation and with mitigation.

1. How are the level of effects translated into RMA terminology?

As outlined in the Wildlands (2024) report, the Level of Adverse Effects was updated to align with the Resource Management Act (RMA) for potential effects on seabirds (e.g. habitat exclusion, attraction to lights, foreign debris, and disturbance and noise). The same principle has been applied to each seabird species, which are categorised according to Threat Classification.

The Ecological Value of a species has been determined by Threat Classification (Robertson *et al.* 2021). All Threatened (Nationally Vulnerable: facing high risk of extinction in the medium term; and Nationally Critical: most severely threatened, facing an immediate high risk of extinction) and At – Risk Declining (population declining but still moderately common) species have been deemed as being of Very High ecological value. All other At – Risk species (Relict: small population stabilised after declining; and Recovering: population increasing after previously declining) have been determined to have High ecological value.

The RMA Extent of Adverse Effect (s95A-G) was used to assess the potential threat to each seabird species that may use areas within the mussel spat farm and address potential risks with and without mitigation.

The following continuum determined the extent of adverse effects:

The extent of adverse effect was determined by the following continuum:

- Nil Effects
No effects at all
- Less than Minor Adverse Effects
Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons.
- Minor Adverse Effects
Adverse effects that are noticeable but will not cause any significant adverse impacts.
- More than Minor Adverse Effects
Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied.
- Significant Adverse Effects that could be remedied or mitigated.
An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied.
- Unacceptable Adverse Effect
Extensive adverse effects that cannot be avoided, remedied or mitigated.

The Likelihood of Occurrence that the threat would affect a species was determined by the species' foraging behaviour, ranging from unlikely to highly likely.

2. Discuss why a particular species has been included in the table

Species within the table have been selected due to Threat Classification, as determined by Robertson *et al.* (2021), presence within the area as determined by the eBird desktop survey and fisheries observation records, and foraging/diving behaviour (entanglement and/or ingestion of foreign objects), breeding/roosting behaviour (disturbance and noise), and visual spectrum (attraction to lighting).

3. Spat catching/holding mussel farm entanglement risk

It is understood that spat catching/holding mussel farm ropes may be thinner than mussel grow-out farms and may also contain more lines per backbone. However, dropper lines consisting of 60-80 millimetres 'hairy' or frayed-like rope will be a visible obstruction to diving birds and will provide a visual cue. As the spat larvae become established, the lines will continue to be noticeable to foraging birds. Although the dropper lines may move with the ocean currents, the thickness of the ropes are unlikely to entangle foraging birds if kept well maintained due to a regular maintenance programme that tightens ropes and fittings, replaces worn ropes, fixes or replaces any damaged buoys, and inspects and tighten anchor ropes. Also, ensuring that there are no loose lines or debris accumulating around

buoys or ropes from other sources (e.g. fishing lines or plastic rubbish) will also prevent entanglement. The offshore spat-catching/nursery operation will not pose a greater risk to seabirds than a mussel farm.

- 4. In respect to seabird surveys, the further information confirmed that a log is operationally feasible and ecologically meaningful. However, it is unclear what scope is envisioned (reference is made to 'maintaining a log', baseline data', and 'a short survey'). Can you provide more detailed information on the objectives and scope of the survey.**

It is recommended that a short survey of bird behaviour is undertaken when a vessel approaches the spat catch farm (within 100 metres of the proposed farm site) and during spat farm activities (e.g. removal of spat catch lines and during maintenance) to provide baseline data on how different bird species interact with the site (e.g. roosting on buoys, foraging on the water surface or diving). These observations should be recorded in a log and will provide baseline information on how different species interact with the farm. Each observation would only take a few minutes to identify the bird species, behaviour and to be noted down. This will also provide data that can be used to further assess whether the mussel spat catching/nursery operation is having less than minor adverse effects, as expected. If the logs identify any issues, they can be proactively managed.

Yours sincerely



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Reviewed and approved for release by:



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References

- Robertson H.A., Baird K., Dowding J.E., Elliott G.P., Hitchmough R.A., McArthur N., Makan T.D., Miskelly C.M., O'Donnell C.F.J., Sagar P.M., Scofield R.P., Taylor G.A., and Michel P. 2021: Conservation status of birds in Aotearoa New Zealand, 2021. *New Zealand Threat Classification Series 36*. Department of Conservation, Wellington. 47 pp.
- Wildland Consultants (2022). *Assessment of effects of a proposed mussel spat-catching/nursery operation along the western Waikato Coast on seabirds*. Wildland Consultants Ltd Contract Report No. 6454. Prepared for North Western Mussels Limited. 40 pp.
- Wildland Consultants (2024). *North Western Mussel Farm*. Wildland Consultants Ltd Contract Report No. 6972. Prepared for North Western Mussels Limited. 9 pp.

Table 1: Summary table of Threatened and At Risk avifauna that could interact with the proposed offshore spat-catching/nursery operation. The potential effects of spat mussel farming on seabirds have been assess using the Resource Management Act (RMA) adverse effects criteria for each potential adverse effect. Potential adverse effects include habitat exclusion, attraction to lights, foreign debris, and disturbance and noise; The assessment also considers the ecological value of the species, likelihood of occurrence at the site, and risk with and without mitigation.

Common name(s)	Scientific name	Threat classification	Ecological value	Behaviour that makes it vulnerable to threat	Threat	RMA adverse effects	Potential impact/ consequence	Likelihood of occurrence	Risk (before mitigation)	Recommended mitigation	Mitigation proposed by applicant	Level of adverse effect (after mitigation)
Black petrel/tāiko	<i>Procellaria parkinsoni</i>	Threatened – Nationally Vulnerable	Very High	Surface feeder, shallow plunge dive, and scavenge	Ingestion of foreign objects	Significant	Digestive tract blockages, potential death	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Black petrel/tāiko	<i>Procellaria parkinsoni</i>	Threatened – Nationally Vulnerable	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Black petrel/tāiko	<i>Procellaria parkinsoni</i>	Threatened – Nationally Vulnerable	Very High	Surface feeder, shallow plunge dive, and scavenge	Entanglement	More than Minor	Injury or Death	Likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Black shag/māpunga	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Relict	High	Plunge dive, underwater pursuit	Ingestion of foreign objects	Significant	Digestive tract blockages, potential death	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Black shag/māpunga	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Relict	High	Plunge dive, underwater pursuit	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Black shag/māpunga	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Relict	High	Roost on buoys	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Likely	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird’s breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor

Buller's shearwater/rako	<i>Adrenna bulleri</i>	At Risk – Declining	Very High	Surface feeding, rarely dives	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Buller's shearwater/rako	<i>Adrenna bulleri</i>	At Risk – Declining	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Caspian tern/taranui	<i>Hydroprogne caspia</i>	Threatened – Nationally Vulnerable	Very High	Surface feeding, Surface plunge diving	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Caspian tern/taranui	<i>Hydroprogne caspia</i>	Threatened – Nationally Vulnerable	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Possible	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Caspian tern/taranui	<i>Hydroprogne caspia</i>	Threatened – Nationally Vulnerable	Very High	Coastal breeding	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Unlikely	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor
Fairy prion/tītī wainui	<i>Pachyptila turtur</i>	At Risk – Relict	High	Surface feeder, alight on sea surface	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Fairy prion/tītī wainui	<i>Pachyptila turtur</i>	At Risk – Relict	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Possible	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Flesh-footed shearwater/toanui	<i>Ardenna carneipes</i>	At Risk – Relict	High	Deep dives, pursuit plunge, underwater pursuit, scavenges, commonly feeds around fishing boats and steals bait	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor

Flesh-footed shearwater/toanui	<i>Ardenna carneipes</i>	At Risk – Relict	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Flesh-footed shearwater/toanui	<i>Ardenna carneipes</i>	At Risk – Relict	High	Deep dives, pursuit plunge, underwater pursuit, scavenges, commonly feeds around fishing boats and steals bait	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Fluttering shearwater/pakahā	<i>Puffinus gavia</i>	At Risk – Relict	High	Underwater pursuit, pursuit plunging	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Fluttering shearwater/pakahā	<i>Puffinus gavia</i>	At Risk – Relict	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Fluttering shearwater/pakahā	<i>Puffinus gavia</i>	At Risk – Relict	High	Underwater pursuit, pursuit plunging	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Little black shag/kawau tūi	<i>Phalacrocorax sulcirostris</i>	At Risk – Naturally Uncommon	High	Surface dive	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Little black shag/kawau tūi	<i>Phalacrocorax sulcirostris</i>	At Risk – Naturally Uncommon	High	Roost on buoys	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Possible	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor
Little shag/kawaupaka	<i>Microcarbo melanoleucos brevirostris</i>	At Risk – Relict	High	Underwater pursuit	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor

Little shag/kawaupaka	<i>Microcarbo melanoleucos brevirostris</i>	At Risk – Relict	High	Underwater pursuit	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Little shag/kawaupaka	<i>Microcarbo melanoleucos brevirostris</i>	At Risk – Relict	High	Roost on buoys	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Likely	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands where bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor
New Zealand white-capped albatross/toroa	<i>Thalassarche cauta steadi</i>	At Risk – Declining	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Possible	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
New Zealand white-faced storm petrel/takahikare	<i>Pelagodroma marina maoriana</i>	At Risk – Relict	High	Surface feeder while flying	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
New Zealand white-faced storm petrel/takahikare	<i>Pelagodroma marina maoriana</i>	At Risk – Relict	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
North Island little shearwater/totorere	<i>Puffinus assimilis haurakiensis</i>	At Risk – Recovering	High	Surface diving and surface plunging	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
North Island little shearwater/totorere	<i>Puffinus assimilis haurakiensis</i>	At Risk – Recovering	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Northern blue penguin	<i>Eudyptula minor iradalei</i>	At Risk – Declining	Very High	Underwater pursuit	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor

Northern blue penguin	<i>Eudyptula minor iredalei</i>	At Risk – Declining	Very High	Underwater pursuit	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Northern blue penguin	<i>Eudyptula minor iredalei</i>	At Risk – Declining	Very High	Visual Spectrum	Attraction to lighting	Minor	Attraction	Unlikely	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Northern blue penguin	<i>Eudyptula minor iredalei</i>	At Risk – Declining	Very High	Coastal breeding	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Unlikely	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor
Northern diving petrel/kuaka	<i>Pelecanoides urinatrix urinatrix</i>	At Risk – Relict	High	Pursuit plunging and underwater pursuit	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely		Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Northern diving petrel/kuaka	<i>Pelecanoides urinatrix urinatrix</i>	At Risk – Relict	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Northern diving petrel/kuaka	<i>Pelecanoides urinatrix urinatrix</i>	At Risk – Relict	High	Pursuit plunging and underwater pursuit	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Northern giant petrel/pāngurunguru	<i>Macronectes halli</i>	At Risk – Recovering	High	Surface feeder, scavenging	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Northern giant petrel/pāngurunguru	<i>Macronectes halli</i>	At Risk – Recovering	High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor

Northern royal albatross/toroa	<i>Diomedea sanfordi</i>	Threatened – Nationally Vulnerable	Very High	Surface feeder	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Northern royal albatross/toroa	<i>Diomedea sanfordi</i>	Threatened – Nationally Vulnerable	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Possible	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Pied shag/kāruhiruhi	<i>Phalacrocorax varius varius</i>	At Risk – Recovering	High	Surface dive, underwater pursuit	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Pied shag/kāruhiruhi	<i>Phalacrocorax varius varius</i>	At Risk – Recovering	High	Surface dive, underwater pursuit	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
Pied shag/kāruhiruhi	<i>Phalacrocorax varius varius</i>	At Risk – Recovering	High	Roost on buoys	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Likely	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor
Salvin's albatross	<i>Thalassarche salvini</i>	Threatened – Nationally Critical	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Possible	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
Sooty shearwater/tītī	<i>Ardenna griseus</i>	At Risk – Declining	Very High	Deep dives, pursuit plunge, underwater pursuit	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
Sooty shearwater/tītī	<i>Ardenna griseus</i>	At Risk – Declining	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Highly likely	High	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor

Sooty shearwater/tītī	<i>Ardenna griseus</i>	At Risk – Declining	Very High	Deep dives, pursuit plunge, underwater pursuit	Entanglement	More than Minor	Injury or Death	Highly likely	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
White-fronted tern/tara	<i>Sterna striata striata</i>	At Risk – Declining	Very High	Surface plunge and dipping	Ingestion of foreign objects	Significant	Digestive tract blockages which can directly or indirectly impact survival.	Highly likely	High	Ensure that loss of debris is minimised and where at all possible retrieved. All rubbish/debris from the marine farm and service vessels shall be disposed of in an appropriate manner on land.	Yes	Less than minor
White-fronted tern/tara	<i>Sterna striata striata</i>	At Risk – Declining	Very High	Visual Spectrum	Attraction to lighting	More than Minor	Attraction	Possible	Low	Maintenance and harvest work to only occur during daylight hours.	Yes	Less than minor
White-fronted tern/tara	<i>Sterna striata striata</i>	At Risk – Declining	Very High	Surface plunge and dipping	Entanglement	More than Minor	Injury or Death	Possible	High	Maintenance programme to tighten ropes and fittings, replace worn ropes, fix or replace buoys, and inspect and tighten anchor ropes. Ensure there are no loose lines or debris accumulating around buoys or ropes from other sources (e.g. fishing lines or plastic rubbish).	Yes	Less than minor
White-fronted tern/tara	<i>Sterna striata striata</i>	At Risk – Declining	Very High	Coastal breeding	Disturbance and noise	Minor	Presence of the farm and associated vessels may disturb breeding and feeding seabirds. Vessels travelling to and from the farm may disturb breeding seabirds.	Likely	Low	Maritime rules require vessels to reduce speed to less than five knots within 200 metres of the shore. Vessels servicing the spat farm should avoid rock stacks, islets and islands were bird's breed. Disturbance and noise during harvesting activity will either attract birds (e.g. gulls and shags) which will forage behind the vessel. Other seabird species may choose to forage away from the activity.	Yes	Less than minor