Response to the Section 46 Completeness Reports (Avifauna) for the Proposed Nova Energy Solar Farm, Twizel

Contract Report No. 6620d

Providing outstanding ecological services to sustain and improve our environments

Wildlands

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September 2026

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1.0 Introduction

Nova Energy is proposing to develop a solar energy farm east of Twizel Township. The application is being considered under the Fast-track Approvals Act 2024 (FTAA). The site is *c.*866 hectares of farmland, with a proposed panel area of 565 hectares. It is currently used mainly for cropping and sheep grazing. The site is close to important avifauna habitat, including the Ōhau and Pukaki Rivers and Lake Benmore.

Nova Energy commissioned Wildland Consultants Ltd (Wildlands) to complete an Assessment of Ecological Effects (AEE; Wildlands 2026) and an Avifauna Management Plan (AMP; Wildlands 2026a; Attachment A). These documents are included in Nova's FTAA application.

This report addresses comments on the AEE made by Dr Colin O'Donnell of the Department of Conservation (DOC), which were received during the course of pre-lodgement consultation[1] and from DOC in a Section 46 (s46) completeness review[2].

This report also addresses comments on additional avifauna-related matters raised by Jean Jack and Anna Stewart of Canterbury Regional Council (CRC) in CRC's section 46 (s46) completeness review. Each point provided by the reviewer is outlined in italics, followed by the corresponding response from Wildlands.

Nova Energy has also commissioned Wildlands to complete an Avifauna Carcass Monitoring Programme (ACMP; Appendix 4 in Attachment A) and an Avifauna Population Viability Analysis (PVA; Wildlands 2026b; Attachment B), which are submitted separately to this document.

2.0 Response Summary Regarding AEE

Table 1 lists the issues raised in relation to the AEE by Dr Colin O'Donnell during pre-lodgement consultation and in the DOC s46 completeness review, and outlines Wildlands' response.

Table 1 – Response to comments received from Dr Colin O'Donnell in pre-lodgement consultation, and in the DOC s46 response.

[1] O'Donnell, C. (2026, May 8). Comments on avifauna aspects of 'Assessment of potential ecological effects of proposed Nova Energy Solar Farm near Twizel (Wildlands Contract Report No. 6620a, March 2026' and Draft Avifauna Management Plan (Wildlands Contract Report No. 7414c.

[2] Department of Conservation advice for EPA compliance assessment.

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Dr Colin O'Donnell Pre-lodgement Comments	
The species lists are largely in agreement, noting some minor differences: O'Donnell (2026) identified an additional five Threatened and At Risk species as present in the area that were not identified in the AEE desktop exercise, including (matuku-hūrepo/ Australasian bittern, pūweto/spotless crake, kawau tūī/little black shag, kāruhiruhi/pied shag, and kōtuku ngutupapa/royal spoonbill). However, two of these species were acknowledged as likely present in the AEE narrative. The AEE identified two At Risk species not identified by DOC (tarāpunga/red-billed gull and tara/white-fronted tern), although the AEE suggests the presence of some of these species as only "possible" or "unlikely". I disagree that occurrences of kōtuku/white heron, pīhoihoi/New Zealand pipit and kārearea/eastern falcon are only "possible", and pūteketeke/ Australasian crested grebe, Australian coot, pūkeko are "unlikely" given that such species are known from the area and are highly mobile among wetland networks, it is likely they fly over the site.	We agree that the species list in the AEE (Table 3) should include matuku-hūrepo/Australasian bittern, pūweto/spotless crake, kāruhiruhi/pied shag, and kōtuku ngutupapa/royal spoonbill. The AEE species list already includes kawau tūī/little black shag. We agree that pīhoihoi/New Zealand pipit are likely to be present on-site, given records in the surrounding area and the habitat available. Kārearea/eastern falcon are expected to hunt within the wider area but will likely occur infrequently within the proposed Nova Energy Solar Farm. Records of pūkeko suggest that small numbers are detected infrequently around the site. While pūkeko are strong fliers and frequently relocate at night, they will use the site irregularly (largely after rainfall events or in areas directly adjacent to wetlands), predominantly preferring other areas with higher-quality foraging habitat, such as the abundant waterways and wetlands present in the surrounding area. They are unlikely to regularly fly over the site. We acknowledge that pūteketeke/Australasian crested grebe and Australian coot are likely to fly over the proposed solar farm but are unlikely to use the site. Although Australian coot will walk on grassy areas near water to forage, it is unlikely they will land within the solar farm footprint. Pūteketeke/Australasian crested grebes are physiologically adapted to the aquatic environment and are highly unlikely to land within the solar farm footprint. We do not consider it necessary to make any changes to the conclusions set out in the AEE.
Although the AEE acknowledges that matuku-hūrepo/Australasian bittern may be present, they highlight that the records are pre-2005. However, recent records are present within five kilometres on the eBird Database they used for their desktop assessment (2025 and 2026 reports), and DOC rangers have seen two birds adjacent to the site in 2026.	We acknowledge these recent records on eBird on in the DOC database. The AEE notes that all points from the dataset that DOC provided to Wildlands in November 2025 were pre-2005, except for one point. The updated information confirms that two matuku-hūrepo/Australasian bittern have been seen adjacent to the site since then. This information is now updated in the AMP. These data provide evidence that matuku-hūrepo/ Australasian bittern use habitats in close proximity to the proposed solar farm, although their abundance and the prevalence of their use of the area remains unclear.
A comprehensive carcass monitoring programme, appropriately designed by a biostatistician (e.g. see Hamlin *et al.* 2026, who designed robust monitoring protocols for the proposed Haldon solar farm prior to approval) is a minimum requirement for a solar farm like this, where there is considerable uncertainty about collision risk. A monitoring plan should be developed prior to approval so that the scale and frequency of monitoring are clear and provisions of appropriate correction factors for observer bias, carcass removal and detection probabilities for very rare events can be factored in. These details should be included in the Conditions to provide certainty to the rigour of the proposal.	Condition 46(d) of the proposed draft conditions of consent provides for the preparation of an Avifauna Carcass Monitoring Programme (ACMP) prepared by a suitably qualified and experienced ornithologist/ecologist and with input from a biostatistician, in consultation with DOC. The objectives and scope of the programme are detailed in the condition. An ACMP has now been prepared, including analysis by a biostatistician (Wildlands 2026b). This is attached to this memorandum as Attachment A. The ACMP details fortnightly carcass monitoring for six months prior to construction, during construction in completed areas, and for at least five years post-construction. It also describes monitoring protocols for carcass detection and carcass persistence trials.

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The AEE also provides trigger levels for invoking adaptive management should mortality of Threatened and At Risk bird species be detected. If fatalities are detected, they propose Collision Risk Modelling and Population Viability Analysis as the first steps in a long and uncertain adaptive management process. In my view, Population Viability Analysis should be undertaken prior to finalising the Trigger Level Conditions because it would be used to determine the effects on bird populations of different death rates. If not done prior, the carcass trigger levels that initiate adaptive management are guesses. I don't think Collision Risk Modelling would be useful for this proposal because there are no New Zealand data to enter into the model, thus model inputs would be guesses. Developing a model to predict collision rates after collisions of Threatened and At Risk species have occurred may provide information to help future planning for other solar farms, but won't help recovering a species already impacted at the site.	Population Viability Analyses (PVAs) have been undertaken and has been used to confirm the trigger levels (Attachment B) Following a review of the available data for New Zealand avifauna species, we agree that insufficient data are available for Collision Risk Modelling (CRM). We believe conducting the PVA will provide more useful data on current known species populations and the effects of collision, and it has been used to help inform the trigger levels. As no suitable data are currently available for the site, we no longer plan to conduct CRM.
I agree with the potential impacts on birds listed in Section 12.1 (page 52). I disagree that the overall effects would be "minor to more than minor", largely because many of the adverse effects appear to have been discounted without adequate study. It is unclear how this conclusion can be reached at this time given the uncertainty around magnitude of effects and lack of field data to assess uncertainty about collision risk (e.g. use of the area as a flyway at night).	We consider that the inclusion of "more than minor" in the assessment of effects adequately incorporates areas of uncertainty identified in the AEE, particularly around bird strike risk. The justification for this is summarised below: • The effect of bird strike is assessed as more than minor. This assessment incorporates the limited information available on bird strike at solar farms in a New Zealand context and the presence of Threatened and At Risk species in the area. It is also based on an analysis of overseas information, which suggests that the design of the proposed Nova Solar Farm should reduce strike risk. • The effect of habitat loss or modification is assessed as minor. The site is currently used for farming and does not provide high-quality avifauna habitat. The surrounding area contains habitat of similar or higher quality. • The effect of displacement of breeding avifauna during construction is assessed as more than minor. This is a conservative assessment that considers the possibility that a small number of Threatened or At Risk species could breed on-site, as well as the unlikely possibility that disturbance could affect birds in adjacent braided river habitats. • The effect of death or injury during construction is conservatively assessed as more than minor, which acknowledges the possibility of harm to any Threatened or At Risk birds that uses the site. • The effect of ongoing disturbance is assessed as more than minor. While ongoing work on-site is expected to be limited in area and duration, it could still affect Threatened or At Risk species. We consider that the assessment of overall effects as minor to more than minor reflects the individual effect levels listed above and their supporting rationale, especially regarding uncertainties relating to Threatened and At Risk species.
Habitat loss for feeding and breeding birds is likely to occur associated with the development (Section	We disagree that displacement of avifauna is likely to be permanent, rather than temporary. Observations at the

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12.3.2). If breeding and feeding birds are displaced and their habitats permanently lost, which seems likely (although not a certainty), this represents a residual risk that needs to be managed or compensated for. Displacement may well be permanent (not temporary; Section 12.3.3). The site should be monitored appropriately to determine if indigenous birds are permanently displaced, meaning that effects would not be minor. I agree that death or injury of birds may well occur during construction activities (Section 12.3.4) and that there may be ongoing disturbance post construction (Section 12.3.5). The site should be monitored appropriately to determine if indigenous birds are killed or injured, or if there are permanent disturbance effects. This represents a residual risk that needs to be managed or compensated for.	Kōwhai Park Solar Farm in Christchurch recorded avifauna, including tōrea/South Island pied oystercatcher (*Haematopus finschi*, At Risk – Declining) and pohowera/ banded dotterel (*Charadrius bicinctus bicinctus*, At Risk – Declining), foraging on-site during construction and between panel rows (report author, pers. obs). This demonstrates that avifauna are not permanently displaced from solar farm sites, and there is no reason to expect that species will be permanently displaced from the proposed Nova Solar Farm. The site contains low-quality avifauna habitat, especially compared to the nearby braided rivers, so the effects of habitat displacement are also likely to be low. However, avifauna monitoring prior to, during, and post-construction will help determine whether habitat displacement is permanent or temporary.
Collision risk with solar infrastructure. Collisions causing death or injury of birds is a major issue worldwide (see DOC report for a summary; O'Donnell 2026) and summarised in Section 12.3.6 of the AEE. I agree that there is a bias towards waterbird fatalities at PV solar farms in California, with many species killed that are similar ecologically to those that are present on or around the Twizel site. I also agree that the complete lack of monitoring information in New Zealand makes it challenging to determine how applicable these overseas studies are to the proposed solar farm design. I note that the waterbird populations using the Twizel - Ōhau River bird flyways appear to be orders of magnitude larger than waterbird populations monitored near PV solar sites in the overseas literature. In addition, the Twizel – Ōhau site supports populations of highly endangered bird species, which the overseas studies did not. Therefore, a precautionary approach to trialling PV solar farms in this area is warranted because the consequences of bird strike, if it occurs, could contribute to the extinction of bird populations.	We do not consider there is sufficient data on waterbird populations within the area and using the Twizel – Ōhau River flyway to determine how these compare in orders of magnitude with those at overseas photovoltaic (PV) solar facilities. We agree that the area supports populations of endangered bird species, which require a careful approach to management. Frequent monitoring at all development stages, as discussed in the AEE and proposed in the AMP (Sections 6.13 and 6.14 in Attachment A), will help detect potential risks to avifauna and allow the timely implementation of management approaches.
The AEE notes that using tracking arrays and anti-reflective panel coatings were typically not used in the United States until 2014/2015, "further indicating that many studies were conducted at solar farms that did not use these measures" (implying to me that the authors are suggesting that using these more modern methods may reduce mortality risk). However, the AEE does not refer to the publication Smallwood (2022), which I refer to in my assessment, and represents the most modern assessment of collision risk for waterbirds (O'Donnell 2026). In this study, 20 of the c.30 monitoring-years of data were collected post 2015 (to 2019).	While Smallwood (2022) is a more recently published paper on solar farms, we do not consider that it is more applicable to the proposed Nova Solar Farm than other studies. All 36 solar farms included within the study were located within California (Smallwood 2022). Based on our calculations, 47% (17/36) of the monitoring years included in Smallwood (2022) occurred during or before 2015, which is before tracking arrays and anti-reflective panel coatings were typically implemented in the United States. Smallwood (2022) does not mention whether any, or what, management measures to reduce avifauna strike risk were in place at the solar farms studied. This limits the applicability of the results in context to a more modern solar farm within New Zealand.
DOC has also recommended the use of solar tracking systems and anti-reflective coatings on panels to reduce the amount of polarised and UV light reflected by them in a hope of reducing bird collisions. However, such methods need to be viewed as experimental as I am unaware of any monitoring or testing of them that supports the assertion that collision risk might be minimised. Modern solar panels use anti-reflective	While anti-reflective coatings for solar panels are not specifically designed to reduce light detection by birds, they are known to increase light absorption and decrease the amount of polarised light being reflected (Fleming 2025). It is expected that this would reduce bird strike risk if birds were being attracted to polarised light from the panels. We agree that there is no current knowledge of the specific polarisation levels that birds are attracted to but note that microtextured

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coatings to maximise the amount of light absorbed and reduce glare for humans. Birds have polarised light and UV sensitive cones in their eyes, which humans do not, and it is thought that PV panels reflect more polarised light than surrounding habitats, with a result of birds being disorientated and potentially colliding with panels. I am not aware of coatings being designed specifically to reduce polarised or UV light detection by birds and nowhere can I find reference to how much polarised light will be reduced by the panels proposed to be used. Szaz et al. (2016) indicated that anti-reflective coatings can reduce polarised light reflectance by up to 12 percent. However, it is unknown whether this is enough to minimise bird responses to polarised light. Questions need to be answered, such as how much polarised and UV light is detected by birds, what effect it has on bird behaviour, and how does it vary depending on different circumstances (including moonlight)? It should be possible to answer some of these questions by testing bird vision sensitivity to panels with different coatings and to design bird-sensitive coatings, if necessary. Therefore, it is likely that specific coatings need to be applied to reduce the ability of birds to detect the polarised and UV light reflected by panels. I would recommend the applicants measure the polarised and UV reflectivity of the panels they propose using against background levels in the local habitats to determine if bird-sensitive light is reduced. Bird-sensitive coatings should be designed and applied if necessary.	solar panel surfaces (which anti-reflective panel coatings are a type of) was found to reduce attractiveness to polartactic insects (Fleming 2025). This suggests these coatings are a highly promising method for similarly reducing bird attraction to panels from polarised light. Anti-reflective coatings could also reduce the risk of birds being attracted to panel arrays to forage on large groups of insects attracted by the polarised light.
The AEE notes that solar panels are typically located near the ground and quote a reference that suggested that low-flying birds may be particularly affected by bird strike (i.e. Smallie 2022). The AEE then states that “many of the Threatened and At Risk bird species that are found near the solar farm, including matuku-hūrepo/Australasian bittern and kakī/black stilt, are generally expected to fly sufficiently high when moving between habitat patches that they minimise the likelihood of striking a solar array. Birds are at greater risk of colliding with solar panels when attempting to land within the site, not when using the area as a flyway” and “Tarapirohe/black-fronted tern is one species that may fly regularly across the site when moving between foraging habitats but is expected to fly high enough when undertaking these flights to remain at a low risk of collision with panels.” (Section 12.3.6, Page 59). I disagree with these suggestions, which appear to be speculation. The applicants don’t appear to have collected data on bird flight heights to back up these statements and there is no evidence in the scientific literature that indicates that low flying birds are at greater risk. Regardless, DOC has some data of flight heights of from elsewhere in the country, which show that matuku-hūrepo/Australasian bittern and South Island pied oystercatchers frequently fly at low altitudes, especially during local commutes (Director General of Conservation 2024). This is likely to be true of birds taking off and arriving from the wetlands and	We agree that birds can fly at low altitudes when taking off and landing, including from the rivers and wetlands that border the site. However, we consider that elevational distances between the site and surrounding waterways, along with the presence of vegetation such as trees bordering the site in some areas, mean that birds are likely to gain height prior to flying over the Nova Solar Farm site. This includes birds that have taken off from waterways adjacent to the site.

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braided rivers immediately adjacent to the boundary of the proposed solar farm (Ruataniwha wetlands, Twizel and Ōhau Rivers, lower Ōhau River wetlands).	
The AEE mentions the "lake-effect hypothesis" (where birds mistake PV panels for water and crash into them) as an explanation for the disproportionately high numbers of collisions with solar infrastructure overseas compared to other bird groups (Kosciuch et al. 2020; Smallwood 2022; Conkling et al. 2023; Anderson et al. 2025) (page 58). The AEE rightly points out that some studies do not support this hypothesis. However, while the "lake-effect hypothesis" is a plausible theory that may explain collisions, there are other potential mechanisms that explain collision risk that have not been included in the AEE. In particular, polarised light is used by mobile bird species for orientation/navigation, especially at dawn or dusk. Polarised light reflected from PV panels can be more intense than polarised light from water so may create a 'sensory trap' by disorientating migrating and mobile species, particularly during periods of low light. Most authors acknowledge that the evidence for the lake effect hypothesis is somewhat tenuous and likely context specific, and that more research is needed to reduce the uncertainty around causal mechanisms behind bird mortality (Kosciuch et al. 2020; Gómez-Catasús et al. 2024). Therefore, other plausible hypotheses that explain bird collisions should be reviewed including whether reflected UV light spectra influences collision risk in birds, whether polarised light at certain times or conditions disorients birds, or if collisions are accidental in periods of low light in nocturnal flying species. This is important because the current proposed mitigations are focused on reducing the "lake-effect", but if other mechanisms are operating, these need to be understood and mitigation designed to reduce these effects specifically.	It is possible that bird collisions with solar panels are due to reasons other than the lake effect, including polarised light reflections. This could occur due to disorientation from the polarised light itself, or because avifauna species gather to forage on insects attracted by the polarised light. It is not currently clear whether polarised light could explain bird collision with solar panels, but anti-reflective panel coatings, such as those proposed for use at the Nova Solar Farm, decrease polarised light levels (Fleming 2025). Microtextured surfaces, such as roughening the panel surface (matt) or applying anti-reflective coatings, are known to diffuse polarised light pollution, reducing the attractiveness to insects (Fleming 2025; Takács et al. 2024). Furthermore, the application of a grid of white, orthogonal or parallel lines greatly reduces the reflection of polarised light (Takács et al. 2024). It is suggested that these methods would also reduce the attractiveness of any polarised light pollution for birds. We know of no evidence suggesting that birds accidentally collide with solar panels during periods of low light. We consider this is unlikely, given that birds regularly navigate past other structures during low-light periods.
The AEE asserts that "Bird strike risk to panels at solar farms can be reduced through effects management, as described in Section 13.2.5-13.2.7.", implying that there will be residual effects that also need to be accounted for. <u>Panel and solar farm design to minimise bird strike risk</u> (Section 13.2.5). Having six-metre-wide gaps between panel rows, as suggested in the literature may break the profile enough to reduce collision risk attributed to the lake-effect. However, I am unaware of this being tested anywhere. Therefore, if implemented, the method should be viewed as experimental and the benefits remain uncertain. If instituted, Conditions would be required that ensure adequate carcase monitoring occurs and if Threatened and At Risk bird species still collide with solar infrastructure, Conditions would also need to include an effective management strategy in response that ensures no net loss in bird populations. In addition, this mitigation appears only to be in response to the lake-effect hypothesis rather than focused on other mechanisms that explain collision risk. If other mechanisms explain collision risk,	We acknowledge that there has been limited testing of many methods hypothesised to reduce bird strike risk, including the size of gaps between panel rows. While we consider that the proposed gaps between panel rows will assist in reducing collision risk, both by breaking up the panel outline and providing gaps for birds to take off and land, monitoring is required on-site prior to, during and post-construction. Bird behaviour will be observed, and an assessment of bird movement and activity on site can be undertaken regarding the gaps between panel rows. If bird strike is detected, a suite of additional mitigation measures can be implemented, including anti-reflective panel coatings, application of white grid lines, stringent monitoring protocols, short-term deterrence measures, and targeted panel removal.

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then it is unknown how effective such mitigation might be.	
The AEE also proposes that panels should have "anti-reflective coated front glass, which is designed to absorb rather than reflect light, and should greatly reduce the attraction to overflying birds". However, as indicated in paragraphs 14 – 18 above, such coatings would need to be tested to ensure they reduce detectability to birds (because their vision is much more sensitive to polarised light) rather than humans. Again, if implemented, the method should be viewed as experimental, and the benefits remain uncertain. Conditions would be required that ensure adequate carcase monitoring and an effective management strategy in response to any collisions that ensures no net loss in bird populations.	We agree that there has been limited testing of the anti-reflective glass coatings, but as stated previously, microtextured coatings such as these are known to reduce polarised light levels and can reduce attractiveness to insects (Fleming 2025). Studies have shown that insects are more sensitive to polarised light than birds, and have well-developed mechanisms for navigation, behaviour and sexual signalling (Marshall & Cronin 2011). As microtextured coatings have been found effective in reducing polarised light levels for insects, the effects should also minimise attraction in birds (Fleming 2025; Marshall & Cronin 2011; Takács et al. 2024). However, careful monitoring and effective management would be required to ensure any collisions that occur are responded to appropriately. The AMP and ACMP (Attachment A) include management approaches. These are supported by the PVA (Attachment B).
The AEE proposes using panel arrays that track the sun and cite information that suggests collision risk may be lower than if fixed panels are used. I support trialling this method but again, if implemented, the method should be viewed as experimental, and the benefits remain uncertain in such a high-usage waterbird area in New Zealand.	Limited testing shows that tracking arrays may reduce collision risk. Data analysis comparing fixed-tilt and tracking arrays indicates fewer aquatic bird fatalities at tracking array facilities (Kosciuch et al. 2025). This suggests tracking arrays could help reduce bird strike, including for waterbirds, at the Nova Solar Farm. Management measures proposed also include strict carcass monitoring to detect bird strike and inform further management actions.
<u>Evidence-based compensation (Section 13.2.7):</u> If recovery on site is not possible, then appropriate compensation at a scale that assures no net loss of bird species needs to be specified in Conditions because there needs to be some certainty that compensation would be effective at replacing losses. For example, if offsite predator control was proposed, then it needs to be conducted at a scale that has a high probability of success. The Department of Conservation has considerable experience at designing and costing such activities.	We agree that any compensation must have a high probability of successfully replacing any losses. We consider that specific details such as the scale and type of compensation depend on the affected species, informed by population viability analyses results for the specific species. Compensation is addressed further in Section 3.3.6 below.
Conclusion re AEE: Given the considerable uncertainty about the effectiveness of every proposed mitigation at reducing collision risk significantly, I disagree with the AEEs conclusion that "the effect of bird strike on avifauna is expected to be less than minor." (See Table 12 AEE). Adverse effects will be **significant** if collisions with solar infrastructure occur regularly, especially for the Threatened bird species. Whether collisions occur (and, if so, at what frequency) is uncertain, but given the weight of evidence from overseas, and the positioning of the proposed solar farm in a very high-use waterbird area, the risks are plausible and concerning.	We agree that if collisions of Threatened or At Risk species were to occur regularly, there could be significant adverse effects, but we do not anticipate that regular collisions of Threatened or At Risk species will occur. We consider that the design of the solar farm, including tracking panel arrays, gaps between panels rows, and anti-reflective coatings, will reduce bird strike risk. These design methods will reduce the reflection and polarised light generated by panels, break up the panel outline to minimise the lake effect, and provide landing areas for birds to safely take off and land. PVA modelling has been undertaken to assist in evaluating bird strike risk for different Threatened and At Risk species (Attachment B). The level of adverse effect has been evaluated following completion of this modelling and based on the findings the trigger levels have remained the same.
DOC s46 Response	
Review avifauna species lists and references in the Avifauna Management Plan (AMP) and Assessment of Ecological Effects (AEE) for consistency.	As discussed above, we have checked both reports for consistency, and we agree with most of the additions and changes that DOC has highlighted with regards to the AEE. See item 1 above for details.

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	Sections 2.1 and 3.0, and Appendix 2 of the AMP have been updated to reflect these details (Attachment A). In Appendix 2, matuku-hūrepo/Australasian bittern has been updated to 'likely', pūweto/spotless crake to 'possible' and kāruhiruhi/pied shag has been added and the likelihood of presence at the site is 'possible'.
Population Viability Analysis should be undertaken up front for threatened avifauna species (at least for kakī/black stilt) to assist the Panel to understand the population risk of bird collisions with the solar panels or infrastructure.	Population Viability Analyses (PVAs) have been undertaken and been used to confirm the trigger level conditions (Attachment B).
Further work is required on (a) bird carcass monitoring design by a suitably qualified biostatistician to ensure it is statistically robust, and (b) description of effective response measures that would apply if bird collision trigger thresholds are reached.	As discussed above, an ACMP has been completed which outlines protocols in more detail (Attachment A). The AMP already outlines response measures that will be implemented if trigger thresholds are reached, and Section 6.14.10 has been updated to provide further detail and an example of how compensation funding will be calculated, if required.
While avifauna species are listed, there are some inconsistencies and gaps in how they are presented. Matuku-hūrepo/Australasian bittern and pūweto/spotless crake are referred to as known in the vicinity in Section 4.0 of the AMP and Section 6.2 of the AEE, but missing from the species list in Appendix 2 of the AMP. Kāruhiruhi/pied shag (At Risk – Recovering) is known in the vicinity but not recorded anywhere in the application documents.	As discussed above, the avifauna species list and in-text discussion have been updated in Section 4.0 and Appendix 2 of the AMP (Attachment A).

3.0 Additional DOC comments: Dr Colin O'Donnell

3.1 DOC: Significant Avifauna (Issue 1)

3.1.1 Key comments

1. *No appropriate field surveys have been conducted to support most of these assertions about likelihood of presence (with the applicant relying on a desktop exercise and a two-day site visit in December). The applicant would need to undertake comprehensive seasonal nocturnal surveys to obtain measures of flight frequencies and flight paths, as a high proportion of waterbird activity occurs in low light or at night.*

<u>Response</u>

A two-day site visit, combined with a desktop assessment using the extensive eBird dataset and expert analysis to identify any additional bird species that might occur at the site, is sufficient to determine the presence of avifauna. Tarapirohe/black-fronted tern nocturnal flight path data, provided by DOC, have also been incorporated. We consider that this provides sufficient information regarding this species' nocturnal behaviour. Nocturnal surveys face several issues, including darkness limiting visibility, reducing the ability to observe flight frequency and flight paths, and limiting the ability to count individuals accurately. Acoustic recordings are reliant on species calling in flight and working at night which carries various health and safety risks. Ultimately, the most accurate nocturnal surveys rely on GPS tracking data, and very few studies are being undertaken using these units. Nevertheless, based on the desktop data, field survey data, and through expert opinion, further field surveys, including nocturnal surveys, are not currently required. A proposed condition of consent requires bird monitoring on site: monthly for six months prior to construction commencing, weekly during the first year of construction, at least fortnightly for the remainder of the construction period, and fortnightly for a minimum of five years after construction is completed. This will provide highly relevant, up-to-date information on the avifauna species present on-site to support previous surveys.

3.2 DOC: Effectiveness of Mitigation Methods (Issue 3)

3.2.1 Key comments

2. *Carcass monitoring and trigger levels (Section 13.2.6): A comprehensive carcass monitoring programme, appropriately designed by a biostatistician (e.g. see Hamlin et al. 2026 who designed robust monitoring protocols for the proposed Haldon solar farm prior to approval) is a minimum requirement for a solar farm like this where there is considerable uncertainty about collision risk. A monitoring plan should be developed prior to approval so that the scale and frequency of monitoring are clear and provisions of appropriate corrects factors for observer bias, carcase removal and detection probabilities for very rare events can be factored in. These details should be included in Conditions to provide certainty to the rigor of the proposal.*

Response

We agree that a robust carcass monitoring programme is important. We have prepared a draft avifauna carcass monitoring programme (ACMP), which is submitted alongside this document (Attachment A).

The DOC WA advice also suggests that carcass monitoring should be designed by a suitably qualified biostatistician to ensure it is statistically robust. As stated above, we agree with this and have prepared a draft ACMP based on contributions from suitably qualified biostatisticians and avifauna ecologists.

3.2.2 Key comments

3. *If collisions of Nationally Critical bird species occur, a management response is needed immediately, not some time in the future, to ensure no net loss in populations that are already at considerable risk of extinction. Thus, management responses need to be well planned at the outset and reflected in Conditions to provide certainty of an appropriate and timely response.*

Response

We agree that management must occur immediately if Threatened bird species experience collisions at the proposed Nova Solar Farm. The AMP outlines clear trigger levels for management (Section 6.14.6 in Attachment A) and discusses adaptive protocols (Section 6.14.7).

After considering the approach confirmed in the Haldon Solar decision dealing with similar issues, Nova has revised its approach from the requirement for preparation of a Bird Collision Management Plan. The proposal is now to implement the following approach (which is intended to be consistent with the Haldon Solar Farm conditions of consent) if a trigger level is reached:

1/ **Immediate notification** – DOC, Te Rūnanga o Ngāi Tahu, Te Rūnanga o Arowhenua, Te Rūnanga o Waihao, Te Rūnanga o Moeraki, and Mackenzie District Council must be notified within 48 hours of becoming aware of the exceedance.

2/ **Investigation** – A suitably qualified avifauna expert (**SQAE**) must investigate the mortality event and prepare a draft report within 15 working days. The report must identify likely causes, any further monitoring required, and possible collision prevention or deterrent measures.

3/ **Review and certification** – The draft report is circulated to DOC and Te Rūnanga o Ngāi Tahu, Te Rūnanga o Arowhenua, Te Rūnanga o Waihao, Te Rūnanga o Moeraki for comment, then submitted to Mackenzie District Council for certification along with responses to those comments.

4/ **Additional mitigation** – If the investigation identifies further collision prevention, deterrent, or monitoring measures, the AMP and/or ACMP must be updated within 60 working days to implement those measures.

The AMP now provides for adaptive management responses to be structured as a tiered escalation rather than a single fixed threshold. Under this structure, the first recorded trigger breach requires immediate investigation and reporting as set out above. Should a further trigger breach occur in the same or a subsequent year despite those measures, the same approach is repeated with additional and more substantial management changes. Should a third trigger breach occur, the same approach must be implemented, including the option to cease operation of the affected part of the site, up to and including decommissioning.

The above approach will be complemented by compensation as described in the AMP and summarised in Section 3.3.6 below.

The Mackenzie District Council consent conditions set has been updated to reflect the above approach.

3.2.3 Key comments

4. *The AEE also provides trigger levels for invoking adaptive management should mortality of Threatened and At Risk bird species be detected. If fatalities are detected, they propose Collision Risk Modelling and Population Viability Analysis as the first steps in a long and uncertain adaptive management process. In my view, Population Viability Analysis should be undertaken prior to finalising the Trigger Level Conditions because it would be used to determine the effects on bird populations of different death rates. If not done prior, the carcase trigger levels that initiate adaptive management are guesses. I don't think Collision Risk Modelling would be useful for this proposal because there are no New Zealand data to enter into the model, thus model inputs would be guesses. Developing a model to predict collision rates after collisions of Threatened and At Risk species have occurred may provide information to help future planning for other solar farms, but will not help recovering a species already impacted at the site.*

<u>Response</u>

We acknowledge this recommendation and have undertaken PVA modelling for several Threatened and At Risk species likely to be present at or near the site, for which suitable data was available (Attachment B). This information has been used to assess the final Trigger Level Conditions and its results support the trigger levels proposed. We agree, on further consideration, that Collision Risk Modelling will be of limited use at this time due to the lack of available species-specific data, and we have removed this step from the adaptive management approach.

The DOC WA response also states that PVA should be undertaken up front for Threatened avifauna species. As stated above, we agree with this and have undertaken PVAs, which are provided alongside this document in Attachment B.

3.2.4 Key comments

5. *The proposal for adaptive management then suggests a range of potential mitigation methods that potentially reduce collision risk further. If these have some merit, perhaps they should be instigated at the outset. However, I am not aware of any studies of their effectiveness at reducing mortality, so they should be viewed as experimental. Applying ineffective methods would delay any positive recovery in the threatened species of concern and the delay may contribute towards extinction should recovery not occur.*

<u>Response</u>

While the proposed adaptive management measures have merit, it is not appropriate to implement them at the outset. This is because there is no certainty that any of the adaptive management measures will be necessary, and adaptive management should target specific issues if they arise. A range of measures are already proposed as part of project design to minimise the risk of bird strike, including panel spacing, reflective coating, and use of a tracking system.

We do not consider there is any requirement to add additional measures at the outset, as the measures outlined above are already considered appropriate to manage risk.

Additional measures should only be implemented on a tiered or escalating basis in response to specific issues. For example, the addition of UV paint or white gridlines could help if strikes are still detected, by further breaking up the panel area and reducing polarised light reflection. The use of UV paint/film/reflective bands are known to break up the reflection of windows, reducing bird strike (Kagan et al. 2014; Swaddle et al. 2020). These methods should also reduce the risk of strike with solar panels. White gridlines could be added directly to the panel surfaces, or UV paint could be applied to the other areas of the panel arrays. Any painted areas would require additional maintenance and expense, and should be implemented only if deemed necessary during operations. Markings on panel surfaces could result in only small decreases in energy production, making them a useful management measure that could be implemented if bird strike is recorded. For example, white gridlines have been used to decrease insect attraction significantly and were found to reduce energy production by just under 2% (Fleming 2025).

Flags, streamers, and other visual deterrents can temporarily deter avifauna, but birds often become habituated to them over time. These measures would be most useful as short-term deterrence immediately after a bird strike is detected, while a long-term solution, such as UV paint, is implemented.

3.3 DOC: AMP - Significant Avifauna (Issue 1)

3.3.1 Key comments

6. *The AMP largely repeats the information in the AEE, so the comments above are also relevant to the AMP in many places. However, several points of note are listed below.*
7. *Table 1, which describes the time of year bird species are likely to be onsite underestimates the period of risk for a number of species.*
    - *Kaki breed from July to January (not August-December).*
    - *The last banded dotterel migrate as late as May, so may be on site June – May (not July – January).*
    - *SI pied oystercatchers begin arriving in the Mackenzie basin in June with last birds migrating north in March (not August – January).*
    - *Some wrybill migrate north as late as April.*

Response

We agree that kakī/black stilt can breed between July and January, and that pohowera/banded dotterel could be present in the area year-round. We also agree that tōrea/South Island pied oystercatcher could be present in the Mackenzie Basin between June and March. We have updated these changes in Table 1 in a revised version of the AMP (Attachment A).

We agree that ngutu pare/wrybill could be present on-site as late as April or May. The updated version of Table 1 in the AMP shows that ngutu pare/wrybill could be present on-site as late as May (Attachment A).

3.3.2 Key comments

8. *The AMP appears to lack specific management objectives.*

Response

The overarching aim of the AMP is to minimise impacts on indigenous avifauna at the proposed Nova Solar Farm site. Management objectives are clearly outlined throughout the AMP. These include:

- Protecting avifauna from habitat loss, displacement, and disturbance throughout solar farm development and operations.
- Minimising avifauna mortality, including managing collision risk.
- Collecting avifauna data prior to, during, and post-construction to assist in informing adaptive management and, if required, evidence-based compensation.

The AMP also states that an ACMP and PVA will be completed to inform further detailed management objectives. The draft ACMP and PVA have been submitted alongside this report (Attachment A and Attachment B).

3.3.3 Key comments

9. *The Avifauna Carcass Monitoring Programme (ACMP) needs to be* ***designed*** *by a suitably qualified biostatistician and include appropriate power analyses to predict how much effort is required to detect collisions with certainty. eDNA identification of feather spots should be included in the monitoring protocol. At the moment, Section 6.14.3 only indicates the biostatistician will be used to analyse results of detection trials.*

Response

The ACMP has been designed by avifauna ecologists and a suitably qualified biostatistician (Attachment A). Where relevant, it is also based on a report completed for the Haldon Station solar farm (Hamlin et al. 2026), as this site is approximately 3.5 kilometres southeast of the proposed Nova solar farm and is highly comparable with regard to avifauna species and habitat. This has provided a robust, statistically sound monitoring plan.

The AMP also notes that DNA samples will be taken from any bird carcasses or signs of bird strike that cannot be identified in the field (Section 6.14.3 in Attachment A). This will include feather spots. This information has also been included in the ACMP.

3.3.4 Key comments

10. *The ACMP needs to include actions to* ***trigger immediate review*** *if Threatened and At Risk species are detected during the monitoring (in consultation with DOC and the consenting authority, as adaptive management may be required immediately to recover the population in question.*

Response

We agree that an immediate review of the causes of the collision would be required if monitoring detects a Threatened or At Risk carcass to ensure adaptive management can be implemented within an appropriate timeframe. This is addressed in Section 3.2.2 above.

3.3.5 Key comments

11. *If collisions of Nationally Critical bird species occur, a management response is needed immediately, not some time in the future, to ensure no net loss in populations that are already at considerable risk of extinction. Thus, management responses need to be well planned at the outset and reflected in Conditions to provide certainty of an appropriate and timely response.*

Response

We agree that management must occur immediately if Threatened bird species experience collisions at the proposed Nova Solar Farm. The proposed adaptive management response is addressed in Section 3.2.2. above.

3.3.6 Key comments

The Expert Panels for the nearby Haldon and The Point Solar Farm projects have suggested that a substantial, upfront and secured funding commitment for avifauna recovery is likely to be necessary to address risks to threatened avifauna. Such compensation would be additional to a detailed adaptive management programme. DOC's understanding is that this application presents the same or greater risk to avifauna as those projects. Accordingly, it will be necessary for this applicant to give consideration to providing an upfront commitment, unless it can provide evidence to show that the risk to avifauna is significantly less at this site.

Response

It is understood that $1,000,000 was proposed as an upfront funding commitment to DOC for the Haldon and The Point Solar Farm projects, but it is unclear how this amount was reached, particularly since the Haldon Solar Project did not use PVA modelling to assess impacts on breeding populations.

Recommendations from DOC and other parties regarding the Haldon Station Solar Farm and The Point Solar Farm projects have prompted additional analysis, including PVA modelling, to address the risk to avifauna at the Nova solar farm.

This analysis has been used to inform a method for compensation calculation payable in the event that a trigger level for critically endangered avifauna (i.e. the death of one bird) is met, as set out in the AMP and PVA.

We have created a draft worked example for kakī/black stilt compensation to illustrate our proposed method of calculating compensation payments. We propose that compensation funding should be based on the cost of producing a kakī/black stilt of approximately the same age/quality (where known) as a killed bird. For kakī/black stilt, our formula is based on calculations of the amount spent for captive rearing, monitoring of the wild population and pest and weed control in the Mackenzie district. The calculation is based on maintaining the current population of 143 kakī/black stilt. The amount spent comes from the following reports and are inflation adjusted to address the current economic conditions:

- Raising captive kakī/black stilt to be released into the wild through the Kakī Recovery Programme (Anker et al. 2009). This report includes the expenditure for reared birds (93 birds at that time) and maintaining the wild population (82 adults at that time) through monitoring and pest animal and plant control.
- Estimated additional predator control and weed control, based on expenditure from Project River Recovery (Nelson et al. 2025) and Te Manahuna Aoraki (2021). These reports include maintaining the wild population of 143 birds through monitoring and pest animal and plant control.

Based on the calculations in Table 2, a compensation payment of $26,200 is payable for a kakī/black stilt up to the age of 1.5 years. This covers the estimated costs of raising a juvenile kakī/black stilt in captivity and predator and weed control to support it in the wild post-release until subadult age.

As most kakī/black stilt are banded and their ages known by DOC, compensation payments should increase for older birds. Older individuals are more likely to be experienced breeders and have already benefited from various resources invested in them (e.g. predator control, monitoring).

Table 2 – Example calculations of the proposed evidence-based compensation for kakī/black stilt, with inflation adjustments updating the original costs to current economic conditions.

Task	Total Cost per Annum ($)	Cost per Kakī ($)	Cost per Kakī, Inflation Adjusted ($)
Kakī Recovery Programme (captive)	148,500.00	1,596.77	2,434.07
Kakī Recovery Programme (wild)	313,500.00	3,823.17	5,827.92
Predator control	1,351,696.00	9,452.42	10,761.30
Weed control	901,131.00	6,301.61	7,174.20
Total Cost per Kakī			**$26,197.49**

For example, compensation for a four-year-old black stilt known to be an experienced breeder should be calculated by adding an additional 2.5 years of predator and weed control to the initial compensation payment. This would equate to:

- Four-year-old kakī/black stilt = (initial compensation payment) + (2.5 years of predator control) + (2.5 years of weed control) + (2.5 years of Kakī Recovery Programme management in the wild)
- Four-year-old kakī/black stilt = 26,197.49 + (2.5 x 10,761.30) + (2.5 x 7,174.20) + (2.5 x 5,827.92) = $85,606.04.

This approach includes several assumptions as follows:

- That the full amount of Project River Recovery and 75% of Te Manahuna Aoraki expenditure benefited kakī/black stilt. This assumption was made as Project River Recovery focuses solely on braided rivers, the key habitat for kakī/black stilt. Te Manahuna Aoraki is a wider project focusing on the Mackenzie Basin and the Aoraki/Mount Cook National Park, so not all work occurs close proximity braided rivers.
- Of the funding estimated to benefit kakī/black stilt from each programme, 60% was used for predator control and 40% for weed control. This estimate was based on the labour-intensive

methods of predator control typically used in these areas. Weed control can occur aerially and may require less frequent follow-up control.

Despite these limitations, we consider that this is a conservative, evidence-based method for calculating compensation funding amounts. Linking compensation to the costs associated with producing an individual of similar age and/or value to the bird that was killed will assist in ensuring compensation is targeted to actual effects. It is expected that kakī/black stilt will have the highest compensation value of the avifauna species included in the trigger levels, due to the large amounts of predator and weed control that occur to support the wild population and the effort expended in the captive rearing programme. The compensation quantum calculated for kakī/black stilt should be applied to other Critically Threatened and Nationally Endangered species, in consultation with DOC, as a conservative compensation approach.

In addition, because the trigger level for Critically Threatened and Nationally Endangered species is set at one bird, it is acknowledged that upfront funding to support avifauna recovery may be appropriate. It is proposed that this should be determined on a principled basis consistent with the above analysis, based on the cost of rearing additional birds. Nova has indicated that it is willing to discuss this further with DOC.

For other species, as set out in the AEE, compensation is proposed as a "backstop" that would be payable if trigger levels are breached on multiple occasions and adaptive management has been unsuccessful. The AMP has been amended to set out the framework applying to the compensation backstop more clearly.

3.3.7 Key comments

Further work is required on the description of effective response measures that would apply if bird collision trigger thresholds are reached.

<u>Response</u>

The AMP outlines a range of response measures that could be implemented if bird collision thresholds are reached or exceeded (Section 6.14.7 in Attachment A) in accordance with a tiered or escalating management response, as set out in Section 3.2.2. These include the use of UV paint, streamers and other visual deterrents, flight diverters such as bird balls, and targeted panel removal (if required). We have also added an additional emerging management approach to the AMP, which involved the use of white lines on panels to reduce polarised light reflection if the anti-reflective coating proves ineffective. While many of these response measures are still considered experimental approaches, the AMP includes explanations of why and in what context we anticipate that these measures will be effective.

The proposed monitoring protocol will detect if these measures underperform, allowing us to adjust and escalate them as needed.

4.0 Additional DOC comments: Wildlife Approval Application

4.1.1 Key comments

The specified activities do not include handling or holding injured birds, although this is covered in the AMP. If not included in this application, separate approval under the standard Wildlife Act process would be required to cover those activities.

Response

A permit is required from DOC to catch, handle, or hold native or protected wildlife for rehabilitation. However, a permit is not required to pick up an injured bird and safely transport it to a vet or rehabilitation centre. In the unlikely event that a further Wildlife Approval was required, this would be sought at the appropriate time.

5.0 Canterbury Regional Council (CRC) s46 Substantive Completeness

5.1.1 Key comments (Anna Stewart and Jean Jack)

Uncertainty remains regarding bird strike risk, the adequacy and timing of compensation, and cumulative effects.

Multiple solar farms are now proposed within the Lake Benmore area. We would recommend a precautionary approach towards the potential for cumulative effects of multiple solar farms being constructed simultaneously – i.e. to determine the impacts of one solar farm on avifauna before building another.

Response

The objectives and ecological outcomes listed by CRC are outlined in the AEE and AMP, including clear monitoring, trigger levels, adaptive management responses, timeframes, reporting requirements, and compensation, as discussed above.

While we have carefully evaluated the potential bird strike risk in the AEE and AMP, we acknowledge that not all uncertainty regarding bird strike risk can be addressed prior to the commencement of solar farm development and operations. This is why we have proposed a thorough monitoring programme, along with an escalating management response framework that can be implemented if unacceptable levels of bird strike are detected.

While several solar farms are proposed in the Mackenzie Basin, at the time of writing, consent has been granted for only one, Haldon Solar Farm. A separate cumulative effects assessment in relation to Haldon Solar Farm has been prepared.

5.1.2 Key comments (Jean Jack)

Concern regarding uncertainty. Proposed management plans recognise the difficulty of predicting the level of effects with mitigation in place. This is due to many ecological mitigations yet to be proven in practice. Or the uncertainty that mitigations will be implemented properly. To address this issue, more certain offset or compensation actions with proven outcomes is advisable.

Response

Although large-scale solar farms are present in various regions of the Northern Hemisphere, comprehensive studies of their impacts have not been rigorously studied. In the AEE and AMP, we have outlined why we consider that the proposed management measures will mitigate effects on avifauna. We have proposed stringent monitoring protocols in the AMP and ACMP to detect if mitigation measures do not perform as expected. This will allow further management measures to be undertaken and, if required, compensation to be provided. Any compensation required will be based on the PVA results, as set out in Section 5.1.1.

5.1.3 Key comments (Anna Stewart and Jean Jack)

Apply consistent terminology and structure across management plans. Each ecological management plan condition should require, as a minimum:

- *Clear objectives and ecological outcomes;*
- *Measurable performance standards;*
- *Monitoring methods linked to those standards;*
- *Trigger levels or thresholds;*
- *Adaptive management responses;*
- *Roles & responsibilities;*
- *Timeframes;*
- *Reporting requirements;*
- *Audit criteria;*
- *Compensation requirements, where relevant for avifauna.*

Response

A discussion of the objectives of the AMP is outlined in Section 3.3.2. We consider that these provide measurable performance standards and associated monitoring methods, including that:

- Avifauna nesting on-site are not displaced or unduly disturbed during development or operations, such that they abandon their nests. This will be determined by live bird monitoring conducted prior to, during, and post-construction, and by pre-works bird surveys where required, as outlined in the AEE and AMP.
- Avifauna present off-site are not disturbed or displaced, such that their abundances are not significantly lower than prior to construction. This will be determined by live bird monitoring conducted prior to, during, and post-construction, as outlined in the AEE and AMP.
- Avifauna mortality, including collisions, are minimised to keep fatality levels below those outlined in the trigger levels listed in the AMP and AEE. This will be determined by the carcass searches prior to, during and post-construction, as outlined in the ACMP.

The stated monitoring requirements trigger adaptive management, as discussed in detail in the AMP and ACMP. For avifauna nesting on-site, adaptive management may involve increasing buffer zones around nests. Management measures to reduce bird strike can include UV paint or white lines added to panel arrays, or visual deterrents such as flags, streamers, or bird balls.

Reporting requirements are outlined in the AMP and ACMP. These include annual reporting of carcass search results and the requirement for a review if fatality levels reach or exceed the stated trigger levels.

The AMP and ACMP also outline compensation requirements. Compensation is discussed in Section 5.1.1.

5.1.4 Key comments (Anna Stewart and Jean Jack)

While the proposed conditions require management plans be certified and the solar farm be operated in accordance with these plans, plans often use "should" rather than "must/will" language. Regardless, management plans in my experience are difficult to enforce, making it important that their provisions are reflected directly within the condition set.

Where relevant, edit management plans to adopt "must/will" language rather than "should" directives. This will improve the clarity and enforceability of the proposed consent conditions. Ensure condition set reflect essential details of the management plans.

Response

The AMP has been edited to use "must/will" language. Consent conditions related to avifauna have also been updated, including to incorporate changes based on Points 5.1.8-5.1.14 below to ensure they align with the AMP and ACMP.

5.1.5 Key comments (Jean Jack)

Locate solar farm away from important bird habitat and known flyways. Consultation with the Department of Conservation to inform the management of this potential effect and any proposed Avifauna monitoring plan, or compensation, is important.

Response

The Twizel and Ōhau Rivers provide the most important avifauna habitat directly bordering the solar farm. A 75-100-metre setback from the Ōhau and Twizel Rivers respectively is proposed to prevent habitat degradation and disturbance to avifauna nesting there. While some birds will fly over the proposed solar farm site, we consider that the proposed management measures, including anti-reflective panel coatings and tracking arrays, will reduce bird strike risk. We agree that monitoring is critical and have proposed stringent monitoring protocols for both live birds and carcasses on-site to help detect any changes in bird distributions or occurrences of fatalities in order to trigger the appropriate response.

5.1.6 Key comments (Anna Stewart and Jean Jack)

The proposed approach for evidence-based compensation should bird strike risk occur raises some questions. Neither the AMP nor the AEE determines the quantum of compensation for kakī/black stilt deaths in a concrete way. They describe a future process for calculating compensation ("evidence-based compensation"), but they do not provide a worked formula, dollar amount, replacement ratio, or identify a decision-maker.

Evidence-based compensation – determining the quantum of compensation through the quantification of ecological risk. Ecological risk is determined by calculating a CRM (collision risk, expressed as a birds per year figure) and factoring that into three scenarios for a species PVA (population dynamics). The scenarios would, presumably, be of without the CRM deaths, with the deaths, and with the deaths plus compensation.

A worked example would assist my understanding of how this approach might play out. Adopt an agreed compensation currency, i.e., number of additional fledglings, surviving adults, predator controlled areas per year etc. that has equivalency with the modelled PVA impact. If modelling is not possible, establish a minimum compensation package. Identify a clear decision pathway, including DOC consultation, or independent expert review, and decision-maker(s).

I have drafted up a worked example for kakī/black stilt using the provided description of the approach and would like to get comment from the applicant's expert(s) on this and, more importantly, an example of their own.

Response

The AEE did not provide a working formula, dollar amount or replacement ratio for calculating compensation.

The comment suggests that a draft working example was prepared by ECan, although we have been unable to identify this.

The proposed approach to calculating compensation is set out in Section 3.3.6 above.

5.1.7 Key comments (Anna Stewart and Jean Jack)

Management plan submission timeframes. Most management plans are only required 30 working days before construction, but the plans themselves require baseline monitoring or preparatory actions much earlier. For example, six months of baseline bird monitoring, a 12-month pest mammal baseline survey, and invertebrate release-site preparation.

Submit management plans earlier/prior to pre-construction activities detailed by the draft management plans. For the AMP: submit/certify before the six-month baseline avifauna monitoring commences.

<u>Response</u>

We agree that it is important to submit the AMP prior to the six months of baseline data collection. The AMP will be submitted at least 30 working days prior to the commencement of the baseline avifauna surveys, and we have amended the draft conditions to reflect this.

5.1.8 Key comments (Anna Stewart and Jean Jack)

Condition 46(e)(i) does not align with AMP. Commencement timing of the Avifauna Carcass Monitoring Programme is for a minimum timing duration of 36 months from commencement of installation of solar panels and ancillary infrastructure within the site. The AMP starts the minimum 36 months from post construction (see AMP, Table 2).

Edit Condition 46(e)(i) to align with AMP – minimum duration for 36 months from post-construction.

<u>Response</u>

We have reviewed the AMP and updated it accordingly to align with the ACMP. Fortnightly carcass monitoring will be completed for six months prior to construction commencing, in the same survey sections used for post-construction carcass monitoring. As areas of the solar farm are completed, these will also be monitored. Once the solar farm is completed, monitoring will continue for a minimum of five years before reassessing whether monitoring needs to continue.

5.1.9 Key comments (Jean Jack)

In order to achieve the objective in Condition 44, the Avifauna Management Plan must, as a minimum, address the following matters as outlined in Section 46:

> *(f) Details of how compensation will be calculated in the event that bird mortalities exceed the thresholds of unacceptable adverse effect in Table 2 and adaptive management responses are not fully effective, in accordance with Section 6.14.6 of the Draft Avifauna Management Plan.*

The AMP suggests a kakī/black stilt strike should trigger compensation immediately, alongside adaptive management. I.e, The AMP states that Compensation would also be necessary in addition to on-site management if a strike of high value Threatened species, including kakī/black stilt, occurred.

Recommend edit to: 46 (f) Details of how compensation will be calculated in the event that bird mortalities exceed the thresholds of unacceptable adverse effect in Table 2 and, where relevant, *adaptive management responses are not fully effective, in accordance with Sections 6.14.5 & 6.14.6 of the Draft Avifauna Management Plan.*

Response

We have detailed in Section 5.1.6 how we propose to calculate compensation, including providing an example for kakī/black stilt compensation, and we have added this information to the AMP (Section 6.14.10 in Attachment A). Condition 46 (f) has been updated to align with the above recommendation.

5.1.10 Key comments (Anna Stewart and Jean Jack)

Does not align with AMP. Set-backs Section 6.4 of AMP apply to nests of protected ground-nesting avifauna – not just Threatened or At Risk (Appendix 3 species include kāhu/swamp harrier, poaka/pied stilt and pūkeko). This will be to align with Wildlife Act provisions.

Edit Condition 51 to include: …Threatened, At Risk and protected ground-nesting avifauna…

Response

We agree that setbacks should apply to all protected avifauna species, as stated in the AMP and aligning with the Wildlife Act. Nova has amended Condition 52 (was previously condition 51) to include protected species.

5.1.11 Key comments (Jean Jack and Anna Stewart)

Inconsistency/incompatibility of timing regarding the submission of the Bird Collision Management Plan.

Edit timeframes within Condition 71 to allow time for Condition 74 provisions (mana whenua and DOC comment on a draft BCMP). Perhaps: immediate notification and interim response within five working days; a draft BCMP provided to DOC and mana whenua rūnaka for comment; a realistic timeframe for final BCMP certification after that feedback period.

Response

The concern regarding the timing of preparation of a BCMP and implementation of management measures has been acknowledged and the proposal to prepare a BCMP has been removed from the condition set. Instead, and as outlined in the above response to the DOC comments, it is proposed to follow a similar process as provided for in the conditions of consent for the Haldon Solar Farm.

5.1.12 Key comments (Anna Stewart and Jean Jack)

Conditions 79 and 80 require an annual ecological compliance report and an independent ecological audit every three years. This is helpful and broadly consistent with the monitoring-based framework, but the audit should explicitly assess whether each management plan's performance standards, adaptive management triggers and reporting requirements have been met.

Edit to require audits to assess whether each management plan's performance standards, adaptive management triggers and reporting requirements have been met. (Referring to my above recommendation for all management plans to include these minimum plan requirements).

Response

The AMP and ACMP both include internal yearly reviews to re-evaluate the plans and update them if required. We have updated Condition 79 to clarify this.

5.1.13 Key comments (Jean Jack)

Glare mitigation is specified to address glare risk to people/drivers. This condition has no timeframes and does not take into account the recommendations of the AMP for solar panel rest positions under certain conditions and at night – see AMP Section 6.7. The AMP recommends the panels will have a 55-degree night rest position to minimise reflectivity at night. After the proposed Glint and Glare mitigation stow position (≥5° angle), the tracker will orient to this angle just before sunrise and sunset to avoid glare to nearby receivers. After the sunset holding period, the tracks will move to the night resting position until sunrise. Tracking arrays reduce the frequency of waterbird fatalities compared to fixed arrays (Kosciuch et al. 2025). If practicable, the panels will be positioned in directions away from sources of polarised moonlight.

Edit Condition 81 to adopt AMP recommendations for solar panel night rest time position(s).

<u>Response</u>

Condition 81 did not address this because it was solely focused on glare mitigation risk. However, we agree that Condition 81 should reflect the 55-degree nighttime solar panel rest position that is recommended in the AMP. We have updated Condition 81 accordingly.

5.1.14 Key concerns raised (Jean Jack)

Regarding avifauna, potential residual effects include bird strike and loss of feeding and breeding habitat. The site is located at a hot spot for Nationally Threatened and At Risk bird species which frequent the Ohau-Tekapo River delta at Lake Benmore. The best way to avoid the impacts is to locate solar farms outside the Mackenzie Basin, within less sensitive habitats, and to undertake research to ascertain the risks these solar developments pose to avifauna. In lieu of this, given the uncertainties and the requirement to achieve a net gain in biodiversity outcomes, offsetting or compensatory measures should be secured upfront.

<u>Response</u>

We agree that the braided rivers in the Mackenzie Basin provide vital avifauna habitat, but as noted in Section 5.1.5, the proposed Twizel Solar Farm will be set back from the surrounding braided rivers by 75-100-metres, and there is an elevation difference between the braided river and the site. Other management measures, as outlined in the AMP, will also be implemented to reduce effects to avifauna (Section 6.0 in Attachment A). These include reducing construction noise and vibration, implementing setback distances for bird nests, and using anti-reflective panel coatings and tracking arrays. We consider that these measures will reduce potential effects on avifauna, both on-site and in adjacent habitats.

5.1.15 Key comments (Jean Jack)

Consideration of alternatives. Potential residual effects, particularly on avifauna values, might be avoided by locating the solar farm within already developed areas of land. It is difficult to ascertain to what degree this option has been explored. Several areas of already developed land within the Basin have been identified and should be considered as alternatives to avoid some of the potential adverse effects on ecology (see Attachment 2 – a map of developed land). Noting that to reduce the likelihood of effects on avifauna relating to bird strike, the proposal would need to be located away from known important avifauna habitats and flyways. [there may be a limitation to do this due to there not being another substation that coincides with developed land area that is away from the kakī/black stilt breeding facility and black fronted tern roosts (i.e. the important bird areas around Lake Benmore. This (whether putting in another substation is a real constraint) could be confirmed.]

Response

As discussed in Section 5.1.6, the site is already set back from important avifauna breeding habitat, such as the Twizel and Ohau Rivers, and we believe that the proposed management measures will reduce the risk of bird strike.

5.1.16 Key comments (Jean Jack)

The effects management proposed by Wildlands (2026b) adopts mitigations which may reduce the risk of bird fatalities from bird strike collisions with solar infrastructure. However, the effectiveness of these mitigations for reducing bird collisions is not tested in New Zealand and are considered experimental. Given the high value of the site and areas directly adjacent, a precautionary approach is warranted, particularly as the effects of the proposal are uncertain but potentially significantly adverse, resulting in the loss of nationally critical species.

The management plan proposes compensation triggers. Please confirm compensation triggers would occur if two instances of a Nationally Critical or Nationally Endangered species are injured or killed due to collision with the infrastructure.

The management plan proposes pre-works nest avoidance surveys. Consider undertaking additional or primary pre-works site nesting surveys during peak nesting season (likely Oct Nov) rather than an 8-day prior to works approach. Having the survey period from July is less likely to detect nesting birds, and initial construction may have little risk if it's not widespread in nature i.e., consider when pre-work survey might have best utility for effect management. I note that the proposed avifauna on-site monitoring might well provide multiple pre-works nest/chick surveys.

Response

We agree that a precautionary response to the effects management of bird strike is required. This is why we have proposed stringent monitoring of both live birds and carcasses on-site in addition to implementing several management measures in the solar farm design.

As a precautionary approach, we have recommended in the AMP that compensation would be triggered in addition to adaptive management if one Nationally Critical or Nationally Threatened bird fatality was detected (Section 6.14.6 in Attachment A).

CRM will not be undertaken due to a lack of available data on the target species, as determined by us and suggested by DOC. However, PVA modelling has been undertaken and is submitted alongside this document in Attachment B. The PVA will be used to inform evidence-based compensation.

We agree that pre-works surveys in July are less likely to detect nesting birds than those conducted in the peak breeding season, but we consider including July in the survey period a best-practice approach to ensure no birds are nesting prior to works starting. The proposed on-site monitoring will occur weekly during construction and, as noted above, should provide regular opportunities to detect nests/chicks. If works cease for more than eight days during the breeding season, or commence in a new area, an additional survey targeted at nesting birds will be required. We consider that these measures will be sufficient for detecting bird nests during the peak breeding season.

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