

**BEFORE A PANEL OF INDEPENDENT HEARING COMMISSIONERS
APPOINTED BY ENVIRONMENT CANTERBURY AND CHRISTCHURCH
CITY COUNCIL**

IN THE MATTER of the Resource Management Act 1991(the **Act**)

AND

IN THE MATTER of Resource Consent applications CRC242267,
CRC242268, CRC242269, CRC242269 and
RMA/2023/3243 by Christchurch City Council (**the
Applicant**) for Southshore and South New Brighton Park
Estuary Edge Project

**STATEMENT OF EVIDENCE OF LEIGH SANDRA BULL
ON BEHALF OF CHRISTCHURCH CITY COUNCIL
(AVIFAUNA)**

Dated: 20 November 2025

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1. SUMMARY OF EVIDENCE

- 1.1 Since the completion of an updated Ecological Assessment in May 2025, an additional design change has occurred as a result of discussions with ECan technical specialists, which involves the construction of a soft edge treatment along the edge area adjacent to South New Brighton Holiday Park. An assessment of potential effects of this design change, provided in this evidence, determined that the overall effects on avifauna associated with the construction and operation of the soft-edge design will not be in any order of magnitude greater than those of the original cobble beach design. Rather, the soft-edge design may provide additional benefits with respect to providing potential high tide roosting habitat for gulls and possibly shags.
- 1.2 The majority of submissions which mentioned birdlife were in support of the application but provided comments around the need for more stringent rules and enforcement with regard to dog control. Notably, the submission of the Director General of Conservation was neutral.
- 1.3 The avifauna technical report written by Mr Crossland (Christchurch City Council) to inform the Section 42A report, reviewed an earlier version (December 2023) of the Ecological Assessment, and was highly critical of the avifauna methods and conclusions. I provided detailed responses to those criticisms and am of the opinion that many of Mr Crossland's criticisms stem from differences in expert opinions, rather than fundamental failings of the data collection and analysis.
- 1.4 The Section 42A report recommends that a Bird Management Plan (BMP) be provided as a consent condition in order to address Mr Crossland's concerns. However, it is my expert opinion that General consent condition 11, and District consent conditions 6, 7 and 8 proposed by the Applicant adequately address the management of avifauna during the construction phase, and as such I do not consider a BMP is required.

2. INTRODUCTION

- 2.1 My full name is Leigh Sandra Bull
- 2.2 My evidence is given on behalf of the Applicant.
- 2.3 My evidence relates to the potential construction and operational effects of the proposal on avifauna.

- 2.4 I authored the avifauna sections of the Southshore and South New Brighton Park Flood Protection Works - Ecological Impact Assessment report, dated 1 December 2023 (original EclA), which was included as Appendix M to the Applicant's Assessment of Environmental Effects (AEE) submitted to the Christchurch City Council (CCC) and Canterbury Regional Council (ECan). Following lodgement of these applications, and in response to Requests for Further Information by CCC, I was involved in updating the original EclA to assess design changes and any changes to impacts on avifauna. The updated EclA, dated 29 May 2025, supersedes the original EclA and forms the basis of my evidence and any subsequent amendments to my Avifauna Assessment, as described below.

3. QUALIFICATIONS AND EXPERIENCE

- 3.1 I am a Senior Ecologist and Director of BlueGreen Ecology Ltd. I hold the qualifications of Bachelor of Science (Zoology), Masters of Science with Honours (Ecology) and PhD (Ecology) from Victoria University of Wellington.
- 3.2 I have worked as a professional ecologist for 20 years (not including 11 years tertiary study). My area of specialisation is ornithology, particularly oceanic and coastal avifauna. Overall, I have authored (and co-authored) over 20 publications in scientific peer reviewed journals, as well as numerous unpublished reports.
- 3.3 I have significant experience conducting surveys and monitoring of seabirds, coastal, shore and wading birds in New Zealand (mainland, offshore and sub-Antarctic islands), New Caledonia, Tonga and France.
- 3.4 Before joining BlueGreen Ecology Ltd in April 2023, I was a Partner at Boffa Miskell Ltd (BML), where I worked as a consulting ecologist for 16 years. Prior to joining BML, I held positions at the Department of Conservation (DOC), Université Paris Sud XI, and as an independent contractor to NIWA. While working for DOC my positions were as a Species Protection Officer in the Biodiversity Recovery Unit, and as a Senior Technical Support Officer in the Marine Conservation Unit.
- 3.5 In my role as a consultant ornithologist, I primarily undertake assessments of effects on avifauna for large infrastructure projects. This involves understanding what species are, or may be, present within and beyond the

zone of influence¹, and how the construction and operation of a project may impact each of those species, as well as recommending measures to avoid, minimise, mitigate, offset or compensate the identified potential effects.

- 3.6 I have appeared as an expert witness before Council hearings, Environment Court hearings, Board of Inquiry hearings and at a Decision-Making Committee hearing for marine consents associated with the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, and the Resource Management (Natural and Built Environment and Spatial Planning and Repeal Interim Fast-Track Consenting) Act 2023.
- 3.7 Of particular relevance to this hearing is my involvement as the avifauna expert in the following projects (ordered north to south) and their locations:
- (a) NorthPort Expansion, Whangarei Harbour.
 - (b) Te Arai north and south coastal developments, Mangawhai Estuary.
 - (c) Ara Tūhono – Pūhoi to Warkworth motorway, Pūhoi and Mahurangi estuaries.
 - (d) Ara Tūhono – Warkworth to Wellsford motorway, Kaipara Harbour.
 - (e) Northern Pathway, Waitemata Harbour.
 - (f) East-West Link Road, Mangere Inlet.
 - (g) Te Ara Tupua coastal shared path, Wellington Harbour.
 - (h) Nelson Airport runway extension, Waimea Inlet.
 - (i) Akaroa and Duvauchelle wharves, Akaroa Harbour.
 - (j) Waitaki and Tekapō power schemes re consenting, Waitaki catchment.
- 3.8 During my involvement in the projects listed above, I encountered all the avifauna species that are present within the Avon-Heathcote Estuary.
- 3.9 I also work on sites monitoring and managing avifauna through construction and operational phases of projects. In doing so, I have obtained first-hand experience and knowledge regarding how avifauna behave through these stages of developments. Currently I spend approximately one third of my time

¹ Defined as “the areas/resources that may be affected by the biophysical changes caused by the proposed project and associated activities.”

working on construction sites and managing the direct and indirect impacts on birds.

- 3.10 On the basis of my qualifications and experience as listed above, I have a thorough understanding of how to monitor shorebirds, how birds utilise estuaries and shorelines through the different tidal cycles, as well as how to manage construction-related effects.
- 3.11 My professional memberships include the New Zealand Ornithological Society and the Environment Institute of Australia and New Zealand (EIANZ). I am a Certified Environmental Practitioner (Ecology Specialist) with the EIANZ and am bound by the Institute's code of ethics.
- 3.12 I served in a voluntary role as the Editor of Notornis, the Ornithological Society of New Zealand's peer-reviewed scientific journal, from 2016 to 2018.
- 3.13 I currently serve in a voluntary role as a subject matter expert to the Shorebirds Trust², a registered charitable trust that invests in scientific research, and funds and co-ordinates conservation efforts aimed to improve coastal biodiversity.

4. CODE OF CONDUCT

- 4.1 Although this matter is not before the Environment Court, I confirm that I have read the Code of Conduct for Expert Witnesses outlined in the Environment Court's Practice Note (2023) (**Code**) and have complied with it in preparing this evidence. I also agree to follow the Code when presenting evidence to the Panel. I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses. I also confirm that I have not omitted to consider material facts known to me that might alter or detract from my opinions.

5. SCOPE OF EVIDENCE

- 5.1 This statement of evidence covers the following:
 - (a) A summary of my evidence (see **Section 1** above)
 - (b) **Section 6:** An update to my Avifauna Assessment, which was previously provided and is included in the updated EclA;

² <https://www.shorebirdstrust.org.nz/about-us-1>

- (c) **Section 7:** My comments on the issues raised in submissions that fall within my area of expertise;
- (d) **Section 8:** My comments on the issues raised in the Section 42A Report that fall within my area of expertise;
- (e) **Section 9:** Conclusions.

6. UPDATE TO MY AVIFAUNA ASSESSMENT

6.1 The updated EclA 'Southshore and South New Brighton Park Flood Protection Works Ecological Impact Assessment' dated 29 May 2025 included the following updates as a result of CCC and ECan requests for further information (RFI):

- (a) The assessments of ecological effects on estuarine species and habitats and on avifauna were revised to account for the following design changes:
 - (i) Changes in the position of the proposed erosion protection structures at South New Brighton Park, resulting in a different quantum of loss and creation of mudflat habitat compared to the original consent application.
 - (ii) Changes in the number and layout of access points to the Estuary bed.
 - (iii) Removal from the application of a new jetty structure to be built at Tern Street.
- (b) The effects of coastal squeeze on coastal avifauna were given further consideration and assessed over the timeframe of the proposed consent duration (i.e., 20 years, with year 2045 as the end point).

6.2 Section 7.5 of the updated EclA (May 2025) provides a detailed assessment of effects on avifauna, and as such is not repeated here. However, a summary of the effects assessment on avifauna, both with and without impact management, is provided in Appendix 1 of this evidence.

6.3 An additional design change that has occurred since that assessment, arising as a result of discussions with ECan technical specialists, is the proposed construction of a soft edge treatment along the edge area adjacent to South New Brighton Holiday Park. The design concept, construction method and

likely maintenance requirements are discussed in the evidence of Mr Reinen-Hamill.

- 6.4 In summary, the design will involve a series of four rock groynes extending into the coastal marine area (CMA), with a sand / gravel mound along the edge above MHWS and sand placed between the rock mounds. Sketches of the proposed design, taken from Attachment A of Mr Reinen-Hamill's evidence, are provided in Appendix 2 of my evidence.
- 6.5 The groyne construction will require excavators operating on the foreshore and CMA, with construction plant expected to work within 10 m of the toe of the rock groynes and along the foreshore landward of the existing reno mattress. Furthermore, the construction of this soft edge is expected to take 8-12 weeks, which will include 6-8 weeks of activity in the CMA.
- 6.6 Operationally, as noted in the design report (Attachment A of Mr Reinen-Hamill's evidence), *"there is the potential for storms to move sand offshore and then alongshore during significant events, so there is a potential for some ongoing loss of sand to the north that could be managed by either ongoing top ups of sand and/or allowing more landward adjustments of the beach crest"*. The report suggested, depending on monitoring results, the possibility of *"top ups every five years with around 200 m³ additional sand to be placed"*. With regard to the sand lost from the beach, the design report states this *"to be thinly dispersed on the seabed seaward of the beach to the north, and potentially ending up on the estuary bed to the north of the wharf"*.
- 6.7 In terms of estuary habitat, based on the calculations arising from the design changes, the Project will now result in:
- (a) An area of 900 m² of mudflat will be lost through reclamation;
 - (b) An area of 3,373 m² of mudflat will be created through declamation;
 - (c) An overall net gain of 2,473 m² of mudflat area.
- 6.8 These design changes have resulted in an even greater area of declamation and overall net gain of mudflat area³.
- 6.9 In the following paragraphs I assess the potential effects of the proposed soft-edge design on avifauna.

³ Refer to Section 7.5.1 of the updated EclA for earlier calculations of estuary habitat changes.

Direct habitat loss

- 6.10 From a terrestrial perspective, I understand that the proposed design would not result in the removal of any additional pine or macrocarpa trees along the coastal edge. However, a few additional ngaio shrubs would be removed as well as a small amount of exotic grassland (compared to the previous cobble design).
- 6.11 The map provided in Appendix 3 of my evidence shows both the proposed design and the coastal avifauna survey data that was collected. As shown, no coastal birds were recorded within the footprint of the soft-shore design.
- 6.12 Furthermore, the proposed soft-shore design will result in additional intertidal habitat.
- 6.13 The rock mounds may well be used by roosting birds such as shags and gulls. As noted in Section 3.4.1 of the updated EclA, a number of the roosting trees recorded along the SNBP edge in 2022 have been removed. In the absence of these trees, it is possible that shags could use the rock mounds (likely the outer edge) to roost. With respect to gulls, Figure 15 in Mr Crossland's review (replicated below) shows gulls roosting on a stormwater discharge pipe at high tide, and I expect that gulls would utilise the rock mounds in the same way.



Figure 15. At full high tide all roosting sites are under water, except for structures like stormwater discharge pipes and small sections of rock cobble beach, which are utilized by gulls, but rarely by other estuarine bird species.

- 6.14 Overall, I consider the magnitude of effects with regard to construction-related direct habitat loss of the proposed soft-edge design are no greater on

avifauna than that of the cobble beach design. In fact, the design increases the potential benefit of providing additional roosting habitat for gulls and possibly shag species.

- 6.15 Furthermore, I consider that any direct habitat loss as a result of operational matters (e.g. sand migration north and top ups) will be negligible based on:
- (a) Movement of sand to the north over time will be thinly dispersed and unlikely to cause infauna mortality; and
 - (b) I would expect the very low numbers of birds recorded adjacent, and non within, to the intertidal footprint (and where top-ups would occur), would continue in the future.

Disturbance and displacement

- 6.16 As shown on the Map provided in Appendix 3 of my evidence, the 2022 surveys recorded a total of nine white-faced heron, four SIPO, 13 kingfisher, one red-billed gull, one spur-winged plover and 22 black swans within 45 m of the footprint (including 10 m construction zone).
- 6.17 Given these low numbers, I consider the magnitude of effects with regard to potential construction disturbance and displacement associated with the proposed soft-edge design are no greater on avifauna than those of the cobble beach design.
- 6.18 As noted above, there is however the potential for operational disturbance or displacement associated with the possible sand top-ups identified by the design report⁴ (and outlined in paragraph 6.6 above). While this is an additional effect that would not occur with the cobble beach⁵, I consider the magnitude of this effect would be negligible given the low number of birds recorded on the adjacent intertidal area, and the low frequency (e.g. every 5 years) at which these works would be required.

Mortality or injury

- 6.19 I consider the potential for mortality or injury of birds associated with the construction of the proposed soft-edge design remains the same as was previously assessed, and that the same management measures would be

⁴ Attachment A of Mr Reinen-Hamill's evidence

⁵ It is assumed any maintenance of the cobble beach would be done manually and not require machinery

implemented to avoid effects as outlined in Section 8.1.1 of the updated assessment and proposed District consent conditions 6 and 7.

Food supply and foraging

- 6.20 Given the relatively small area over which the works are proposed, and the low number of birds that were recorded foraging in this area (refer to Map in Appendix 3), I consider the magnitude of effects with regard to potential impacts on food supply and foraging associated with the proposed soft-edge design are no greater on avifauna than that of the cobble beach design.

Coastal Squeeze

- 6.21 The coastal edge at the location of the proposed soft-edge design is not used by foraging, roosting or nesting coastal birds. As such, there will be no impact of coastal squeeze at this location. Rather, as noted above (paragraph 6.11), the rock groynes will likely provide additional high tide roosting habitat for gulls and possibly shag species.

Summary

- 6.22 Overall, I do not consider the overall effects associated with the construction and operation of the soft-edge design will be in any order of magnitude greater than those of the cobble beach. Rather, this design may provide additional benefits with respect to providing potential high tide roosting habitat for gulls and possibly shags.

7. ISSUES RAISED IN THE SUBMISSIONS

- 7.1 I have reviewed the submissions received by the Applicant on the CCC and ECan applications which raise issues within my area of expertise.
- 7.2 I note that several local resident submitters provided helpful commentary on their avifauna observations. For example, in the submission of Ms Karina Hay, a 35-year resident of Southshore, she writes "*The Boffa Miskell report also provides strong empirical evidence regarding roosting birds, and the updated ecological report shows that most identified roosting areas lie outside the proposed development zone. As a long-term resident, my own observations confirm this, with roosting birds typically found on the sand islands or within tree areas that are not part of the edge restoration site.*" In another submission, Ms Linda Smolar wrote "*We have a view of the estuary and have spent many years walking along the estuary edge. We have never*

seen nesting birds along the estuary edge from Tern street to Capsian(sic). What we see from our house are swans, geese and ducks, none of which are native to this area”.

- 7.3 The majority of submissions which mentioned birdlife were in support of the application but provided comments around the need for more stringent rules and enforcement with regard to dog control⁶. This matter is discussed later in my evidence (refer to paragraphs 8.36 to 8.37 below).
- 7.4 The Director General of Conservation submitted in opposition to the proposal included in the application to ECan on a number of ecological matters (as assessed in the original EclA), including the effect of coastal squeeze on birds (refer to paragraph 3 of submission). However, the Department of Conservation subsequently submitted a letter (dated 17 September 2025) in response to the proposal included in the application to CCC, stating that the updated EclA satisfied the Director-General’s concerns raised in her submission. I also note that unlike Mr Crossland for CCC, the Department did not raise any concerns regarding the survey method used to collect avifauna data, nor the methods used to assess the potential effects of the project on avifauna.
- 7.5 Mr Scott Butcher opposed the proposal on the basis that it would have significant negative environmental impacts if implemented. With respect to shorebirds, Mr Butcher writes *“the project will have significant detrimental impact on shore birds that use this area due to disturbance during the construction phase. Importantly the project does not seek to address disturbance impacts by recreational users and as the proposed new bund appears higher than the existing LINZ bund, it will make disturbance more pronounced”*. I note that all the potential impacts on shorebirds identified by Mr Butcher were assessed⁷ and my conclusions in respect to the impact on birds (both direct and indirect) as a result of the proposal have not changed following my reading and consideration of Mr Butcher’s submission.
- 7.6 The Avon-Heathcote Estuary Ihutai Trust submitted in opposition to the proposal citing the steps into the Estuary and loss of estuary habitat through the construction of rock revetment at Southshore. In regard to steps, the

⁶ For example, submissions by Ms Katherine Margaret Morris, Mr Aaron Minson, Ms Anna van den Bosch, Mr Anthony David Streeter, Mr Bernard Andrew Calder, Ms Elizabeth Yuki, Mr Greg Chapman, Ms Lee Ann Osborn, Mr Michael Garner, Mr Nicholas Yuki, Southshore Residents Association.

⁷ Refer to Section 7.5 of the Ecological Impact Assessment (dated 29 May 2025).

concern relates to people with dogs accessing the estuary and disturbing birds in the estuary. The matter of dog control is discussed later in my evidence (refer to paragraphs 8.36 to 8.37 below). I also note that the updated design has looked to reduce the access points (refer to paragraph 6.1(a)(ii) above). In terms of the loss of estuary habitat, as outlined in paragraph 6.7(c) above, the proposal will result in a net gain of 2,473 m² intertidal habitat for shorebirds rather than a loss.

- 7.7 Ms Leane Dempsey submitted in opposition to the proposal due to the removal of trees and impacts on wildlife as a result of construction disturbance. I note that both habitat loss and disturbance on avifauna were assessed⁸ and my conclusions in respect to the impact on birds (both direct and indirect) as a result of the proposal have not changed following my reading and consideration of Ms Dempsey's submission.

8. ISSUES RAISED IN THE SECTION 42A REPORTS

- 8.1 With regard to avifauna matters, the technical reports of Dr Shane Orchard (Appendix 5⁹ of the S42A report) and Mr Andrew Crossland (Appendix 7¹⁰ of the S42A report) were used by Ms Carter to prepare her S42A report for CCC. Dr Philip Grove also prepared a report for the ECan S42A report, in which he referenced avifauna matters.
- 8.2 Both Dr Orchard (Section 4.5 of his report) and Dr Grove (paragraphs 23-28 and 40) largely defer to Mr Crossland on avifauna matters. As such, here I respond at a high level to Mr Crossland's rather critical comments on the avifauna aspects of the earlier ecological impact assessment. From my reading of his memorandum, his key criticisms are as follows:
- (a) Application of Low to Very Low value to intertidal areas;
 - (b) Lack of seasonal or annual data;
 - (c) Timing of relative tidal cycles;
 - (d) Size of the coastal avifauna survey area;

⁸ Refer to Section 7.5 of the Ecological Impact Assessment (dated 29 May 2025).

⁹ Orchard, S. (2024). 'Review of ecological impact assessments for coastal protection structures at Southshore and South New Brighton Park. Report prepared for Christchurch City Council, dated January 2024.

¹⁰ Crossland (2025). Southshore and South New Brighton Park coastal protection works (RMA 2023/3243) Avifauna memorandum. Christchurch City Council, Parks Biodiversity Team, dated May 2025.

- (e) Application of 45 m buffer zone;
- (f) Failure to address coastal squeeze;
- (g) Underplaying the impacts of increased public access and recreational use;
- (h) Use of EIANZ guidelines;
- (i) Ecological value of declamation; and
- (j) Requirement of a Bird Management Plan.

8.3 I address each of the above points in the following paragraphs.

Application of Low to Very Low value to intertidal areas

- 8.4 On page 1, Mr Crossland states *“The Boffa Miskell avifaunal assessment assigned very low to low ecological value to intertidal areas, underestimating both bird numbers and the importance of the habitat”*.
- 8.5 This assertion is completely incorrect. In Section 9 on page 163 of the updated EclA, it states *“The intertidal mudflats of the Estuary are considered to be of Very High value based on the presence of a number of Threatened and At Risk species utilising that habitat. However, the avifauna species utilising the area are assigned Very High to Low ecological value (Table 14, page 77) as per the criteria of the EIANZ guidelines (refer to Table 7 on page 26).”*
- 8.6 Thus, I determined the intertidal mudflats as having Very High ecological value, not Very Low to Low as Mr Crossland wrongly states.

Lack of seasonal or annual data

- 8.7 As noted by Mr Crossland, the ecology assessment itself clearly outlines the limitations of the data, including with respect to potential temporal variability in the avifauna assemblage utilising the area. These limitations were raised with CCC at the time the scope of works was being developed, however CCC chose not to take on my recommendation to expand the scope of works to include seasons outside that which was surveyed.

Timing of relative tidal cycles

- 8.8 On page 22, Mr Crossland states *“The Boffa Miskell Ltd ecologists appear to have conducted their bird surveys at stages in the tidal cycle which were*

either too high or too low to encounter the concentrations of birds close to the shoreline”.

- 8.9 I have provided a list of the survey dates and times in Appendix 4 of my evidence. This shows that on days when surveys were conducted, the surveys were nearly continuous over an 8-9 hour period. As such I strongly refute Mr Crossland’s criticism (pages 1 and 23) regarding “*suboptimal survey timing relative to tidal cycles*”.
- 8.10 I note that much of Mr Crossland’s criticism throughout his review appears to be based on this inaccurate characterisation of the timing of my bird surveys.
- 8.11 Mr Crossland, having criticised the approach taken due to its inability to account for annual variation, went on to state on page 1 that “*Critically, their survey methods **failed to detect** substantial aggregations of estuarine birds along the shoreline where proposed coastal protection works will take place*”. However, this statement fails to recognise that what he describes as a failure to detect, could in fact be due to annual variation.
- 8.12 Thus, it is my expert opinion that during the period surveyed as agreed by CCC, the various tidal cycles were adequately surveyed and the difference between the observations recorded by Boffa Miskell and Mr Crossland could be explained through other factors such as annual variations, weather conditions, presence of recreational users, etc.

Size of the coastal avifauna survey area

- 8.13 Mr Crossland describes (page 24) the coastal avifauna survey areas as “*excessively large survey zones—often hundreds of metres wide—that vastly exceeded the area relevant to potential disturbance.*”
- 8.14 Mr Crossland is correct that the survey zones extended beyond the potential disturbance zone; this is essential in order to be able to put into context any potential effects of avifauna at the wider estuary scale.
- 8.15 It is not appropriate to restrict the scale of an assessment, or surveys, to the potential effects on individuals within what is called the zone of influence; effects must be considered at an ecosystem or population level, rather than an individual level.
- 8.16 This is an approach that I have applied to other projects in New Zealand (e.g. East West Link, North Port, Te Ara Tupua) that have been in front of various hearing panels, and which the decision makers have accepted.

- 8.17 Mr Crossland's very narrow approach to surveying runs the risk of devaluing an area of habitat. The application of larger survey zones, such as was done for the current project, allows one to identify if species are **only** recorded in the zone of influence. In such cases, the ecological value of that area would be elevated. However, Mr Crossland's approach does not enable the gathering of sufficient information to put the value of the zone of influence into a wider context.

Application of 45 m effects zone

- 8.18 With regard to my application of a 45 m zone, Mr Crossland writes (page 1) *"Additional methodological concerns include the inappropriate use of a 45-metre buffer zone to assess potential disturbance effects, derived from flight initiation distances (FID) for a narrow and poorly representative group of species. The standard 100-metre buffer used in Canterbury by agencies such as Environment Canterbury and Christchurch City Council was disregarded without adequate justification. The exclusion of key species such as bar-tailed godwit and South Island pied."*
- 8.19 In the context of this assessment, the objective of identification of a flight initiation distance (FID) is to assist with determining the zone of influence¹ for the proposed activities.
- 8.20 I have applied this approach on other projects in New Zealand (e.g. East West Link, North Port, Te Ara Tupua) that have been in front of various hearing panels, and which the decision makers have accepted.
- 8.21 Mr Crossland criticises the FIDs that were included in the assessment (Table 26 of the updated EclA), describing them as *"for a narrow and poorly representative group of species"*. As noted in Section 7.5.2 of the updated EclA, those FIDs were for the 14 species expected to use the habitats in the vicinity of the project, and which were listed in Weston et al.'s (2012)¹¹ review of FIDs. My assessment goes on to explain that *"While there is considerable variability between species, the mean FID for those species for which it is known, and who have a Threatened or At Risk classification, ranges from approximately 10-45 m (Table 26). In order to take a conservative approach to assessing the potential effect of construction and operational disturbance, we have used a distance of 45 m as the FID for all species."*

¹¹ Weston et al. (2012). A review of flight-initiation distances and their application to managing disturbance to Australian birds. Emu 112: 269–286.

- 8.22 Mr Crossland identifies two species in particular that were not listed in Table 26 of the updated EclA assessment: those being bar-tailed godwit and South Island pied oystercatcher (SIPO). With regard to bar-tailed godwit, Weston et al. (2012) list FIDs ranging from 22.1-59.5 m. While Weston et al. (2012) did not include SIPO, a recent study by Sanaz (2022)¹² investigated FIDs of braided river birds, including SIPO, in the Ashley, Waimakariri, and Ashburton rivers. Table 2-1 from Sanaz is included below, and shows the FID for SIPO ranged between 17.65-36.42 m, with a mean FID of 26.56 m.

Species	Sample size (n)	Body mass (g)	Mean FID (+/- SE)	Mean landing distance (+/- SE)
Banded dotterel (<i>Charadrius bicinctus</i>)	30	60	12.66 +/- 0.21 (6.96 – 20.62)	11.15 +/- 0.19 (4.97 – 17.43)
Wrybill plover (<i>Anarhynchus frontalis</i>)	25	55	14.01 +/- 0.23 (7.43 – 22.48)	12.62 +/- 0.22 (7.61 – 20.61)
Black-fronted tern (<i>Chlidonias albobristatus</i>)	41	95	29.76 +/- 0.40 (15.86 – 45.62)	43.27 +/- 0.46 (422.68 – 50)
White-fronted tern (<i>Sterna striata</i>)	27	160	24.38 +/- 0.35 (12.24 – 34.27)	30.59 +/- 0.81 (8.11 – 50)
Black-billed gull (<i>Chroicocephalus bulleri</i>)	39	230	17.45 +/- 0.30 (8.75 – 27.85)	21.69 +/- 0.84 (4.12 – 50)
Red-billed gull (<i>Larus novaehollandia</i>)	31	280	17.85 +/- 0.15 (13.49 – 22.76)	22.86 +/- 0.59 (10.18 – 50)
Black backed gull (<i>Larus dominicanus</i>)	28	1000	31.74 +/- 0.71 (12.53 – 50)	39.53 +/- 0.73 (15.61 – 50)
Pied stilt/ poaka (<i>Himantopus leucocephalus</i>)	54	190	30.56 +/- 0.42 (12.54 – 50)	40.77 +/- 0.63 (10.20 – 50)
South Island pied oystercatcher (<i>Haematopus finschi</i>)	27	550	26.56 +/- 0.30 (17.65 – 36.42)	33.06 +/- 0.65 (12.69 – 50)

- 8.23 Greater Wellington Regional Council (GWRC) undertook a study¹³ to test the effectiveness and practicality of implementing vehicle and machinery exclusion zones around identified shorebird (banded dotterel, black-fronted dotterel and pied stilt) nests on two rivers in the Wairarapa Region. While there were some limitations with that trial, it was able to determine the FIDs

¹² Sanaz, S. (2022). The effect of anthropogenic disturbance on braided river birds in New Zealand. Unpublished PhD thesis, University of Canterbury.

¹³ McVeagh & John (2019). How well do riverbed-nesting shorebirds tolerate machinery? Greater Wellington Regional Council, Publication No. GW/ESCI-G-20/31, Wellington.

of riverbed-nesting birds in the presence of a perceived threat (vehicle or human; trial results provided in Appendix 5 of this evidence), and recommended that the previously used 100 m exclusion zone from banded dotterel nests could be reduced to 50 m, but that the 50 m distance from chicks should be maintained, as should the 25 m distance for passing a nest.

- 8.24 Thus I consider my proposed 45 m zone of influence distance is valid based on the findings of the GWRC¹³ trial, as well as the FIDs recorded^{11,12} for a number of the species observed in the Avon-Heathcote Estuary.
- 8.25 While Mr Crossland identified a greater number of birds within his 100 m disturbance zone, this could be due to several factors, including:
- (a) Annual variability in numbers, which may in turn be due to variability in food resources available; or
 - (b) Birds may be exhibiting some avoidance behaviour within the 45 m zone of influence that I have identified given the existing presence of human activity along the coastal edge.
- 8.26 With regard to potential construction disturbance, I think it important to reiterate, as identified in Section 7.1 of the updated EclA, that:
- (a) Works will be from land, with no machinery on the Estuary bed¹⁴; and
 - (b) Construction activities on the Estuary bed will only be occurring during low-tide windows, to ensure working in dry conditions.
- 8.27 Mr Crossland himself identified (page 1) that bird densities and abundance within his 100 m wide 'disturbance footprint zone' were consistently low during high and low tides. Therefore, the construction works within the estuary bed will be undertaken when the birds are expected to be at their lowest numbers close to the works as they will be feeding further out on the intertidal mudflats.

¹⁴ We note that this was case in the effects assessment reviewed by Mr Crossland, however a design change has occurred since that assessment, which requires the operation of an excavator on the foreshore and CMA to trial a soft edge treatment along the edge adjacent to South New Brighton Holiday Park. This is discussed further and assessed in Section 7.

Coastal squeeze

- 8.28 On page 27, Mr Crossland writes *“The consultant’s report (pages 108–109, 134) does not adequately address the ecological implications of coastal squeeze on avifauna within the Avon–Heathcote Estuary”*.
- 8.29 Following earlier feedback from ECan on this matter, the updated ecological impact assessment (dated May 2025) included an assessment of effects of coastal squeeze on avifauna (refer to Section 7.5.6). This updated EclA was provided to CCC as part of the Applicant’s AEE, however, I note that Mr Crossland appears to have reviewed the original EclA that was submitted to ECan, rather than the updated EclA that was submitted to CCC.
- 8.30 As outlined in the updated EclA, the proposal is not expected to result in coastal squeeze effects on shorebirds given that the project will result in a lot more declamation ($3,373 \text{ m}^2$)¹⁵ than reclamation (900 m^2)¹⁵. On that basis, the project will result in a net gain of $2,473 \text{ m}^2$ intertidal habitat for shorebirds rather than a loss.
- 8.31 Roosting habitat loss is likely to be minimal because the majority of important known and potential high tide roost habitat within the Avon-Heathcote Estuary (identified by Wildlands (2017)) is located away from the project site¹⁶. These sites would not be impacted by project-induced coastal squeeze. In addition, during the high tide coastal bird surveys conducted in 2022 as part of this project, no birds were observed using the three roost habitats within and in proximity to the project site half an hour either side of high tide, whereas 1,730 observations were made of birds using other high tide roost habitat away from the project site.

Increased public access and recreational use

- 8.32 On page 2 Mr Crossland states *“Despite acknowledging a likely increase in human use (page 108), the report concludes that this will result in only a “minor shift” from baseline conditions. This assertion is inconsistent with long-term observational data, which show that current low levels of disturbance have allowed bird populations to continue using estuary edge habitats for roosting and foraging. With improved access infrastructure and the promotion of the area for recreational activity, a significant increase in off-*

¹⁵ Updated area as outlined in paragraph 6.7 of my evidence.

¹⁶ As shown in Figure 50 of the updated Ecological Impact Assessment.

leash dog activity and general disturbance is foreseeable. This has been dismissed in the Boffa Miskell report”.

8.33 With regard to the existing situation, Mr Crossland makes the following statements (pages 28 and 29):

- (a) long-term observational data show that current low levels of disturbance have allowed bird populations to continue using estuary edge habitats for roosting and foraging;
- (b) human activity along the eastern shoreline of the estuary has been relatively limited, primarily involving local residents engaging in passive recreation;
- (c) most visitors comply with the CCC Dog Control Bylaw (2016);
- (d) dogs are typically kept under control within a designated ‘passing through’ zone; and
- (e) local dogs also tend to be more habituated to estuarine birdlife and are generally less prone to disturbing wildlife compared to dogs brought in by non-local visitors.

8.34 I find it interesting that Mr Crossland raises the issue of local dogs habituating but does not raise the possible concept that equally birds may also habituate to disturbances to a certain level.

8.35 Furthermore, even if there is an increase in recreational users, I am not sure why he would not expect to see the same behaviours by those users as what he has already identified as occurring i.e. general compliance with the CCC Dog Control Bylaw and dogs being typically kept under control.

8.36 With regard to dogs, it is up to CCC to ensure appropriate Dog Control rules are in place and that compliance with those is enforced. On this matter, I understand that CCC has adopted a new Dog Control Policy (2025) which will come into effect in November 2025, and that the following sites are listed in Schedule 1 of that Policy:

Description	Dog Control Status	Comment
Southshore Spit Reserve	Prohibited / Leashed	Dogs are prohibited in the reserve to protect wildlife values, except on formed walking tracks, where dogs must be on a leash (Note that dogs are prohibited on the beach and foreshore area around the Spit, see the entry for Te Ihutai Avon Heathcote Estuary).

Description	Dog Control Status	Comment
Te Ihutai Avon Heathcote Estuary	Prohibited	Dogs are prohibited from the estuary to protect wildlife, especially shorebirds. This includes the shoreline, where birds roost, moult and nest, and tidal areas, where birds feed The prohibited area applies to the whole of the estuary from the landward boundary inwards. This includes all areas within the shoreline (whether rocky, stoney, gravel, sandy or vegetated, and all foreshore, mudflat, saltmarsh and tidal areas). The prohibited area crosses the outfalls from the Avon / Ōtākaro River at Bridge Street and the Heathcote / Ōpāwaho River at the Ferry Road bridge. At the estuary-mouth, the prohibited area reaches from the corner by Shag Rock out to the north-eastern side of Southshore Spit Reserve. The beach and foreshore area around Southshore Spit Reserve are included in the prohibited area
South New Brighton Park	Prohibited / under effective control	Dogs are prohibited in the southern wetland area (Jellicoe Wetland) to protect wildlife, but are otherwise allowed under effective control

8.37 Thus, given the above controls in the ecologically sensitive areas, the issue then comes down to ongoing education of dog owners, as well as enforcement of the dog bylaws by CCC.

8.38 Lastly, I note that several design updates have occurred which Mr Crossland may not have been aware of when preparing his review. I understand that in response to feedback from ECan and CCC the number of formal access points (i.e. with steps) has been reduced to two (located at the end of Godwit Street and south Tern Street, as listed in proposed general consent condition 1a) and a new jetty structure at Tern Street is no longer proposed.

8.39 As such, I do not believe that I have underplayed the potential effect on avifauna associated with the possible increased public access and recreational use but rather have considered that birds are already exposed to such disturbances and that the responsibility of dog control lies with both owners and CCC.

Use of EIANZ guidelines

8.40 Mr Crossland's comment on page 26 regarding the development of the EIANZ framework by a former Boffa staff member is not only irrelevant, but professionally inappropriate in the context of this review.

8.41 It appears to me that a number Mr Crossland's criticisms of the EIANZ framework stem from his lack of understanding around its correct application.

- 8.42 Mr Crossland states (page 27) that *“The application of the EIANZ Ecological Impact Assessment (EclA) framework in the Boffa Miskell report further complicates the analysis. While presented as a de facto national standard, this is not the case and the EIANZ approach has been criticised for its rigidity and lack of context-specific adaptability. It is not required under the Resource Management Act (RMA), and in this instance, has produced conclusions based on flawed input data”*.
- 8.43 With regard to Mr Crossland’s comment of the framework’s *“rigidity and lack of context-specific adaptability”* (page 2), the EIANZ guidelines themselves specifically state (Section 5.1.2, page 61) that *“This matrix framework does not replace the need for rational interpretation of ecological data based on a sound understanding of environmental principles; an impact assessment always requires professional ecological judgement”*.
- 8.44 I can provide an example of an assessment¹⁷ where I have deviated from the EIANZ effects framework and provided the ecological rationale for doing so. I therefore refute Mr Crossland’s assertion that the EIANZ framework is rigid and lacks context-specific adaptability.
- 8.45 Mr Crossland’s statement that the analyses *“places undue emphasis on bird species classified by the Department of Conservation as threatened or at risk”*. The emphasis isn’t “undue”, as Mr Crossland describes, but rather part of the EIANZ methodology. He goes on to state that *“the assessment should have included greater consideration”* of species classified as Not Threatened. I note that the assessment gave the same consideration of potential effects of the project on all species, irrespective of threat classification.
- 8.46 While the application of the EIANZ framework is not required by the RMA, an assessment of ecological impacts is required, and the EIANZ framework provides a transparent and robust method for doing this, as well as removing individual subjectivity from the assessment.

Ecological value of proposed declamation

- 8.47 I note that Mr Crossland appears to not recognise the potential ecological value that may arise from the declamation of some areas of shoreline, stating on page 2 that *“the validity and functional value of this gain are questionable. The new mudflat areas are highly fragmented, limited in size, and situated*

¹⁷ Refer to Section 6.2.3.1 in: Boffa Miskell Limited 2022. Northport Eastern Expansion: Coastal Avifauna Assessment. Report prepared by Boffa Miskell Limited for Northport Ltd.

along shoreline margins prone to weed accumulation, algal growth, and tidal debris. These conditions severely limit their value for benthic invertebrates and the diverse range of estuarine birds the report claims will benefit". Dr Grove (paragraph 28) is equally critical of the potential value of the declaimed areas for avifauna.

- 8.48 Very rarely do opportunities arise to declaim land, especially adjacent to a significant area for coastal avifauna. As such, I find Mr Crossland's and Dr Grove's criticisms overly pessimistic.
- 8.49 While Mr Crossland appears to have formed his own opinion around the value for benthic invertebrates, given this is outside my area of expertise (i.e. avifauna), I have relied on Dr Tommaso Alestra's (marine ecologist for the applicant) technical expertise on this matter. Dr Alestra's assessment has informed me that the areas of declamation will be level with the surrounding seabed and will immediately become inundated even under current sea level. Therefore, the colonisation of these areas by estuarine organisms will start immediately. With time, these areas are expected to be colonised by the same suite of benthic organisms that is currently present in the surrounding mudflat. On that basis, it is my opinion that the declamation will be of benefit to avifauna.

Bird Management Plan

- 8.50 Ms Carter, at paragraph 149, states that "*I prefer the advice of Mr Crossland in respect to the appropriate methodology to adopt to assess the effects on bird species for this project*", and that "*While the Applicant's assessment concludes that ecological effects will be 'Very Low' to 'Low', this conclusion is reliant on fieldwork with identified limitations*" (paragraph 150).
- 8.51 Notwithstanding my responses above in regard to the criticisms pertaining to field data collection, Ms Carter states (paragraph 154) that "*Mr Crossland is strongly of the view that a Bird Management Plan is required (BMP). ... Mr Crossland considers the BMP should cover: Timing of works, disturbance mitigation (including methods for minimising disturbance to feeding and roosting birds), pre-works nest searches (along the South New Brighton sector works footprint and buffer zones only, as Mr Crossland considers they are not necessary along the Southshore sector), and ongoing periodic monitoring of the works as they progress to ensure activity complies with BMP guidelines.*"

- 8.52 Ms Carter states at paragraph 157, *"I consider that the BMP will address earlier concerns expressed by Mr Crossland in respect to the adequacy of the assessment of the number of protected birds present at different times and locations within the estuary environment. With the imposition of a BMP and associated conditions recommended at the end of this report, I consider that the adverse effects on avifauna will be acceptable"*.
- 8.53 I have already provided a response to Mr Crossland's concerns around the "adequacy" of my assessment. Nevertheless, it is my expert opinion, based on my ornithological knowledge and extensive experience working on construction sites, that a BMP is not needed for this project based on the following measures:

Timing of works

- 8.54 With regard to potential construction disturbance, as noted above (paragraph 8.26) and identified in Section 7.1 of the updated EclA, construction activities on the estuary bed will only be occurring during low-tide windows. Works will continue on land during mid and high tide windows.
- 8.55 Mr Crossland himself identified (page 1) that bird densities and abundance within his 100 m wide 'disturbance footprint zone' were consistently low during high and low tides.
- 8.56 Therefore, the construction works within the estuary bed will be undertaken when the birds are expected to be at their lowest numbers close to the works as they will be feeding further out on the intertidal mudflats.
- 8.57 General consent condition 11(b) requires the preparation of a construction methodology for each stage of works which shall include the proposed timing of the works, including compliance with any seasonal or tidal restrictions.

Disturbance mitigation

- 8.58 As outlined in Section 7.5.2 of the EclA, I consider the potential effect of construction disturbance to foraging and roosting avifauna will be temporary in nature and of Low to Very Low level, therefore not requiring mitigation.
- 8.59 However, with regard to potential *Threatened* or *At Risk* species that may be breeding at Jellicoe saltmarsh rushland, District consent condition 8 proposed by the Applicant outlines the necessary measures to avoid impacts

of construction disturbance on Australasian bittern, grey duck and marsh crake that may be breeding there.

Pre-work nest searches

- 8.60 Pre-work nest searches are already specified in the District consent conditions 6 and 7 proposed by the Applicant.

Ongoing periodic monitoring for compliance BMP guidelines

- 8.61 Ongoing monitoring of compliance of the matters Mr Crossland suggests the BMP would cover is not required due to the existing proposed consent conditions covering these matters:

- (a) Timing of works: General consent condition 11(b)
- (b) Disturbance mitigation: District consent condition 8
- (c) Pre-work nest searches: District consent conditions 6 and 7

Summary of response

- 8.62 Based on my responses above to Mr Crossland's criticism of the avifauna assessment, it appears to me that many of Mr Crossland's criticisms stem from differences in expert opinions, rather than fundamental failings of the data collection and analysis.
- 8.63 Furthermore, I am of the opinion that proposed consent conditions adequately address the potential effects of construction and that a BMP is not required.

9. CONCLUSIONS

- 9.1 I have assessed the potential construction and operational effects on avifauna of the proposed soft edge treatment along the edge area adjacent to South New Brighton Holiday Park and have concluded that they will not be in any order of magnitude greater than those of the cobble beach. Rather, this design may provide additional benefits with respect to providing potential high tide roosting habitat for gulls and possibly shags.
- 9.2 The majority of submissions which mentioned birdlife were in support of the application but provided comments around the need for more stringent rules and enforcement with regard to dog control. Notably, the submission of the Director General of Conservation was neutral.

- 9.3 The avifauna technical report written by Mr Crossland (Christchurch City Council) to advise the Section 42A report, reviewed an earlier version (December 2023) of the Ecological Assessment, and was highly critical of the avifauna methods and conclusions. However, it appears that many of Mr Crossland's criticisms stem from differences in expert opinions, rather than fundamental failings of the data collection and analysis.
- 9.4 While the CCC's Section 42A report recommends that a requirement for a Bird Management Plan (BMP) be imposed as a consent condition in order to address Mr Crossland's concerns, it is my expert opinion that General consent condition 11, and District consent conditions 6, 7 and 8 proposed by the Applicant adequately address the management of avifauna during the construction phase

A handwritten signature in black ink, appearing to read 'S Bull', with a large, stylized initial 'S'.

Dr Leigh Sandra Bull

Dated: 20 November 2021

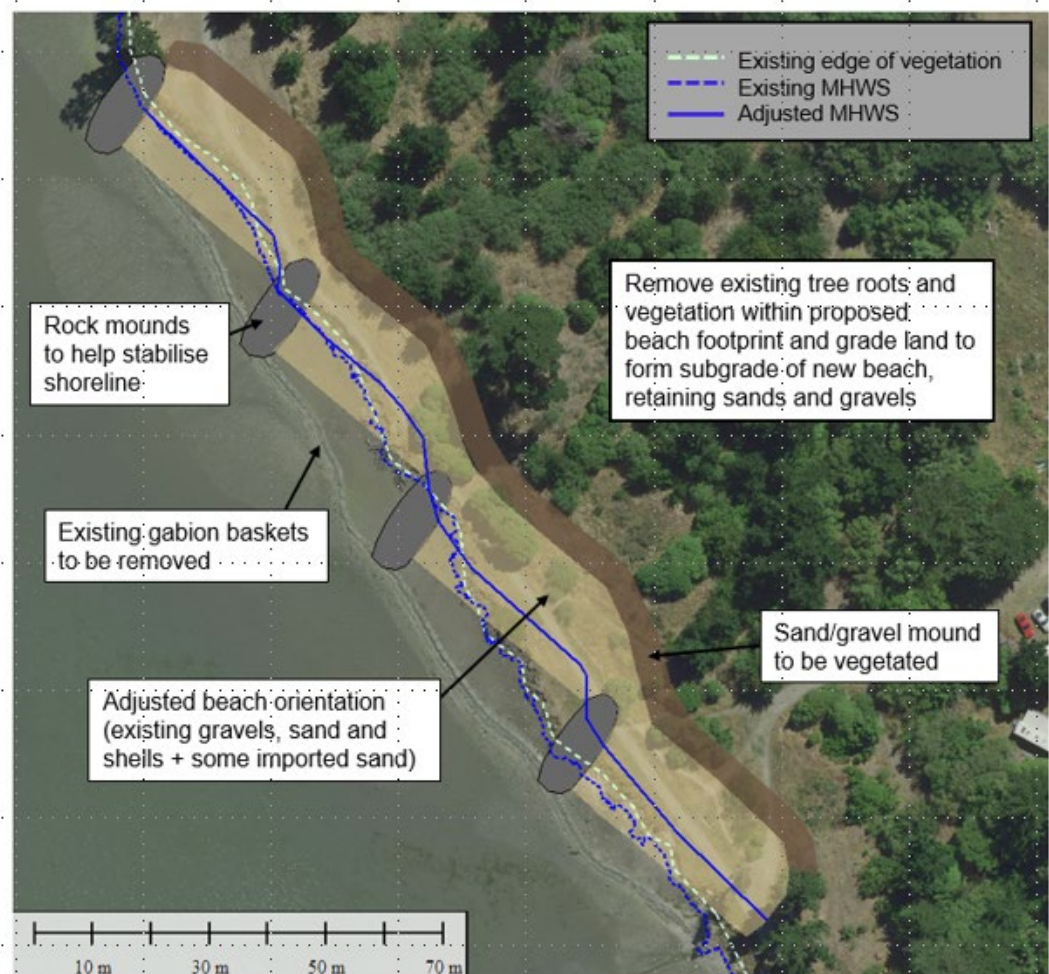
APPENDIX 1: SUMMARY OF POTENTIAL AVIFAUNA EFFECTS (MAY 2025)

Potential Effect	Ecological Value	Magnitude of Effect Without Impact Management	Level of Effect Without Impact Management	Magnitude of Effect With Impact Management ¹⁸	Level of Effect With Impact Management ¹⁸
Direct habitat loss	Negligible to Very High	Positive to High	Net Gain to Low		
Disturbance and displacement	Negligible to Very High	Negligible to Moderate	Very Low to High ¹⁹	Negligible	Very Low to Low
Mortality or injury	Negligible to Very High	Negligible to High	Very Low to Low	Negligible	Very Low to Low
Food supply and foraging	Negligible to Very High	Negligible	Very Low to Low		
Lighting	Negligible to Very High	None	None		
Coastal squeeze	Negligible to Very High	Negligible	Very Low to Low		
Cumulative effects	Negligible to Very High	None	None		

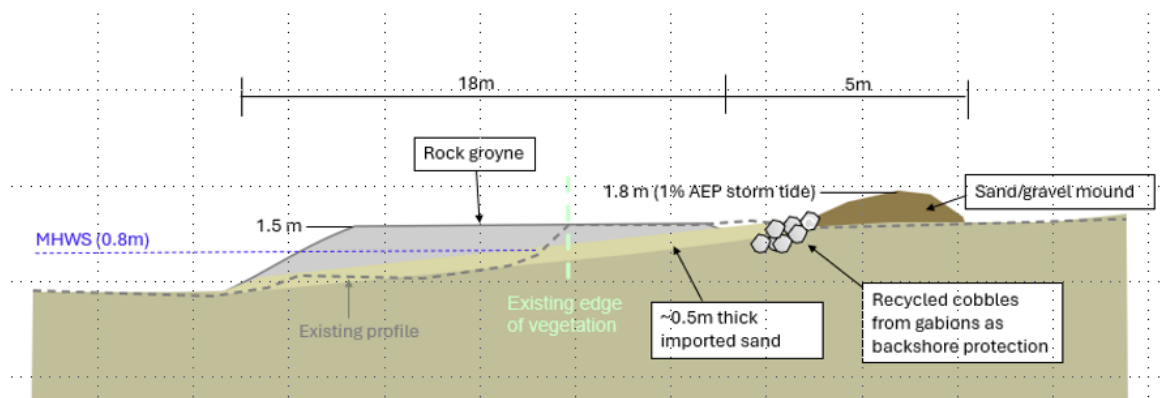
¹⁸ As outlined in Section 8.0 of the Ecological Effects Assessment

¹⁹ High and Moderate levels of effect for Australasian bittern and grey duck, respectively.

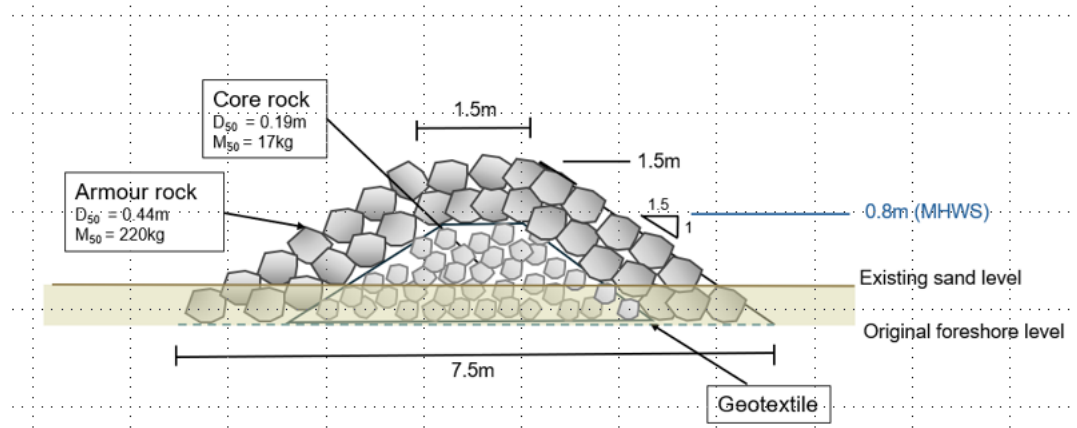
APPENDIX 2: PROPOSED SOFT-EDGE DESIGN



Plan view of the concept sketch (not to scale) for a nature based soft shore showing the existing and expected future MHWS location and the existing coastal edge



Typical section showing existing and proposed topographies and a section through the rock groyne (not to scale)



Typical section through the proposed rock groyne (not to scale)

APPENDIX 3: SNBP SOFT EDGE CONCEPT & AVIFAUNA SURVEY DATA

This plan has been prepared by Boffa Miskell Limited on the instructions of our Client, in accordance with the agreed scope of work. If it is intended to support an application under the Fast-track Approvals Act 2024, it may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application. While Boffa Miskell Limited has exercised due care in preparing this plan, it does not accept liability for any use of the plan beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.

Black swan

Kingfisher

Red-billed gull

South Island pied oystercatcher

Spur-winged plover

White-faced heron

Adjusted MHWS (T&T, 30.10.25)

Key Depositional Area (T&T, 30.10.25)

Soft Edge Concept Design (T&T, 30.10.25)

Adjusted beach orientation (existing gravels, sand and shells + some imported sand)

Plant vegetation along back of beach

Rock mounds to stabilise shoreline

SNBP Declamation

SNBP Reclamation

Bund and Revetment Design

Project Works Extent (includes 10m buffer from soft edge works and 5m buffer from all other works)

45m buffer from Project Works Extent

Boffa Miskell



www.boffamiskell.co.nz

0

50 m

1:2,250 @ A3

DATA SOURCES: Boffa Miskell, Tonkin and Taylor, Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

SOUTHSHORE FLOOD PROTECTION ECOLOGY

Avifauna survey results within 45m - SNBP with soft edge concept details

Date: 31 October 2025 | Revision: 0

Plan prepared for Christchurch City Council by Boffa Miskell Limited

Project Manager: Tanya.Blakely@boffamiskell.co.nz | Drawn: LJJa | Checked: TBI

APPENDIX 14 2022 SURVEY EFFORT AND TIDAL TIMES

Sumner tidal times are provided in the table below. However, as noted in the Section 2.6.3 of the Ecological Assessment, high tide times vary considerably across the Estuary, with areas closer to the Estuary mouth experiencing the peak of the tide earlier than areas located further away. Nevertheless, the table below shows the spread of survey effort over the course of the tidal cycles, as well as the height of each tide.

Date	Low tide time	Low tide m	High tide time	High tide m	Zone	Start time	Finish time	Notes
16/02/22	11:30	0.6	17:33	2.0	1	11:05	12:45	
16/02/22	11:30	0.6	17:33	2.0	2	12:45	13:40	
16/02/22	11:30	0.6	17:33	2.0	3	13:45	14:30	
16/02/22	11:30	0.6	17:33	2.0	4	14:55	15:20	
16/02/22	11:30	0.6	17:33	2.0	1	15:40	16:40	
16/02/22	11:30	0.6	17:33	2.0	2	16:40	16:57	
16/02/22	11:30	0.6	17:33	2.0	3	16:57	17:42	
16/02/22	11:30	0.6	17:33	2.0	4	17:45	18:11	
16/02/22	11:30	0.6	17:33	2.0	1	18:30	19:08	
16/02/22	11:30	0.6	17:33	2.0	2	19:15	19:30	
16/02/22	11:30	0.6	17:33	2.0	3	19:35	20:08	
16/02/22	11:30	0.6	17:33	2.0	4	20:15	20:37	
3/03/22	11:58	0.3	18:09	2.3	4	11:26	12:10	
3/03/22	11:58	0.3	18:09	2.3	3	12:15	14:05	Survey paused 12:45 to 13:15
3/03/22	11:58	0.3	18:09	2.3	2	14:05	15:10	
3/03/22	11:58	0.3	18:09	2.3	1	15:15	16:17	
3/03/22	11:58	0.3	18:09	2.3	4	16:25	17:10	
3/03/22	11:58	0.3	18:09	2.3	3	17:12	18:16	
3/03/22	11:58	0.3	18:09	2.3	2	16:17	16:40	
3/03/22	11:58	0.3	18:09	2.3	1	16:40	19:17	
16/03/22	10:11	0.6	16:04	2.0	4	9:05	10:12	
16/03/22	10:11	0.6	16:04	2.0	3	10:15	11:20	
16/03/22	10:11	0.6	16:04	2.0	2	12:00	13:15	
16/03/22	10:11	0.6	16:04	2.0	1	13:15	14:27	
16/03/22	10:11	0.6	16:04	2.0	4	14:45	15:15	
16/03/22	10:11	0.6	16:04	2.0	3	15:15	16:15	
16/03/22	10:11	0.6	16:04	2.0	2	16:45	17:04	
16/03/22	10:11	0.6	16:04	2.0	1	17:04	17:34	
16/03/22	10:11	0.6	16:04	2.0	4	17:55	18:15	
16/03/22	10:11	0.6	16:04	2.0	3	18:15	19:17	
16/03/22	10:11	0.6	16:04	2.0	2	19:17	19:45	
16/03/22	10:11	0.6	16:04	2.0	1	19:45	20:06	
4/04/22	12:57	0.5	19:13	2.2	4	7:55	8:10	
4/04/22	12:57	0.5	19:13	2.2	3	8:10	9:02	
4/04/22	12:57	0.5	19:13	2.2	2	9:02	9:20	
4/04/22	12:57	0.5	19:13	2.2	1	9:20	10:08	
4/04/22	12:57	0.5	19:13	2.2	4	10:25	11:05	
4/04/22	12:57	0.5	19:13	2.2	3	11:05	12:37	
4/04/22	12:57	0.5	19:13	2.2	2	12:37	13:50	
4/04/22	12:57	0.5	19:13	2.2	1	13:50	15:06	Survey paused between 14:05 to 14:30
4/04/22	12:57	0.5	19:13	2.2	4	15:20	15:55	
4/04/22	12:57	0.5	19:13	2.2	3	14:05	17:25	

Date	Low tide time	Low tide m	High tide time	High tide m	Zone	Start time	Finish time	Notes
4/04/22	12:57	0.5	19:13	2.2	2	17:25	18:30	
4/04/22	12:57	0.5	19:13	2.2	1			Too dark to complete
13/04/22	7:48	0.6	13:52	2.0	4	8:05	9:00	
13/04/22	7:48	0.6	13:52	2.0	3	9:00	10:30	
13/04/22	7:48	0.6	13:52	2.0	2	10:33	11:38	
13/04/22	7:48	0.6	13:52	2.0	1	11:38	12:33	
13/04/22	7:48	0.6	13:52	2.0	4	12:56	13:20	
13/04/22	7:48	0.6	13:52	2.0	3	13:20	14:30	Survey paused 13:48 to 14:05
13/04/22	7:48	0.6	13:52	2.0	2	14:30	14:44	
13/04/22	7:48	0.6	13:52	2.0	1	14:55	15:24	
13/04/22	7:48	0.6	13:52	2.0	4	15:40	16:11	
13/04/22	7:48	0.6	13:52	2.0	3	16:11	17:33	Survey paused 16:27 to 16:52
13/04/22	7:48	0.6	13:52	2.0	2	17:33	18:08	
13/04/22	7:48	0.6	13:52	2.0	1			Too dark to complete
29/04/22	9:23	0.4	15:38	2.2	4	7:45	8:20	
29/04/22	9:23	0.4	15:38	2.2	3	8:20	9:46	
29/04/22	9:23	0.4	15:38	2.2	2	9:46	11:09	
29/04/22	9:23	0.4	15:38	2.2	1	11:09	12:25	
29/04/22	9:23	0.4	15:38	2.2	4	12:45	13:20	
29/04/22	9:23	0.4	15:38	2.2	3	13:20	14:55	
29/04/22	9:23	0.4	15:38	2.2	2	14:55	15:30	
29/04/22	9:23	0.4	15:38	2.2	1	15:30	16:17	
29/04/22	9:23	0.4	15:38	2.2	4	16:36	17:00	
29/04/22	9:23	0.4	15:38	2.2	3	17:00	18:00	
29/04/22	9:23	0.4	15:38	2.2	2	18:00	18:15	
29/04/22	9:23	0.4	15:38	2.2	1			Too dark to complete

APPENDIX 5: GWRC TRIAL - FID RESULTS

Table 5.1: Flight initiation distance (tolerance) testing August – December 2019

	100m	50m	25m	Oblique	Direct	Comments	Date
			20m flush	✓		Early in season	8/08/2019
			16m flush	✓		Tractor drilling adjacent paddock	18/09/2019
			19m flush		✓	Stopped dozer at 25m and two people walked another six metres toward the nest before the bird flushed	3/12/2019
		40m flush	18m flush		✓ ✓	Nest 2 drive straight at nest Nest 1 drive straight at nest	18/09/2019
		30m flush 33m flush 32m flush 27m flush			✓ ✓ ✓ ✓	Tests carried out within 10 minutes of each other, drive straight at nest Test carried out within 15 minutes of each other, drive straight at nest	19/09/2019 31/10/2019
		30m flush			✓	Drive straight at nest	18/09/2019
			5.8m flush 5.8m flush	✓ ✓		First time stopped opposite nest and person alighted from vehicle; bird flushed. Second time drive straight past nest, bird alert but did not flush	15/11/2019
			12m flush		✓	Early in season	8/08/2019
		41m flush	16m flush	✓	✓	Bird facing away, wind covering approach Walk straight at nest	16/09/2019

Draft Code of Practice

75m from nests during activities causing continuous disturbance
50m from chicks during activities causing continuous disturbance

Current Code of Practice (V21 October 2019)

100m from nests
50m from chicks during activities causing continuous disturbance to habitat
25m vehicles must not be operated within 25m of any nests and chicks