

Appendix 1 Legal Descriptions

Site	Legal Description	Area	Owner as on 6/11/23	Record(s) of Title
Stockpiling of Material				
80 Owles Terrace	Lot 1 DP 47330	4.87ha	Christchurch City Council	CB26B/576
Park Erosion Protection Works and Inundation Works				
South Brighton Recreation Reserve	New RES 4875 LT 416633, SO 9070	15.56 ha	Christchurch City Council	CB8K/989
South Brighton Recreation Reserve	New RES 4874 DP 465910, DP 465996, SO 9070	12.24 ha	Christchurch City Council	CB8K/989
Southshore Erosion Protection Works and Inundation Works				
Stopped Road Ebbtide Street to Heron Street	Section 1 SO 563306	0.70 ha	Christchurch City Council	1010022
2 Godwit Street	Lot 1 DP 71198	0.06 ha	Christchurch City Council	CB41B/303
4 Godwit Street	Lot 2 DP 71198	0.07 ha	Christchurch City Council	CB41B/304
32A Rocking Horse Road	Lot 6 DP 16205	0.06 ha	Christchurch City Council	CB627/92
34A Rocking Horse Road	Lot 7 DP 16205	0.07 ha	Christchurch City Council	CB652/89
36A Rocking Horse Road	Lot 10 DP 16205	0.07 ha	Christchurch City Council	CB627/89
36B Rocking Horse Road	Lot 11 DP 16205	0.06 ha	Christchurch City Council	CB7D/432
40A Rocking Horse Road	Lot 14 DP 16205	0.07 ha	Christchurch City Council	CB618/47
40B Rocking Horse Road	Lot 15 DP16205	0.07 ha	Christchurch City Council	CB677/40
44A Rocking Horse Road	Lot 18 DP 16205	0.09 ha	Luke John William Jamin, Sandra Jane Firth	CB698/69
46A Rocking Horse Road	Lot 19 DP 16205	0.09 ha	Christchurch City Council	CB627/90
46B Rocking Horse Road	Lot 20 DP 16205	0.11 ha	Christchurch City Council	CB624/31
5 Heron Street	Lot 2 DP 28869	0.07 ha	Christchurch City Council	CB10K/521
3 Heron Street	Lot 3 DP 28869	0.06 ha	Christchurch City Council	CB10K/522
2 Heron Street	Lot 3 DP 26391	0.08 ha	Christchurch City Council	CB8B/1002

6 Heron Street	Lot 1 DP 26391	0.06 ha	Christchurch Council	City	CB8B/1140
2A Heron Street	Lot 4 DP 26391	0.06 ha	Christchurch Council	City	CB8B/1003
4 Heron Street	Lot 2 DP 26391	0.09 ha	Christchurch Council	City	CB35A/836, CB35A/837
2B Heron Street	Lot 5 DP 26391	0.06 ha	Christchurch Council	City	CB8B/1004
2C Heron Street	Lot 6 DP 26391	0.06 ha	Christchurch Council	City	CB8B/1005
9 Heron Street	Lot 6 DP 37149	0.06 ha	Christchurch Council	City	CB17F/1147
11 Heron Street	Lot 7 DP 37149	0.05 ha	Christchurch Council	City	CB17A/484
7 Heron Street	Lot 5 DP 37149	0.09 ha	Christchurch Council	City	CB17F/1146
62C Rocking Horse Road	Lot 4 DP 24125	0.11 ha	Christchurch Council	City	CB6A/542
62B Rocking Horse Road	Lot 3 DP 24125	0.10 ha	Christchurch Council	City	CB6B/559
64A Rocking Horse Road	Lot 2 DP 49643	0.06 ha	Christchurch Council	City	CB29A/960
66B Rocking Horse Road	Lot 1 DP 51260	0.16 ha	Christchurch Council	City	976922
66C Rocking Horse Road	Lot 2 DP 51260	0.16ha	Christchurch Council	City	CB29K/87
74B Rocking Horse Road	Lot 16 DP 19427	0.07 ha	Christchurch Council	City	CB32B/721, CB32B/722
74C Rocking Horse Road	Lot 17 DP 19427	0.07 ha	Christchurch Council	City	CB33K/833, CB33K/834
74A Rocking Horse Road	Lot 15 Dp19427	0.19 ha	Christchurch Council	City	CB31A/457, CB33B/1262
76A Rocking Horse Road	Lot 2 DP 39313	0.09 ha	Christchurch Council	City	CB17K/404
78 Rocking Horse Road	Lot 71 DP 4692	0.15 ha	Robert Knowles	Barry	CB15K/509
80A Rocking Horse Road	Lot 2 DP 17112	0.08 ha	Christchurch Council	City	CB704/90
82A Rocking Horse Road	Lot 1 DP 36785	0.09 ha	Christchurch Council	City	CB15K/1273
3A Penguin Street	Lot 2 DP 37259	0.08 ha	Christchurch Council	City	CB16B/567
3 Penguin Street	Lot 1 DP 3259	0.09 ha	Christchurch Council	City	976923
Stopped Road at Penguin Street	Section 3 SO 563306	0.06 ha	Christchurch Council	City	1010024
2B Penguin Street	Lot 1 DP 36659	0.06 ha	Christchurch Council	City	CB42B/55
2A Penguin Street	Lot 2 DP 36659	0.06 ha	Christchurch Council	City	CB42B/55

2 Penguin Street	Lot 3 DP 36659	1.137 ha	Christchurch Council	City	977324
88B Rocking Horse Road	Lot 3 DP 21691	1.137 ha	Christchurch Council	City	977324
88A Rocking Horse Road	Lot 2 DP 21691	1.137 ha	Christchurch Council	City	977324
90B Rocking Horse Road	Lot 1 DP 57612	1.137 ha	Christchurch Council	City	977324
94A Rocking Horse Road	Part Lot 2 DP 18852	1.137 ha	Christchurch Council	City	977324
96A Rocking Horse Road	Lot 3 DP 18852	1.137 ha	Christchurch Council	City	977324
96B Rocking Horse Road	Lot 4 DP 18852	1.137 ha	Christchurch Council	City	977324
100A Rocking Horse Road/100C Rocking Horse Road (Cross lease)	Lot 1 DP 47440	1.137 ha	Christchurch Council	City	977324
100B Rocking Horse Road	Lot 2 DP 47440	1.137 ha	Christchurch Council	City	977324
104A Rocking Horse Road	Lot 2 DP 16502	1.137 ha	Christchurch Council	City	977324
106A Rocking Horse Road	Lot 3 DP 16502	1.137 ha	Christchurch Council	City	977324
106B Rocking Horse Road	Lot 4 DP 26420	1.137 ha	Christchurch Council	City	977324
108B Rocking Horse Road	Lot 5 DP 26420	1.137 ha	Christchurch Council	City	977324
112B Rocking Horse Road	Lot 21 DP 19427	1.137 ha	Christchurch Council	City	977324
112C Rocking Horse Road	Lot 22 DP 19427	1.137 ha	Christchurch Council	City	977324
5 Plover Street	Lot 3 DP 35785	1.137 ha	Christchurch Council	City	977324
1 Plover Street	Lot 2 DP 35785	0.06 ha	Christchurch Council	City	CB16A/455
3 Plover Street	Lot 1 DP 35785	0.06 ha	Christchurch Council	City	CB16A/454
Stopped Road at Plover Street	Section 4 SO 563306	0.09 ha	Christchurch Council	City	1010025
2 Plover Street	Lot 2 DP 557654	0.08 ha	Christchurch Council	City	977325
4 Plover Street	Part Lot 2 DP 18140	0.10 ha	Christchurch Council	City	1067916
122A Rocking Horse Road	Part Lot 3 DP 18140	0.30 ha	Christchurch Council	City	1067916
124A Rocking Horse Road	Lot 1 DP 27447	0.11 ha	Christchurch Council	City	CB9B/220
126A Rocking Horse Road	Lot 1 DP 33062	0.07 ha	Christchurch Council	City	CB13A/1260
126B Rocking Horse Road	Lot 2 DP 33062	0.07 ha	Christchurch Council	City	CB13A/1262

128A Rocking Horse Road	Lot 3 DP 33062	0.10 ha	Christchurch Council	City	CB13K/179
132A Rocking Horse Road	Lot 2 DP 28790	0.10 ha	Christchurch Council	City	CB10K/338
132B Rocking Horse Road	Lot 2 DP 58641	0.07 ha	Christchurch Council	City	CB36B/79
134B Rocking Horse Road	Lot 2 DP 40548	0.06ha	Christchurch Council	City	CB46A/100
1/134A, 2/134A Rocking Horse Road (Cross Lease)	Lot 2 DP 40820	0.08 ha	Christchurch Council	City	CB24F/181, CB24F/182
136B Rocking Horse Road	Lot 3 DP 30759	0.06 ha	Christchurch Council	City	CB12F/290
136A Rocking Horse Road	Lot 2 DP 30759	0.08 ha	Christchurch Council	City	CB12F/289
140 Rocking Horse Road	Lot 3 DP 51138	0.08 ha	Christchurch Council	City	CB30B/341
140A Rocking Horse Road	Lot 2 DP 51138	0.06 ha	Christchurch Council	City	CB30B/341
142B Rocking Horse Road	Lot 1 DP 37183	0.06 ha	Christchurch Council	City	CB15K/937
142A Rocking Horse Road	Lot 2 DP 37187	0.08 ha	Christchurch Council	City	CB15K/938
144B Rocking Horse Road	Lot 3 DP 21048	0.05 ha	Christchurch Council	City	CB2D/1392
144A Rocking Horse Road	Lot 2 DP 21048	0.09 ha	Christchurch Council	City	CB2C/538
146B Rocking Horse Road	Lot 25 DP 19427	0.05 ha	Christchurch Council	City	CB748/91
146A Rocking Horse Road	Lot 23 DP 19427	0.09 ha	Christchurch Council	City	CB40A/759, CB41A/1291
148B Rocking Horse Road	Lot 3 DP 19246	0.05 ha	Christchurch Council	City	CB729/24
148A Rocking Horse Road	Lot 2 DP 19246	0.09 ha	Christchurch Council	City	CB730/37
1A Tern Street	Lot 7 DP 30898	0.06 ha	Christchurch Council	City	CB13K/816
1 Tern Street	Lot 6 DP 30898	0.06 ha	Christchurch Council	City	CB13K/815
3 Tern Street	Lot 5 DP 30898	0.06 ha	Christchurch Council	City	CB13K/814
5 Tern Street	Lot 4 DP 30898	0.06 ha	Christchurch Council	City	CB13K/813
Stopped Road at Tern Street	Section 6 SO 563306	0.12 ha	Christchurch Council	City	1010027
2 Tern Street	Lot 4 DP 26246	0.05 ha	Christchurch Council	City	CB8B/609
4 Tern Street	Lot 3 DP 26246	0.05 ha	Christchurch Council	City	CB8B/590
156B Rocking Horse Road	Lot 3 DP 27962	0.08 ha	Christchurch Council	City	CB10F/712

160B Rocking Horse Road	Lot 2 DP 360074	0.25 ha	Christchurch Council	City	974036
162B Rocking Horse Road	Lot 3 DP 25957	0.25 ha	Christchurch Council	City	974036
162A Rocking Horse Road	Lot 2 DP 25957	0.1 ha	Christchurch Council	City	CB36B/712, CB38A/435
164B Rocking Horse Road	Lot 3 DP 40227	0.25 ha	Christchurch Council	City	974036
166B Rocking Horse Road	Lot 2 DP 37175	0.08 ha	Christchurch Council	City	CB16K/1213
166C Rocking Horse Road	Part Lot 51 DP 6001	0.01 ha	Christchurch Council	City	N/A
168A Rocking Horse Road	Lot 2 DP 21876	0.13 ha	Alistair Neil Bowie		CB6D/1472
1/168B Rocking Horse Road, 2/168B Rocking Horse Road	Lot 3 DP 21876	0.07 ha	Christchurch Council	City	CB38A/1118, CB39A/1118
170 Rocking Horse Road	Lot 4 DP 75827	0.11 ha	Christchurch Council	City	CB43C/872
172B Rocking Horse Road	Lot 3 DP 23008	0.09 ha	Christchurch Council	City	CB6C/511
172C Rocking Horse Road	Lot 4 DP 23008	0.06 ha	Christchurch Council	City	CB6C/512
172D Rocking Horse Road	Lot 5 DP 19113	0.11 ha	Kenneth Green, Dale Maureen Green		CB8K/483
172J Rocking Horse Road	Lot 3 DP 351497	0.06 ha	Christchurch Council	City	210881
172H Rocking Horse Road	Lot 4 DP 351497	0.07 ha	Christchurch Council	City	210882
178B Rocking Horse Road	Lot 3 DP 20543	0.13 ha	Christchurch Council	City	CB19B/1294, CB19B/1295
178D Rocking Horse Road	Lot 4 DP 20543	0.06 ha	Christchurch Council	City	CB25K/297
180C Rocking Horse Road	Lot 2 DP 38882	0.14 ha	Christchurch Council	City	CB17B/189
182C Rocking Horse Road	Lot 4 DP 46272	0.10 ha	Christchurch Council	City	CB26B/350
184B Rocking Horse Road	Lot 28 DP 19427	0.15 ha	Craig Johnson, Peter Michael Harold Johnson, Ian Lindsay Johnson, Lindsay Harold Johnson, Reader Investments Limited		CB34C/379, CB35B/1149
184C Rocking Horse Road	Lot 29 DP 19427	0.08 ha	Christchurch Council	City	CB822/69

Appendix 2 – List of Submitters and Submission Number

Sub #	Name
001	Carol Elaine Thomas
002	Lee Ann Osborn
003	Maureen Green
004	Kenneth Dale Green
005	Rebecca Nicole Toone
006	Bianca channon
007	Adam perry
008	Amanda McDonald
009	Ellen Mary hoy
010	Michael John Smith
011	Lucy burns
012	Annabel Graham
013	Michaela Malloch
014	Jo Battye
015	Bernadette Cakman
016	Glyn Alan MacDonald
017	Antonia Gebauer
018	Gary Mr Miller
019	Malcolm Campbell
020	Peter Muir
021	Noeline Nunnink
022	Adam Parker
023	Kathleen joy Walsh
024	Mark David Smith
025	Aaron Peter Smith
026	Ana Kelleher
027	Karina Hay
028	Sharyn Berg
029	Anna King
030	Todd Martin Johnston
031	Angus Macdonald
032	Brian Mariner
033	Kim Elder
034	Emma Rodriguez Dos Santos
035	Lyndsay Fenn
036	James Peter Knight
037	Simon Zust
038	Michael Lough
039	Gemma Zust
040	Avon-Heathcote Estuary Ihutai Trust
041	Diane and Lynton Douglas
042	Melva Gill
043	Nigel Vine

044	Lisa Maree Perry
045	Sue Davidson
046	Carol A Scott
047	Pauline Margaret Crowe
048	Grant Gillard
049	Linda Nicolson
050	Yuri Bacas Hosaka
051	Tara OBrien
052	Billie Hall
053	Roderick N Schou
054	Chay Joseph Froggatt
055	RE Sansom
056	Sarah Smith
057	Rosie MacDonald
058	Sonia Maria Evans
059	Keith Evans
060	Mark Warren Burley & Ellie Caroline Jones
061	Kathleen Joy Walsh
062	David john Small
063	Kate Latimer
064	Susan McKenna
065	Joseph Jonathan Radford
066	Grant Sutherland
067	Mr Damon Mangos
068	Katrina Lajunen
069	Anthony David Streeter
070	Anna van den Bosch
071	Carol Ann Scott
072	Suzanne Richards
073	Allison Froggatt
074	Ruby Froggatt
075	Nick Yuki
076	Patrick Boland
077	Courtney Winsloe
078	Coral Ings
079	Mathilda Froggatt
080	Michael Garner
081	Sharyn Ogg
082	Janet Ison
083	Heritage New Zealand Pouhere Taonga (HNZPT)
084	Gregory Allan Ritchie
085	Miriam Mallinder
086	Bernadette Hartley

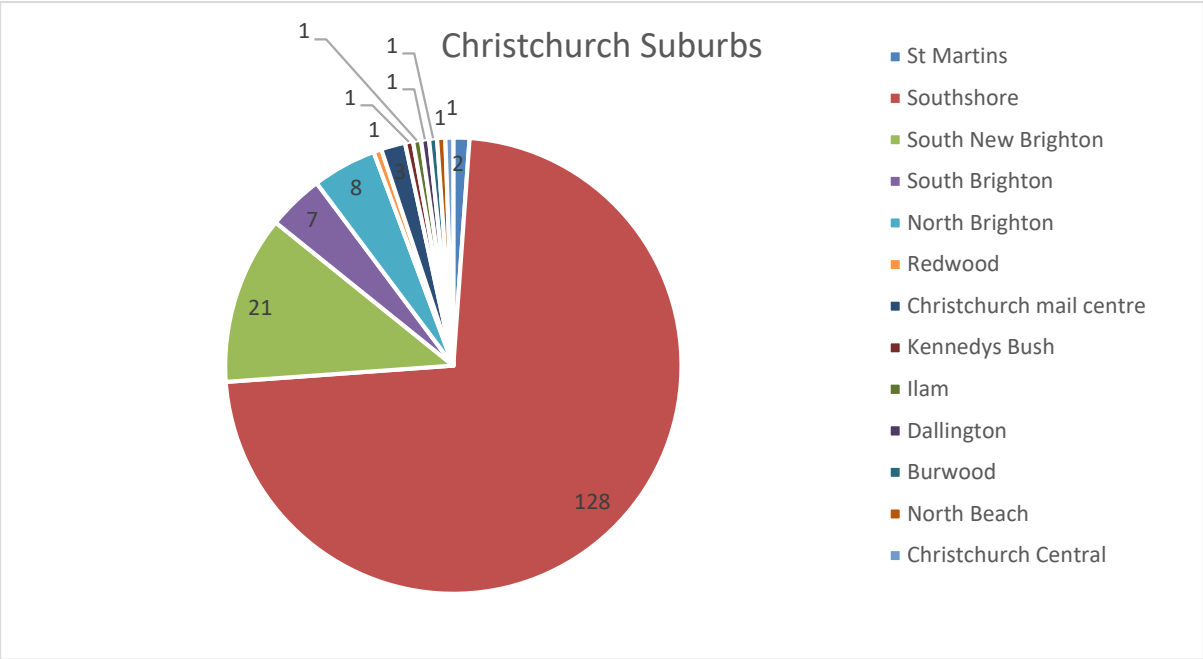
087	Heidi Mariner
088	Julia Joyce Mariner
089	Linda Smolar
090	Simon Brown
091	Julie Cullen
092	Georgina Langridge
093	Gerard Vink
094	Dani Boxall
095	Jade Sintes
096	Andrew Olliver
097	Alex Hinchey
098	Angus James Smith & Rachel Louise Newton
099	Tim Roulston
100	Katherine Margaret Morris
101	Pete Thornhill Sealey
102	Alena Riordan
103	Annette Bolton
104	Susan Alderman
105	Nicholas Yuki
106	Clare Tank
107	David Low and Jane Low
108	Timothy Robert Sintes
109	Russell & Penny Rogers
110	Stephen Burnside
111	Jan Walker
112	Beth Jaeger
113	Megan Jane Roulston
114	Fiona Garrett
115	Helen Barraclough
116	Greg Chapman
117	Emma Brunton
118	Elizabeth Yuki
119	Maria Smolar
120	Leane Dempsey
121	Kerry Ann McDougall
122	Scott Butcher
123	Kim Money
124	Marie Annabel Graham
125	Angela Doudney
126	Herenga ā Nuku Aotearoa, the Outdoor Access Commission
127	Susan Lynne Carbines
128	Bernard Andrew Calder
129	Yuki Bacas-Streeter

130	Kylie Eastman & Mama Day
131	Ian Wright and Rebecca Wright
132	Kerri Douglas
133	Gerad Sutton and Antea Hill
134	James S and Susan M Ryburn
135	Bethany Ann Brixton
136	Glenda Howard
137	Paul Wood
138	Edward Potts
139	Susan Adair Bailey
140	Gaye Meryl Meffan
141	Logan Forman
142	Sean Farrelly
143	Tim Samuel Burrows
144	Dianne Carol Dobson
145	Vesta Boswell
146	Frances Mary Miatamney
147	Darrell Jones & Tina Lockyer
148	Jayne Lucas and Michael Hutchinson
149	Jon Wallace
150	Jourdin Blair
151	Neil Archibald Taggart
152	Shirley Effie Nixon
153	John Jacob Bootsma
154	Angus John C Simpson
155	Peter and Susan Greggains
156	Grant West
157	Anne Mayo and Leon Minson
158	Jacqueline Tracey Keen
159	Wendy Mary Tolchard
160	Aaron Francis Ladd
161	Toni Anne Minson
162	Gareth James Horne
163	Gregory Peter Keen
164	Ian Leonard Spencer
165	Lisa Anne Baglow
166	Aaron Minson
167	Carl Baglow
168	Michael Wayne Morris
169	Christine Anne Gillman
170	Owen Trevor Davidson
171	Danielle Petterol-Ladd
172	Bruce Tait
173	William Bruce Nixon

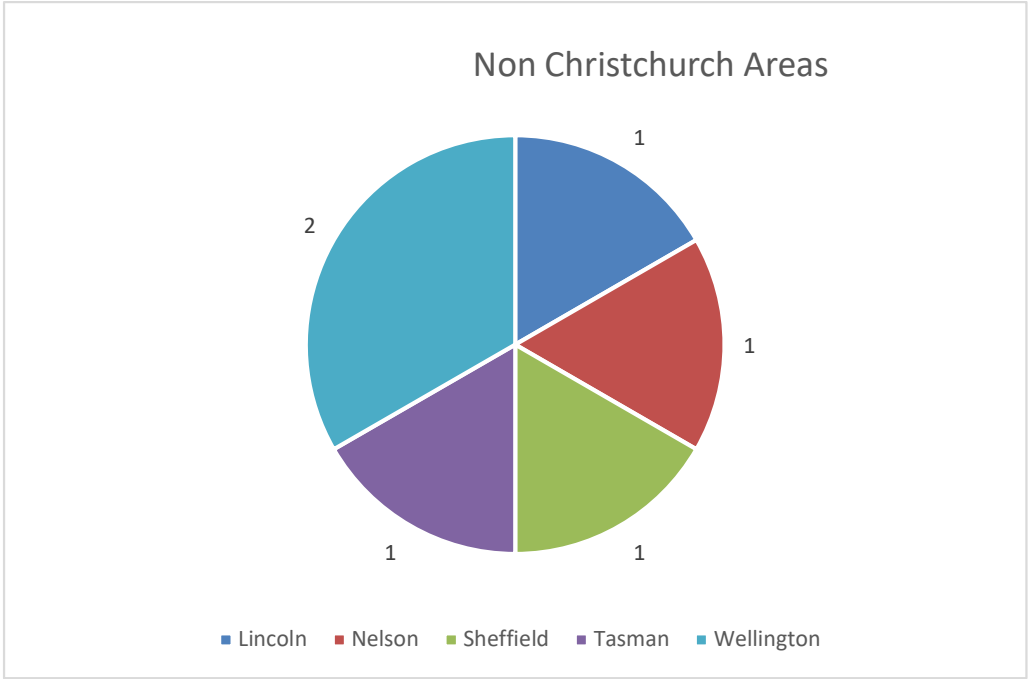
174	Lauren Brooke Simpson
175	Jan Sintes
176	Mrs Christine Anne Tait
177	Andrew Evammy - Evammy Family
178	Vicki Mclver
179	Director General of Conservation (the Director General)
180	Ministry of Education
181	Rangi Hawkins
182	Estella Robb

Appendix 3 – Location of Submitters (Pie Graphs)

Location of submitters



Row labels	Count of Town
St Martins	2
Southshore	128
South New Brighton	21
South Brighton	7
North Brighton	8
Redwood	1
Christchurch mail centre	3
Kennedys Bush	1
Ilam	1
Dallington	1
Burwood	1
North Beach	1
Christchurch Central	1
Grand Total	176



Row labels	Count of Town
Lincoln	1
Nelson	1
Sheffield	1
Tasman	1
Wellington	2
Grand Total	6

Appendix 4

Landscape Peer Review – Jeremy Head

LANDSCAPE PEER REVIEW

To: Janice Carter, Consultant Planner to Christchurch District Council

Copy:

From: Jeremy Head, Registered NZILA Landscape Architect
Jeremy Head Landscape Architect 2022 Ltd.

Date: 19 March 2025

1. Introduction

Jeremy Head, Landscape Architect ('author') was requested by the Christchurch City Council (CCC) to carry out a peer review of a landscape effects assessment (LEA - dated 27 November 2023) prepared by Sue McManaway (Landscape Planner, Boffa Miskell) on behalf of CCC. The subject of the LEA is to determine the landscape and natural character effects of erosion and inundation protection works, proposed to be constructed in two separate areas. One within part of South New Brighton Park (SNBP) and the second; within a strip of red-zoned land along the estuary edge of the spit extending between Caspian Street and Mermaid Place (the 'Southshore Section'). Both 'sites' are referred to in this report as the 'site' unless specifically referred to otherwise.

This peer review began in late 2023 and has now been finalised after a hiatus following changes to the scheme and the Applicant's recent responses to several RFIs, both from within CCC's Environment and Planning section and Environment Canterbury Regional Council (ECan). A revised LEA has not been provided by the Applicant although a memorandum has been provided which concerns several responses to recent RFIs. The nature of these responses which essentially clarifies aspects of the description of the site and Project, any proposed recent changes to the design, and the Project's landscape effects have been incorporated into this peer review. The author has also prepared a separate memorandum which addresses the Applicant's response to the RFI points in further detail.

This peer review does not form a 'parallel landscape assessment'. The intent is to impartially review and evaluate the work completed by a colleague with similar competencies and in so doing, maintain quality, improve performance, and provide credibility. The sole purpose of this peer review report is to assist the decision maker.

The authors scope for the peer review is threefold: (1) to confirm that the methodology used by the Applicant's landscape architect is appropriate and follows best industry practice; (2), to consider the recent changes to the design for the Project and Applicants recent responses to RFIs; and (3), that the overall conclusions reached are sound. This peer review will also confirm whether the information included in the assessment is sufficient to enable a robust understanding of the receiving environment and the landscape effects of the Project. This may highlight omissions in the assessment. This peer

review will also include comment on whether the effects findings in the assessment are credible and can be justified.

The peer review methodology is based on Te Tangi a te Manu Aotearoa New Zealand Landscape Assessment Guidelines (TTatM) and utilises information obtained from both desk top study and site context investigation through field study.

While this report is not before the court, the author can confirm that this peer review has been prepared in accordance with the Environment Court's Code of Conduct for Expert Witnesses¹. This peer review is within the author's area of expertise except where it states that other experts' reporting is being relied upon.

As requested, a summary of the peer review author's expert qualifications and relevant experience is included in **Appendix 1** to this report.

The following documents have been relied on in the preparation of this peer review:

- a) Landscape Assessment Report, prepared by Boffa Miskell and dated 27 November 2023.
- b) Landscape and Natural Character Graphic Supplement, prepared by Boffa Miskell and dated 27 November 2023.
- c) Landscape Plans and Plant Palettes, prepared by Christchurch City Council and dated November 2023 and the version including changes received 25 February 2025.
- d) AEE prepared by Jacobs for Christchurch City Council and dated 4 December 2023.
- e) Technical drawings prepared by Jacobs for Christchurch City Council and dated 30 November 2023 (Issue 'D') and the version including changes received 25 February 2025.
- f) Memorandum prepared by Boffa Miskell and dated 13 February 2025.
- g) Christchurch City Council response to s92 and dated 19 February 2025.
- h) Christchurch City Council response to ECan RFIs received 27 February 2025.

In late January 2024, a specific site visit was carried out in relation to this peer review which involved walking the areas at SNBP and the estuary side of the spit between SNBP and Petrel Lane. During fieldwork, the site condition, degree of visibility of the site and Project was ground-truthed following earlier desktop study. Site photographs and field notes were taken at the time.

The site was not observed from further afield. A few years prior to this site visit, the peer review author prepared a landscape assessment for erosion protection and remediation works for the Bromley Landfill where it extended to the estuary. This work included observing the area from various locations across the estuary, which also encapsulated the site subject to this peer review. Further the LEA makes comment that: *"Whilst views from these [distant] areas may be possible, any change associated with the Site is likely difficult to be perceived in the context of the distance, the changing Estuary foreground and the broader views available."* The peer review author agrees with this point.

In addition, the site was not observed from the estuary waters itself, nor from the estuary mudflats. It was determined during fieldwork that this was not necessary for two reasons. The first being that the most potentially affected parties are located landward of the shoreline, and the second, that due to its curvaceous form, the shoreline was able to be observed from several places from the land which provided a sufficient understanding of its current condition and how the land/estuary edge will appear following the Project.

¹ Environment Court of NZ Practice Note 2023 (Section 9).

The peer review author understands from the AEE that the Project attracts non-complying activity status overall.

2. Landscape Assessment Methodology

It can be confirmed that the landscape assessment methodology used in the LEA follows the guidance set out in TTatM which is considered to be best industry practice. Reports by other experts are referenced throughout the LEA (some of which are listed at Section 1.3) which demonstrates a good understanding of the broader issues at play, the key technical imperatives and cultural and community requirements and their aspirations. The widely recognised seven-point scale of effects from TTatM has been used which enables a clear understanding of the various landscape effects and their comparison with the RMA effects scale. It is noted that several site visits were carried out by the LEA author which suggests a fulsome understanding of the site and its context was made possible. Appendix 1 to the LEA includes general background information underpinning the assessment methodology which is relevant and draws on the landscape assessment guidelines set out in TTatM.

3. Description of the Existing Environment

A broad 'top down' approach is taken where the site context is described; first, under the 'physical', 'associative' and 'perceptual' realms, and fourthly, under natural character (natural character effects are correctly considered under RMA Section 6(a)). This is a logical and well set out approach. After which the LEA 'drills down' to an in-depth description of the site, broken into a separate description of both parts of the site. The description of the wider landscape context, the site, and its condition accord with the peer review author's understanding of the wider site context, his observations and conclusions as to the current condition of the site.

The written site / context description is also supported by a set of site photographs and photographic viewpoint location maps which is very helpful. Of note, best practice use of a 50 mm focal length is not stated in the photographic labelling / titles. However, the images appear 'true' and are more than likely to have been taken and prepared following best industry practice as per TTatM.

Section 3.4 describes the visual catchment, the various viewing audiences, and their degree of visibility of the parts of the Project and in a general sense how their views will change. The various parties and the findings here accord with the peer review author's own observations during fieldwork. Actual visual effects are not discussed. That comes later in the LEA in Section 5.0.

4. Project

The description of the Project is included in 1.1 (report scope), and more fully at 2.0 (Project Description). The description of the Project is at an appropriate level of detail to clearly understand the implications of the changes to the landscape and the effects of these changes. The general arrangement drawings prepared by Jacobs for CCC are relied upon in the subsequent natural character and landscape effects assessment. The drawings are referenced throughout which is helpful. This section of the LEA also demonstrates a good understanding of the background to, and design rationale of the Project.

Planting on the bunds is mentioned throughout the LEA and was relied upon in the original effects assessment. Recent requirements post the LEA stipulate that only mown grass be planted on the landward side of the bund and trees shall be located no closer than 5 m from the core of the bund. This is to facilitate maintenance and improve structural integrity / performance of the bund landform. Of note, the current CCC landscape concept plan (still) shows no planting other than grass on the bund within SNBP. In the Southshore Section the bund is (still) shown planted with estuarine species on the estuary side of the shared path / bund crest. The landward side (still) includes a mix of both mown grass and other plants. A play area is also shown partly on the bund south of Heron Street. Trees are not shown on the bund, although some (still) appear to be within 5 m of the bund core. The landscape plan has not been updated to remove planting and the play area from the landward side of the bund. However, the Applicant has addressed the removal of planting from the bund in their recent RFI response where they conclude that this will not alter their earlier landscape effects assessment. The author agrees with this conclusion which is discussed in more detail in the peer review author's separate memorandum.

5. Statutory Context

The relevant statutory documents / provisions are cited at Section 4.0 in the LEA. The LEA states that an examination of sections of the various listed statutory documents will be 'required as part of the landscape assessment'. However, while the various relevant provisions are exhaustively set out over the following six pages, there is no explicit landscape response provided to each relevant to the landscape aspects of the Project. TTatM states that the *"...purpose of reviewing the provisions is to frame the landscape assessment in a way that best assists the decision maker..."* and *"...not to undertake a planning assessment of the proposal against the provisions."*² As such the approach used in the LEA is sound and the following assessment and conclusions respond indirectly to the statutory context. By dint of including the various provisions in the LEA provides a level of comfort that the assessment has been appropriately framed. This is evident in places where occasional reference is made to some of the aforementioned statutory matters. As such, it is taken here that while an exhaustive 'blow by blow' response to each statutory provision is not included, or required, the guidance and expectations of the relevant provisions has been accounted for while undertaking the natural character and landscape effects assessment.

6. Assessment of Effects

Section 5.0 structures an assessment of the effects on natural character, landscape, and the visual realm separately. The LEA correctly states that these procedures are inextricably linked which is consistent with TTatM.

Natural Character and Landscape Effects

There is a certain overlap between natural character and landscape effects and so both are discussed together next.

An environmental 'baseline' is mentioned - which is what all effects must be measured against. This includes the consented baseline, but by the same token, must exclude any existing unconsented

² TTatM pg. 237.

elements in the landscape relevant to the Project. Further, such unconsented items cannot be considered 'expected' and while valid to include in the landscape description, these elements must be disregarded when considering the effects of the Project.

In this case such elements include various ad hoc 'erosion protection works', garden furniture, informal estuary access structures and the like, remaining in situ following recently removed residential development due to the red-zone process³. In this vein the changes proposed, particularly along the shoreline must be assessed in most cases as wholly 'new' built elements, as opposed to replacing or upgrading existing (unconsented) built works - with positive net effects. This is not explicit in the LEA (see third and fourth to last paragraphs, page 27), although it is in the second to last paragraph on page 28. Here, a 'Very low' adverse effect on natural character is assessed at the broad scale balanced against current modification. However, no finding is provided at the site-based scale as it is earlier in the LEA regarding the new bund (a 'Low' adverse effect on natural character is assessed). In the third paragraph, page 31 the existing site condition (including unconsented elements presumably) is considered to reduce the sensitivity to the proposed changes.

The peer review author concludes that the effects of the replacement of unconsented structures with the new improved works have not however been substantively relied upon in the LEA. Instead, localised modification of the local area and site through consented urban development, roading, public paths, consented slipway structures, erosion protection structures and so forth appears to form the weight of the existing baseline environment being relied upon.

This topic has been traversed in further detail through the RFI process and has been addressed in detail by the Applicant. The peer review author covers this in his separate memorandum.

Putting the above to one side, in the opinion of the peer review author, the natural character and landscape effects conclusions are fair and reasonable, when the 'Low-moderate' (minor) temporary construction effects are considered combined with the erosion control structures being introduced into the CMA, both of which will reduce natural character. The loss of coastal vegetation cover albeit being replaced with a greater area of vegetation cover will also decrease natural character temporarily. The effects findings are of course balanced with the long-term improvements to natural character given the various aspects of the Project that are discussed such as ongoing erosion attenuation and increased coastal vegetation cover. It is also of note that the Applicant concludes that any permanent landscape effects following the Project will be 'Very low' adverse, which is fair and reasonable, and in the peer review author's opinion on the conservative side.

In response to the RFIs, a small table has been included in the Applicant's recent memorandum with effects columns including 'during construction', 'post all project construction' and lastly, an overall effects finding 'following project completion (within 5 years)'. Residual effects are between 'Low' and 'Very low' adverse (all 'Less than minor') for both natural character, landscape and visual effects – a finding which is fair and reasonable.

Change over time is mentioned as part of the assessment process. However tidal change which can vary by up to 2.1 m⁴ coupled with storm events are not discussed. Such events would presumably have some bearing on the changes arising from the Project, such as the development of biota on the new works and how tidal / erosional processes are altered / better attenuated for example. This would

³ Jacobs AEE pg. 24 (1.2.1).

⁴ Jacobs AEE pg. 58 (3.4.6.4).

doubtless have significant natural character and landscape benefits. It is assumed that the erosion protection works follow coastal engineering best practice and so an overwhelmingly positive outcome for humans' use of the site and in many instances for flora and fauna too will result compared with the current situation.

It is acknowledged by the peer review author that the permanent erosion protection works will provide a stable and more permanent environment than what currently exists, at least for 20 years. It is also understood that such structures will potentially contribute to 'coastal squeeze' inhibiting the natural landward progression of biota, as sea levels rise for instance, were the site left in a less built state. As such, some natural processes (the movement of biota across the landscape) will be restricted to a point. It is acknowledged that the effects of the proposal, balanced against alternative solutions or a 'do nothing' approach will have likely been covered in detail in others' technical reporting, such as the ecological reporting.

Visual Effects

The LEA correctly states in Appendix 1 that a landscape change or change to a view does not necessarily constitute an adverse landscape effect.

In this Section of the LEA, a 'Low' adverse visual effect finding is concluded in places. It is noted that on the TTatM 7-point scale 'Low' can mean 'less than minor' or 'minor'. The 'Low' adverse effect has been clarified through the Applicant's RFI response as a 'Less than minor' adverse effect.

The visual effects section fleshes out the various potentially affected parties and their locations introduced in Table 1 of the LEA. The level of detail included in Section 5.3 provides a high level of comfort that the LEA author has a thorough understanding of the specifics of the Project, the site, potentially affected parties and their locations, their likely viewpoints and amenity expectations. As such, the effects findings (all adverse to varying degrees) included in this section and summarised in the table on page 39 and in the later response to the RFIs are considered to be fair and reasonable, given the magnitude of the construction effects, the marginal reduction in visibility of the estuary waters for some due to the slightly raised bund, built changes within the CMA, all coupled with a likely increase in public activity within the Project area.

As discussed earlier, existing unconsented (and unsightly) landscape elements occur within the existing baseline but do not appear to have been given special weight in the effects assessment – the correct approach. However, there are several legitimate built elements within the site that do not contribute to visual amenity values especially which *have* been considered as part of the existing baseline environment in the LEA. The response to the RFI has gone to some trouble to set out what these include at the bottom of page 3 such as reno mattresses, stormwater outlets, tidal protection works, rock armouring and so forth which is helpful.

In the third to last paragraph on page 35, a point is made where a cobbled structure is preferred in areas of the shoreline that are less modified, compared with other more modified areas, which are therefore proposed to be treated with a less-natural engineered solution. On the face of it, this raises a question that a key design 'driver' for treatment of the shoreline was how modified the area is currently. Substantive comment has been provided around this point in the Applicant's response to the RFIs where the choice of shoreline treatment is discussed and is clearly based on many factors other than existing levels of modification / condition. This matter is also responded to in the peer review authors separate memorandum. Suffice to say that the question of how the shoreline is treated

and why has been further clarified and the proposed locations for 'cobbled beach' and rock revetment - in absence of others' technical evidence recommending an alternative appears reasonable.

Private residents' views are discussed in the LEA from page 37. This party is numerous and includes the occupants from over seventy dwellings located between Caspian Street and the southern end of the Project. For these parties, views of the Project will be long term and fixed. The LEA concludes that construction effects will be 'Low-moderate' (minor) for these parties other than the occupants of 44a Rocking Horse Road ('44a') where construction effects will be 'Moderate' (more than minor).

These construction effects conclusions are considered to be fair and reasonable given the scale of the works and works methodology described in the AEE.

It is noted that the recent iteration of the design for the Project (see Jacobs Sheet 2005) includes a 200 mm increase in the height of the bund opposite 44a. This height increase is to reduce public views into this property from the shared path. In turn, this will also cause slightly more screening to estuary views for any occupants of 44a, however a 200 mm height increase balanced with improved privacy for this party and the other landscape improvements is not considered substantial enough to alter the effects finding in the author's opinion.

All private residents will doubtless benefit from westward views to and across the estuary now, which the LEA asserts. The Project may alter these views for some – a possibility covered in the LEA. Residual adverse visual effects from within all private dwellings are assessed as 'Very low' which is fair and reasonable. For some there will be a reduction in visual openness due to new planting, reduced visibility of the water due to the slightly higher bund and reduced privacy as more of the public will be seen going past on the upgraded tracks.

It is also of the peer review author's opinion, that for many people living adjacent to the site or visiting, the visual effects following completion of the Project will potentially be positive or at worst 'neutral'. This will be due to the earthworks changes (bund), remediating the shoreline, and an overall increase in vegetation cover, including native coastal plants. In some instances, westwards views to the estuary will be opened up. In other areas there will be improvements to access for land and water-based recreational activity. All these changes are directly associated with the Project's primary goal which is to provide an increased resilience to flood risk. This will directly benefit those living nearby. Most of the changes mentioned above are of course physical ones, however, how these changes appear will be an enduring and, in most instances, (some estuary views will be affected), a welcome reminder of the overall physical improvements to the site.

At Section 5.3.1 'Distant Views' are discussed. The visual effects of the Project regarding distant views are further clarified in the visual effects table in the Applicant's response to the RFI as being 'Low' (construction phase), 'Low' to 'Very low' (post all project completion) and 'Very low' adverse (following completion within 5 years). It of the peer review author's opinion that any changes visible at distance arising from the Project post construction will likely be indiscernible other than possibly the visibility of changes to vegetation. As such, effects are likely to be 'negligible' or perhaps 'positive'. The LEA concludes with a 'Very low' residual adverse effect which allows for the possibility that a less congruous change may be visible, which is a conservative approach and is not disputed.

7. Recommendations

Several recommendations are included in the LEA to ensure that the landscape effects conclusions found in the LEA are not exceeded (worsened). The four recommendations included are brief and indicate aspects forming part of the Project in any case. The point being made is that if the Project specifics are altered then there may be effects implications. Or in other words, the LEA relies on the plans and specifications as they are currently presented. In this vein, the Applicant states in their response to the RFIs that the landscape effects conclusions have not altered following recent changes to the design of the Project.

A recommendation is made where new planting is recommended to be implemented sequentially and in an ongoing manner as construction works complete stage by stage. This is also included in the AEE. Typically planting should occur only during the planting season (1 April – 30 September) which may necessitate some delay following construction works in some instances and was raised in an RFI. The Applicant has provided a satisfactory response to this matter which was helpful and is traversed in the peer review authors separate memorandum. Suffice to say that any risk of plant failure can be adequately addressed through conditions of consent.

The peer review author supports the recommendation in the LEA conclusion whereby occupants of the dwellings facing the Southshore Section are consulted regarding changes to vegetation cover (removal of existing trees and/or the addition of new trees) which may alter their views. It may be possible that the planting design be fine-tuned at detail design stage to accommodate any specific and valued westward views from these parties.



Jeremy Head
Registered NZILA Landscape Architect

19 March 2025

Appendix 1

Jeremy Head: Qualifications and Experience

Jeremy holds the qualifications of Bachelor of Landscape Architecture from Lincoln University (hons) 1993 and is a registered member of the New Zealand Institute of Landscape Architects (since 2000). Prior to 2000, Jeremy was an Associate member of the NZILA.

Jeremy has practised as a Landscape Architect for thirty years in both New Zealand and briefly in the UK. Jeremy has been self-employed since 2006 other than four years spent at WSP (Christchurch) where he held the position of Team Leader (South Island Landscape and Urban Design section).

During the course of his career, Jeremy has been involved in a wide range of work in expert landscape evaluation, assessment, and advice throughout New Zealand, including district wide landscape assessment, landscape assessments for several NoRs and public works for District and Regional Councils and Central Government and for preparing landscape assessments for private developers.

As an independent expert, Jeremy is regularly asked to peer review others' work and prepare and present evidence in hearings.

Jeremy has mentored several landscape architects to achieve registration status in the NZILA.

In November 2017, Jeremy contributed to a full day workshop with four other senior landscape architects as part of a national 'roadshow' with regards to developing an agreed landscape assessment methodology. This was facilitated by the late Environment Court Judge Gordon Whiting and is now borne out in the book: Te Tangi a te Manu Aotearoa - New Zealand Landscape Guidelines which Jeremy regularly relies on.

Appendix 5

Technical Memorandum – Ecology – Shane Orchard

Review of ecological impact assessments for coastal protection structures at Southshore and South New Brighton Park

Prepared by
Shane Orchard

For
Christchurch City Council

January 2024





Report WL240101 for Christchurch City Council
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List of Abbreviations

AEE	Assessment of Ecological Effects
CCC	Christchurch City Council
CRPS	Canterbury Regional Policy Statement
DOC	Department of Conservation
EclA	Ecological Impact Assessment
GNSS	Global Navigation Satellite System
InSAR	Interferometric Synthetic Aperture Radar
LiDAR	Light Detection and Ranging
MfE	Ministry for the Environment
MHWS	Mean High Water Springs
NPS-IB	National Policy Statement for Indigenous Biodiversity
NZCPS	New Zealand Coastal Policy Statement 2010
RCEP	Regional Coastal Environment Plan
RMA	Resource Management Act 1991
RRZ	Residential Red Zone
RSLR	Relative Sea Level Rise
SES	Site of Ecological Significance
SLR	Sea Level Rise
SNBP	South New Brighton Park
UAV	Unmanned Aerial Vehicle
VLM	Vertical Land Motion

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1 Introduction

This report presents the results of a review of environmental assessments for coastal protection structures that are proposed at Southshore and South New Brighton Park in eastern Ōtautahi Christchurch. It responds to a peer review request from Christchurch City Council (CCC) and has a focus on a CCC resource consent application (RMA 2023 3243) and supporting assessments that together describe the proposed structures, associated construction activities, and environmental impacts.

The methods used in preparing this report include a review of the resource consent application and related documents, and other scientific and technical information identified in relevant literature.

Information provided by CCC that was reviewed or otherwise relied upon in forming the conclusions include the following documents and sources:

- Southshore and South New Brighton Park Flood Protection Works Ecological Impact Assessment (Boffa Miskell, 2023).
- Southshore and South New Brighton Park Erosion Protection and Inundation Protection Works Resource Consent Application (Jacobs, 2023).
- Avon-Heathcote Ihutai Estuary Edge Condition Inventory (Jacobs, 2019).
- Coastal Hazard Assessment for Christchurch District (Tonkin & Taylor, 2021), Christchurch District Plan (Christchurch City Council, 2021b), and Christchurch District Plan Proposed Plan Change 12 (Christchurch City Council, 2021a).
- CCC Coastal Adaptation Framework (Christchurch City Council, 2022) and information on Coastal Hazards Adaptation Planning (available from CCC website).
- CCC information on existing consents in the project area and clarification of the new infrastructure status of the proposed project (see section 2.2).

The technical reports and other supporting information in the above list are part of a longstanding programme of work to address effects of the 2010 -2011 Canterbury earthquakes and the management of coastal hazards and climate change.

The project and associated resource consent application involves coastal protection works in two areas on the shoreline of the Avon Heathcote Estuary Ihutai at South New Brighton Park (SNBP) and Southshore. Throughout the documentation (and in the project design) these two areas are considered separately. As a brief summary, the proposal includes:

- Approximately 560 m of coastal erosion protection structures in South New Brighton Park, and 1580 m at Southshore. At South New Brighton Park these structures consist of a mix of gabion baskets and engineered cobble beaches, while at Southshore they consist of a mix of engineered cobble beaches and rock revetments.
- Construction of an impermeable inundation bund landward of the coastal erosion protection structures, with a shared user track located on the crest of the bund in both areas. The alignment of the bund is close to the coastal erosion protection structures at Southshore (mostly following a 5 m setback), and a variable distance (40-180 m) inland at South New Brighton Park.
- Replacement of an existing jetty and viewing platform at Tern Street (Southshore).

The land involved in South New Brighton Park is an existing CCC reserve managed under the Reserves Act 1977. In Southshore most of the land involved and the adjacent area is Residential Red Zone (RRZ) land that was acquired by central government under earthquake recovery legislation. In 2023 this RRZ land was transferred from central government to CCC, and the council is now progressing plans for its future use and management. At the same time, CCC is progressing a wider programme of work on the management of coastal hazards that includes the development of a proposed plan change to the Christchurch District Plan (Plan Change 12) and a commitment to work with affected communities in its Coastal Hazards Adaptation Planning Programme which has a focus on coastal hazards and climate change. The coastal protection proposals that are reviewed here contribute to this wider hazard management context.

The technical elements of this review include comments on conservation ecology, impacts and risk assessment. Only limited suggestions on recommended changes to the project design are made since these involve additional considerations such as engineering feasibility and community preferences. Instead, the focus of the review is to provide advice to CCC on resource consent matters, and it is assumed that CCC would obtain additional advice to address any implications for project design options or additional information requirements. Although a few typographical errors were noted in the material that was reviewed these are generally not noted unless they affected a topic requiring clarification.

2 General comments

2.1 Overview of consent application

The CCC consent application and overall Assessment of Environmental Effects (AEE) for the project provides a summary of the proposal (Jacobs, 2023). The AEE was informed by several design and consultation processes and supporting technical assessments. One of these is the Ecological Impact Assessment (EclA) which presents the results from a range of ecological studies and considerations (Boffa Miskell 2023).

The technical investigations that contribute to the EclA are organised around the following four key topics:

- Terrestrial vegetation and habitats
- Estuarine species and habitats
- Herpetofauna
- Avifauna

2.2 Characterisation of ecological values

The methodologies that were employed to characterise the ecological values of the project area are briefly summarised as follows:

- The terrestrial vegetation and habitat investigations considered indigenous vegetation and habitats of terrestrial fauna and terrestrial species in terrestrial areas, inland salt meadow wetlands, and estuarine saltmarsh wetlands. The methods used included a desktop review, vegetation mapping from UAV (drone) imagery, a walkthrough site survey, and vegetation plot measurements to assess areas of saltmeadow at Southshore.
- The estuarine species / benthic investigations included a desktop review and site investigations based on transects at approximately even spacings (100 m at SNBP, 120 m at Southshore) oriented perpendicular to the shoreline. Seagrass (*Zostera muelleri*) was mapped using a hand-held GPS to delineate the patches.
- The herpetofauna investigations included a range of field survey methods that were used to detect and capture lizards including direct searches of the project site and the use of a baited trapping programme.
- The avifauna investigations included a desktop review, a nesting / roosting tree survey, five-minute bird counts for terrestrial bird species conducted at 16 pre-determined locations spaced approximately 200 m apart, and six fortnightly counts of coastal birds with each of four pre-determined zones.

Although most of these methods are generally appropriate, a few shortcomings were noted in relation to the vegetation assessments. For these, the field survey approach followed the methodology of Atkinson (1985), as has been used in other studies in the area. However, in the vegetation mapping and evaluation steps the units considered have been aggregated into a relatively small number of vegetation types. This simplified set of vegetation types forms the basis for the assessment of effects and leads to some effects being obscured. The implications are detailed further in the following sections.

The characterisation of estuarine / benthic species and habitats, herpetofauna, and avifauna, generally follows established methods that seem well matched to the study objectives. The conclusions drawn from these studies are considered to be well founded and include the identification of assumptions and limitations as is appropriate.

2.3 Scope of impact assessment

In addition to review comments on the vegetation assessment (see section 4.2.1), and proposed biodiversity offset (section 5.1.4), the lack of a climate change impact assessment for the natural environment was noted. Such an assessment is required under Policies 25 and 27 of the New Zealand Coastal Policy Statement 2010 (NZCPS) for new, infrastructure, subdivision, use, or development of land in areas potentially affected by coastal hazards over at least the next 100 years (Department of Conservation, 2010).

The operative Christchurch District Plan (Christchurch City Council, 2021b), Proposed Plan Change 12 (Christchurch City Council, 2021a), and the most recent coastal hazards assessment (Tonkin & Taylor, 2021) all indicate that the project site is located within an area that is exposed to coastal hazards within a 100 year period. This indicates that NZCPS policies 25 and 27 are directly applicable, and NZCPS policy 26 is also relevant in relation to principles for project design.

NZCPS policies 25, 26, and 27 are as follows:

Policy 25: Subdivision, use, and development in areas of coastal hazard risk

In areas potentially affected by coastal hazards over at least the next 100 years:

- a. avoid increasing the risk of social, environmental and economic harm from coastal hazards;*
- b. avoid redevelopment, or change in land use, that would increase the risk of adverse effects from coastal hazards;*
- c. encourage redevelopment, or change in land use, where that would reduce the risk of adverse effects from coastal hazards, including managed retreat by relocation or removal of existing structures or their abandonment in extreme circumstances, and designing for relocatability or recoverability from hazard events;*
- d. encourage the location of infrastructure away from areas of hazard risk where practicable;*
- e. discourage hard protection structures and promote the use of alternatives to them, including natural defences; and*
- f. consider the potential effects of tsunami and how to avoid or mitigate them.*

Policy 26: Natural defences against coastal hazards

1. Provide where appropriate for the protection, restoration or enhancement of natural defences that protect coastal land uses, or sites of significant biodiversity, cultural or historic heritage or geological value, from coastal hazards.
2. Recognise that such natural defences include beaches, estuaries, wetlands, intertidal areas, coastal vegetation, dunes and barrier islands.

Policy 27: Strategies for protecting significant existing development from coastal hazard risk.

1. In areas of significant existing development likely to be affected by coastal hazards, the range of options for reducing coastal hazard risk that should be assessed includes:
 - a. promoting and identifying long-term sustainable risk reduction approaches including the relocation or removal of existing development or structures at risk;
 - b. identifying the consequences of potential strategic options relative to the option of “do-nothing”;
 - c. recognising that hard protection structures may be the only practical means to protect existing infrastructure of national or regional importance, to sustain the potential of built physical resources to meet the reasonably foreseeable needs of future generations;
 - d. recognising and considering the environmental and social costs of permitting hard protection structures to protect private property; and
 - e. identifying and planning for transition mechanisms and timeframes for moving to more sustainable approaches.
2. In evaluating options under (1):
 - a. focus on approaches to risk management that reduce the need for hard protection structures and similar engineering interventions;
 - b. take into account the nature of the coastal hazard risk and how it might change over at least a 100-year timeframe, including the expected effects of climate change; and
 - c. evaluate the likely costs and benefits of any proposed coastal hazard risk reduction options.
3. Where hard protection structures are considered to be necessary, ensure that the form and location of any structures are designed to minimise adverse effects on the coastal environment.
4. Hard protection structures, where considered necessary to protect private assets, should not be located on public land if there is no significant public or environmental benefit in doing so.

Currently the AEE states that “the expected physical lifetime of the structures will be longer than 20 years, with increased maintenance repairs, and adaptation likely to be required to maintain the structures after this timeframe. There is no allowance in the project design for increased water levels due to sea level rise, or other climate change factors ...” (Appendix I. Coastal Processes and Natural Hazards Assessment, p.6).

This omission is largely carried through into the Ecological Impact Assessment. However, it was noted that the topic of coastal squeeze from rising sea levels was briefly considered in relation to two small sections of shoreline that were characterised as having a lack of protective structures in place prior to the earthquake (approx. 170 m at SNBP where new areas of seabed have developed behind damaged reno mattresses, and approx. 90 m of estuary edge bordering saltmarsh habitat at Penguin Street). This interpretation and the associated assessments indicate that the engineering works have been accorded the same activity status as the maintenance of existing structures across the remainder of the project site (a total length of shoreline of 1880 m).

Since this interpretation might explain the absence of climate change impact considerations in the AEE and EclA, it was necessary to clarify with Council whether the proposed structures were regarded as new infrastructure or the maintenance of existing infrastructure.

Advice received from CCC in response to this question (H. Blair, pers. comm.) included:

For the purpose of the CCC land use consent, our preapplication advice was as follows:

We would consider the structures (other than those covered by resource consents) to be 'new' for the purpose of any rule in the District Plan that distinguishes between new and existing structures, as lawful establishment hasn't been proven.

Post-earthquake CCC consents include:

- *RMA/2015/845 aka RMA92029082 boat ramp and associated gabion baskets for Pleasant Point Yacht club*
- *RMA/2018/1183 retrospectively approved a mitigation bund for South New Brighton Park*
- *RMA/2019/134 flood mitigation works in Southshore, Jellicoe Marsh and road end.*
- *RMA/2020/246 approved a bund south of bridge street within Bridge Reserve and South New Brighton Park*

In light of this clarification, it is clear that NZCPS policies 25, 26 and 27 will apply to this project.

Policy 25 is particularly relevant due to its focus on avoiding increasing the risk of social, environmental and economic harm from coastal hazards. For a project to demonstrate that it can avoid increasing these, risks they must be specifically assessed. This is the focus of Policy 27 which sets out requirements for such assessments and associated management strategies. The provision of such an assessment (referred to here as a 'climate change impact assessment') is therefore a key recommendation of this review. Its role is to ensure that the relevant effects are identified and considered in the design process as is the intention of these NZCPS policies.

The above matters also relevant to the implementation of Policy 4 of the National Policy Statement for Indigenous Biodiversity (NPS-IB) (Ministry for the Environment, 2023), as follows:

Policy 4: Indigenous biodiversity is managed to promote resilience to the effects of climate change.

In the supporting material provided in Section 3.6 (Resilience to climate change) the NPS-IB states:

- (1) *Local authorities must promote the resilience of indigenous biodiversity to climate change, including at least by:*
 - (a) *allowing and supporting the natural adjustment of habitats and ecosystems to the changing climate; and*
 - (b) *considering the effects of climate change when making decisions on:*
 - (i) *restoration proposals; and*
 - (ii) *managing and reducing new and existing biosecurity risks; and*
 - (c) *maintaining and promoting the enhancement of the connectivity between ecosystems, and between existing and potential habitats, to enable migrations so that species can continue to find viable niches as the climate changes.*
- (2) *Local authorities must recognise the role of indigenous biodiversity in mitigating the effects of climate change.*

Addressing these aspects of the project design and AEE will help to manage coastal hazards and climate risk across all of the relevant considerations, and can help to identify nature-based solutions such as the restoration of natural ecosystems with coastal protection functions (Orchard & Schiel, 2021). It was noted that the AEE recognised these potential benefits in relation to areas of saltmarsh in the project area (AEE Appendix 1. Coastal Processes and Natural Hazards Assessment, p.27), but this depends on their continued presence in a changing climate. In this case, the scope of considerations for indigenous biodiversity include potential effects on ecosystem types such as saltmarsh, and specific habitat types such as high tide roosting grounds for avifauna, which were previously affected by relative sea level rise (RSLR) caused by the Canterbury earthquakes (Orchard et al., 2020a). There are also some additional considerations that affect the rate of RSLR, as discussed in the following section.

2.4 Implications of recent subsidence

The NZCPS requirement to assess climate risks for a minimum of 100 years has an interaction with observed subsidence in the project area. This was identified and discussed in the AEE in relation to earthquake effects in the project area (Appendix I. Coastal Processes and Natural Hazards Assessment, p. 32-34). LiDAR analyses show that the initial (co- seismic) subsidence mostly affected SNBP (particularly the northern portion near Bridge Street) and Southshore ground surface elevations showed little change at the shoreline over this period 2008 - 2015. Subsequently, however, post-seismic subsidence has occurred across the entire area. This effect was first detected in 2019 using GNSS surveys of ground surface elevations around the estuary (Figure 1) (Orchard et al., 2020b). These observations have since been confirmed in a recent study using InSAR (satellite) data which reported subsidence of ~5mm/ yr in the wider eastern Christchurch area since November 2016, and up to ~8–9 mm/ yr in South New Brighton and Southshore (which are subsiding at a faster rate than other areas) (Hamling & Kearse, 2023).

At present it is not clear how the project design and AEE has addressed the implications of this vertical land movement, but it has a direct effect on relative sea levels and therefore interacts with eustatic (global) sea level rise as an important component of coastal hazard risk, e.g., in relation to flooding and erosion.

The AEE notes that “as a design principle, SLR or vertical land movement has not been included in the design water levels” (Coastal Processes and Natural Hazards Assessment, p.27). Similarly, the effects of these processes have not been addressed in the supporting assessments. For example, the recent estuary edge erosion was considered to be “primarily driven by overtopping of the shoreline structures, causing back scour behind the damaged protection structures, and eroding the natural sand and placed topsoil material located behind the structures” (AEE Appendix 1. Coastal Processes and Natural Hazards Assessment, p.27). The post-earthquake subsidence was not mentioned in relation to this topic, but it is likely to have been a key contributor to the overtopping events and erosion processes.

At present, the factors contributing to this observed subsidence remain unknown and this makes it difficult to estimate the future rate of vertical land motion (VLM) in this area. However, it is highlighted here due to its effect on relative sea levels which are a central consideration, and it would ideally be addressed in the climate change impact assessment.

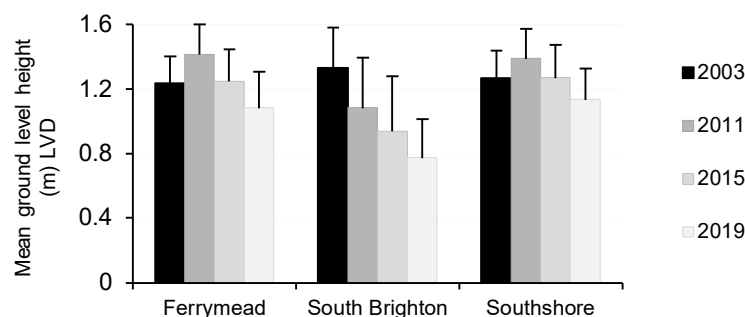


Figure 1. Changes in ground levels within the footprint of pre-earthquake intertidal vegetation at three localities within the Avon Heathcote Estuary Ihutai over the period 2003–2019. LVD = Lyttelton Vertical Datum. Source: Orchard et al. (2020b).

2.5 Specific comments

Following sections provide specific comments from the review of sections 3, 7 and 8 of the Ecological Impact Assessment which together describe the ecological values, assessment of ecological effects, and the impact management measures / additional mitigation steps that were identified. To assist with cross-referencing these comments are set out using the same sub-section titles as used in these sections of the EclA report (Boffa Miskell, 2023).

3 Ecological values

The following comments are set out using the same sub-section titles as used in section 3 of the Ecological Impact Assessment (Boffa Miskell, 2023).

3.1 Terrestrial vegetation and habitats

3.1.1 Ecological context

Throughout the EclA there is a substantial a focus on protecting indigenous vegetation (which is appropriate). However, there are other relevant priorities such as those identified in the Canterbury Biodiversity Strategy (Canterbury Biodiversity Strategy Partners, 2008). These include:

- Protecting the remaining significant indigenous habitats and ecosystems, and maintenance of linkages between indigenous habitats. The Strategy (p. 26) notes that this fundamental to preventing further loss of biodiversity.
- The restoration of representative habitats and ecosystems that have been lost or degraded, particularly in those areas where the greatest degree of loss has already occurred. The Strategy (p. 26) notes that without restoration, indigenous habitat within many parts of the region will remain well below the critical 20% threshold, and indigenous biodiversity will remain seriously threatened and vulnerable to further decline.

Attention to habitats and ecosystems can differ from the emphasis on protecting indigenous vegetation that is apparent in the EclA (p. 23-24). This difference becomes important when it comes to managing adverse impacts on values and areas that are defined by habitat and ecosystem types. In some cases, the existing vegetation within these types may be in a successional stage (e.g., recolonising or recovering from earthquake effects), or degraded (e.g., by exotic invasive species). In these situation, vegetation assessments alone are unlikely to account for the values of the area.

3.1.2 Vegetation types and ecological value

In the maps used to support the EclA, the vegetation types (and their associated areas) are characterised according to the following five classes:

- Exotic grassland / herbfield
- Exotic herb cobblefield / 'sparsely vegetated backshore
- Saltmarsh ribbonwood / marram grass grassland
- Saltmarsh herbfield ('saltmeadow')
- Saltmarsh rushland

This approach differs somewhat from previous approaches used at Ihutai and generally reflects a degree of aggregation of the more detailed classes found in classifications such as Grove et al. (2012). More detailed classifications have been used in previous assessments of vegetation and vegetation change in the project area (e.g., Grove et al. 2012; Orchard 2020; Orchard et al. 2020a), and are generally more suitable for the purposes of impact assessment. At the same time, it is recognised that decisions must be made on the level of detail that is recorded. For these purposes the 'vegetation type' class of Grove et al. (2012) is considered to be the most appropriate (noting that this is considerably less detailed than the 'vegetation composition' class and represents an intermediate level of detail).

The five vegetation types used in the EclA present a few difficulties that include the following considerations:

Exotic herb cobblefield:

- The wetland vegetation types mapped by Grove et al. (2012) recognise stonefields and various herbfield types, but no specific combinations that match the description 'exotic herb cobblefield'. Walkthrough surveys completed on 19th and 22nd January 2024 found that vegetation matching this description is not particularly evident at South New Brighton Park. However, there is some vegetation becoming established among the stones of gabion baskets or reno mattresses, including one example of NZ iceplant. There is also a considerable area between the line of the old (slumped) reno mattresses and the current erosion scarp that meets the description of a sparsely vegetated saltmarsh herbfield that is establishing at favourable tidal heights in this newly exposed area. The vegetation is currently sparse here, but it includes patches of typical saltmarsh herbfield species such as sea blite and orache. The substrates are a mixture of mud, sand and crushed shell in addition to some gravel deposits that are likely to have originated from aggregate that has eroded from sections of walkway. There are also signs of benthic estuarine species (e.g., mud crabs) moving into this area showing that a natural ecosystem shift has occurred. This newly eroded area is expanding in size and currently occurs along most of the South New Brighton Park shoreline within the project site where it ranges from 1 to more than 10 m in width at present. It is noted that this area has an overlap with the reclamation area that has been correctly identified in the project design details (EclA, p. 89, Figure 44). For this calculation, the area that has already eroded was regarded as already having reverted to estuary bed, and an area of declamation was calculated to reflect the additional land that would be returned to the estuary with implementation of the project. These areas are correctly identified.
- In Southshore, there are several areas of existing cobble beach that mostly reflect deposits of stone and gravel fill that have found their way to the shoreline. The vegetation type of 'exotic cobble beach' is applicable to most of these areas although there are also some indigenous species present (i.e., 'sparsely vegetated cobblefield').

Saltmarsh ribbonwood / marram grass grassland:

- This is an unlikely combination that mixes two structural classes (grassland and shrubland). Marram areas generally represent dune systems that have been invaded and modified from their original indigenous vegetation. Although saltmarsh ribbonwood can tolerate relatively dry positions such as riverbanks, it typically occurs with wetland associates. For example, Grove et al. (2012) identified nine examples in their classification of vegetation composition groups for saltmarsh ribbonwood shrubland. It is recommended that these vegetation types are separated and assessed as two separate classes.

3.2 Estuarine species and habitats

These aspects appear to be well researched within the scope of the investigations that were reported. It is noted that they mainly concern benthic species rather than wider 'estuarine' species and habitats (i.e., 'estuarine benthic species and habitats').

3.3 Herpetofauna

These aspects appear to be well researched within the scope of the investigations that were reported.

3.4 Avifauna

These aspects appear to be well researched within the scope of the investigations that were reported.

3.5 Summary of ecological values

This summary should be read in conjunction with the site significance information. The vegetation assessment considerations discussed above will affect the appropriate ratings for the four significance criteria that are considered.

3.6 Site significance

This is a useful summary of the ecological significance considerations while noting that it could be better linked to the ecological values summary section (as above).

Under criterion 7 (Diversity and pattern), Southshore would likely meet the Canterbury Regional Policy Statement (CRPS) Appendix 3 criteria as well as the National Policy Statement for Indigenous Biodiversity (NPS-IB) Appendix 1 criteria, as identified. This is due to the consideration of 'changes in species composition reflecting the existence of ecological gradients' under the CRPS, which is similar to the 'presence of indigenous ecotones, complete or partial gradients or sequences' consideration in the NPS-IB.

From the field data, the EclA concluded that the examples of an ecotone of estuarine to terrestrial indigenous habitats are limited in extent due to much of the terrestrial habitat being low in indigenous species' diversity at Southshore. However, the assessment also identified transitions to saltmeadow above Mean High Water Springs (MHWS) as areas that would qualify as an indigenous ecotone (which is appropriate). These areas, at least, are significant under these criteria. They represent sites that are reverting to more natural vegetation typical of an estuarine shoreline gradient following the change in land use that was associated with the red zoning decision. It is also noted that these aspects illustrate some of the difficulties of conducting a significance assessment in this recovering environment context where biodiversity and other ecosystem components are in a state of transition at the time of the assessment.

4 Assessment of ecological effects

The following comments are set out using the same sub-section titles as used in section 7 of the Ecological Impact Assessment report (Boffa Miskell, 2023).

4.1 Project impact management measures

This is a useful summary of project design measures that contribute to the project description.

4.2 Terrestrial vegetation and habitats

As a general comment on this section, it was also noted that the concluding statements (often the last sentence) in each sub-section are a little inconsistent. Some refer to the residual impact expected after mitigation (which belongs in Section 8), instead of a summary of the required mitigation, which is more consistent with the topic of Section 7.

4.2.1 Vegetation clearance

4.2.1.1 Loss of exotic grassland / herbfield at SNBP and in RRZ

In this case, the relatively broad habitat preferences of southern grass skinks in relation to the proposed mix of changes to vegetation and substrates are important aspects of the assessment. The conclusions seem reasonable in light of the information presented in the herpetofauna assessment.

4.2.1.2 Loss of exotic forest / treeland at SNBP

Assessment is well explained and supported. No issues were identified.

4.2.1.3 Loss of exotic herb cobblefield on backshore

Assessment is well explained and supported. No issues were identified.

4.2.1.4 Loss of saltmarsh ribbonwood / marram grass grassland at south end of project site at Southshore

The assessment correctly finds that the loss of up to 0.34 ha of this vegetation type would require mitigation due to its status as a Site of Ecological Significance (SES) in the District Plan. As previously noted, however, it is recommended that these vegetation types are assessed separately (see section 3.1.2). From an ecosystem standpoint, the marram areas represent a modified sand dune ecosystem and the saltmarsh ribbonwood is more associated with wetlands (and in this case it is also not a major component of the impacted area) (Figure 2).

In considering these aspects, it was noted that the landscape concept plans that are included in the AEE documents (Jacobs 2023) do not specifically identify areas to remedy the loss of these vegetation types (but could do). This is considered to offer a pragmatic option for addressing these losses since there appears to be sufficient land available in close proximity to the impact site (i.e., after construction works have been completed). To provide for this solution, it is recommended that further information is included in this section of the EclA to this effect, and suitable amendments made to the landscape plan. There are opportunities to restore indigenous dune vegetation in this area that could be explored as a remedy for the loss of marram-dominated dune habitat.



Figure 2. Google Earth view of marram-dominated duneland in the area that would be impacted by the project footprint at the southern end of the project site. The underlying landform represents old dunes that are an extension of the more prominent dune system at the distal end of Southshore Spit. Note the flatter dune swale area behind that is also a natural component of the sandspit landform (although in the case it has been largely modified into parkland).

[4.2.1.5 Loss of saltmarsh below revetment / cobble beach at Southshore](#)

Assessment is well explained and supported. No particular issues.

[4.2.1.6 Loss of saltmeadow above existing estuary edge at Southshore](#)

Assessment is well explained and supported. No particular issues.

[4.2.2 Indirect effects](#)

These sections are well explained and supported. No particular issues.

[4.3 Estuarine species and habitats](#)

[4.3.1 Construction effects](#)

[4.3.1.1 Loss and creation of mudflat habitat](#)

This section is well explained and supported. No particular issues.

[4.3.1.2 Loss and creation of hard-bottom habitat](#)

No particular issues were noted, although the summary of effects could more simply highlight the overall positive effect of increased hard bottom habitat.

[4.3.1.3 Permanent modification \(shading\) of mudflat and hard-bottom habitat](#)

No particular issues due to the small magnitude of expected changes.

[4.3.1.4 Mudflat habitat disturbance](#)

This section is well explained and supported. No particular issues.

4.3.1.5 Seagrass habitat disturbance

Given that similar substrate conditions are proposed to be reestablished following excavation works, it is reasonable to assume that an equivalent vegetation type will be able to reestablish in the area afterwards in this environment. However, this assumption must be confirmed by monitoring to determine whether seagrass has been able to recolonize in the area disturbed by the project in order to implement Policy 11(a) of the NZCPS (i.e., adverse effects of activities on Threatened and At Risk indigenous taxa must be avoided). This would be appropriate for implementation as a consent condition.

4.3.1.6 Mortality of estuarine organisms

This section is well explained and supported. No particular issues.

4.3.1.7 Resuspension of benthic sediments and contaminants

This section is well explained and is generally supported. A pragmatic approach is proposed that is consistent with accepted practices.

4.3.1.8 Runoff of terrestrial sediment and contaminants

This section is well explained and is generally supported. A pragmatic approach is proposed that is consistent with accepted practices.

4.3.1.9 Noise and vibration

The potential effects of noise and vibration were not specifically assessed in this review, but the approach taken seems consistent with accepted practices.

4.3.2 Post-construction effects

4.3.2.1 Estuary bed lowering

This section is well explained and the conclusions are generally supported.

4.3.2.2 Movement of cobble beach material

The assessment provided in this section is a little convoluted. The main principles are:

- the cobble beach material could be disturbed in an extreme event (e.g., associated with strong southwest winds that can generate waves and locally raised water levels across the fetch of the estuary), and
- the effects of this could include the movement of cobbles into the saltmarsh habitat where they have the potential to have adverse impacts on the vegetation.

The assessment correctly identifies this as a risk that requires mitigation. This is addressed in a proposed consent condition for cobble management and monitoring (EcIA, section 8.1.2.2) and seems appropriate.

4.3.2.3 Increased access to the estuary bed

It is good to see access changes identified and considered within the scope of the EclA. The range of potential effects could include those identified in the EclA (trampling, harvesting of estuarine organisms and littering) and others such as disturbance to avifauna at critical times. As the potential magnitude of these effects is difficult to forecast, it is recommended that they are the subject of specific monitoring (in addition to the other impact management measures proposed in section 8.1.3 of the EclA).

4.3.2.4 Coastal squeeze

This is a more complex topic that has not been appropriately addressed in the assessment. As noted previously, there are statutory requirements to consider and address the coastal squeeze effects of new infrastructure proposals in this location. A misinterpretation of the statutory context appears to have contributed to the omission of these aspects that is also evident in the project design documentation and other assessments included in the AEE (Jacobs 2023). This context may have been complicated by the stated scope of the project having a focus on reinstatement of pre-earthquake conditions that were framed as a 'level of service' in relation to coastal flooding and erosion (Jacobs 2023).

The statements made on the magnitude of coastal squeeze effects being negligible (EclA, p. 109) are incorrect, but it is noted that this primarily results from the limited scope of the assessment. It is recommended that further information is obtained to address the coastal squeeze aspects of the proposal using appropriate methodologies. To meet the statutory requirements, this assessment needs to consider areas potentially affected by coastal hazards over at least the next 100 years:

4.3.3 Cumulative effects

No particular issues were noted.

4.4 Herpetofauna

The potential impacts on herpetofauna appear to have been comprehensively covered in the lizard survey and analysis provided by Dr Tocher. A combination of construction phase and longer-term management measures are included. No particular issues were noted.

4.5 Avifauna

The following section provides only brief notes on the avifauna assessments for which a more specialist review is being prepared by Mr Andrew Crossland (CCC). The points highlighted here related mostly to spatial ecology aspects.

Overall, the potential impacts on avifauna were assessed using standard observational methods and the compilation of existing data from a considerable body of previous work on avifauna at Ihutai (e.g., Crossland 2010, 2013, 2014, 2020). Limitations of the field surveys in relation to spatiotemporal variability (e.g., seasonal patterns) were noted in the EclA, and these partly reflect constraints on the level of survey effort that was available to support the project. Please refer to Mr Andrew Crossland's review for more specific information on the appropriate level of survey effort. In general, this needs to address the degree of spatiotemporal variability that is known (or expected) to be important, and in this case these aspects are informed by previous studies.

In relation to the assessment of direct habitat loss, there are some omissions due to the need to consider these aspects in relation to the potential impacts of coastal squeeze on avifauna, as highlighted above (section 4.3.2.4). Currently this is not considered within the scope of the EclA.

In relation to the consideration of disturbance effects, the potential effects of increased access should include attention to effects on avifauna (see comments above in section 4.3.2.3).

In relation to the topic of cumulative effects, the habitat loss associated with the removal of estuary edge trees is not just a cumulative effect for the purposes of the impact assessment (i.e., it is a direct effect). However, the proposed removal of trees does contribute to the cumulative loss of trees in the area through other processes (particularly since the earthquake). The potential impact of tree removal on bird species is considered to be an important finding, and its implications could be more specifically addressed in the proposed impact management measures. From a practical standpoint, they can be largely addressed in the choice and location of new trees to be established as detailed in the landscape plans (Jacobs 2023). Although the quantities and planting locations of individual species are not shown in those details, it may be important to ensure that tall trees are re-established in this area, especially near the water's edge where tall trees may help to replace lost roosting sites (as was noted in the avifauna assessment).

4.6 Summary of assessment

The summary provided in Table 27 is a little out of place here. It would be better to be presented after the impact management measures have been described (i.e., in section 8) for the matters requiring mitigation (which is the focus of section 7).

5 Impact management measures

The following comments are set out using the same sub-section titles as used in section 8 of the Ecological Impact Assessment report (Boffa Miskell, 2023).

5.1.1 Avoid

For seagrass and saltmarsh vegetation / ecosystem types that are vulnerable to coastal squeeze, the project impacts and impact management measures would need to be revised following completion of a climate change impact assessment.

5.1.2 Remedy

5.1.2.1 Construction effects

Regarding seagrass and saltmarsh vegetation / ecosystem types that are vulnerable to coastal squeeze, there may be some revision needed to address construction phase effects following completion of a climate change impact assessment.

For saltmarsh ribbonwood / marram grass grassland habitat:

The provisions for saltmarsh ribbonwood are appropriate. Additional impact mitigation measures that specifically address the marram-dominated dune habitat are recommended, as discussed above (see section 4.2.1.4).

5.1.2.2 Post-construction effects

As above regarding the potential impacts of coastal squeeze. See notes below in section 5.1.4 regarding additional 'remedy' opportunities.

For reworking of cobble beach material by natural hazard events and coastal processes:

The suggested package of measures is well designed for detecting and attending to potential issues.

5.1.3 Mitigate

These measures and their rationale seem appropriate.

5.1.4 Offsetting

Although the potential need for biodiversity offsetting should be revisited following with the investigation of have climate change impacts, a fundamental flaw in the proposed biodiversity offset was noted. This concerns the offset site which is an existing protected area (i.e., a SES under the Christchurch District Plan, and a naturally rare ecosystem following Williams et al. (2007)). This aspect has been overlooked in the offset plan which fails to consider the conservation status and ecological values of the proposed offset site. This is reflected in the offset calculations that were prepared using the method of Maseyk et al. (2015), in which the existing value of the offset site is recorded as zero.

The proposed offset site is part of the dune ecosystem that is associated with Te Karoro Karoro / Southshore Spit (Figure 3a). Grove (2005) noted that semi-natural dune systems persist at Southshore Spit and that they still have considerable value as wildlife habitat despite the dominance of exotic vegetation. They are also the focus of restoration efforts such as planting with more natural vegetation types even though the elimination of marram is not practically feasible over the large areas that are involved (Figure 3b).

Although the current vegetation at the offset site is highly modified, it is clear that the underlying ecosystem type is protected. As such it cannot be converted into another ecosystem type through structural (e.g., hydrological) and vegetation-oriented changes, as is the focus of the offset proposal. **This would be contrary to many biodiversity conservation principles. Instead,** any restoration activities at this site should endeavour to restore a more indigenous dune ecosystem (and indeed this would be highly consistent with many statutory policies and objectives). This example shows some of the pitfalls inherent in biodiversity offsetting and highlights the essential need for robust approaches that can adhere to all of the relevant principles.

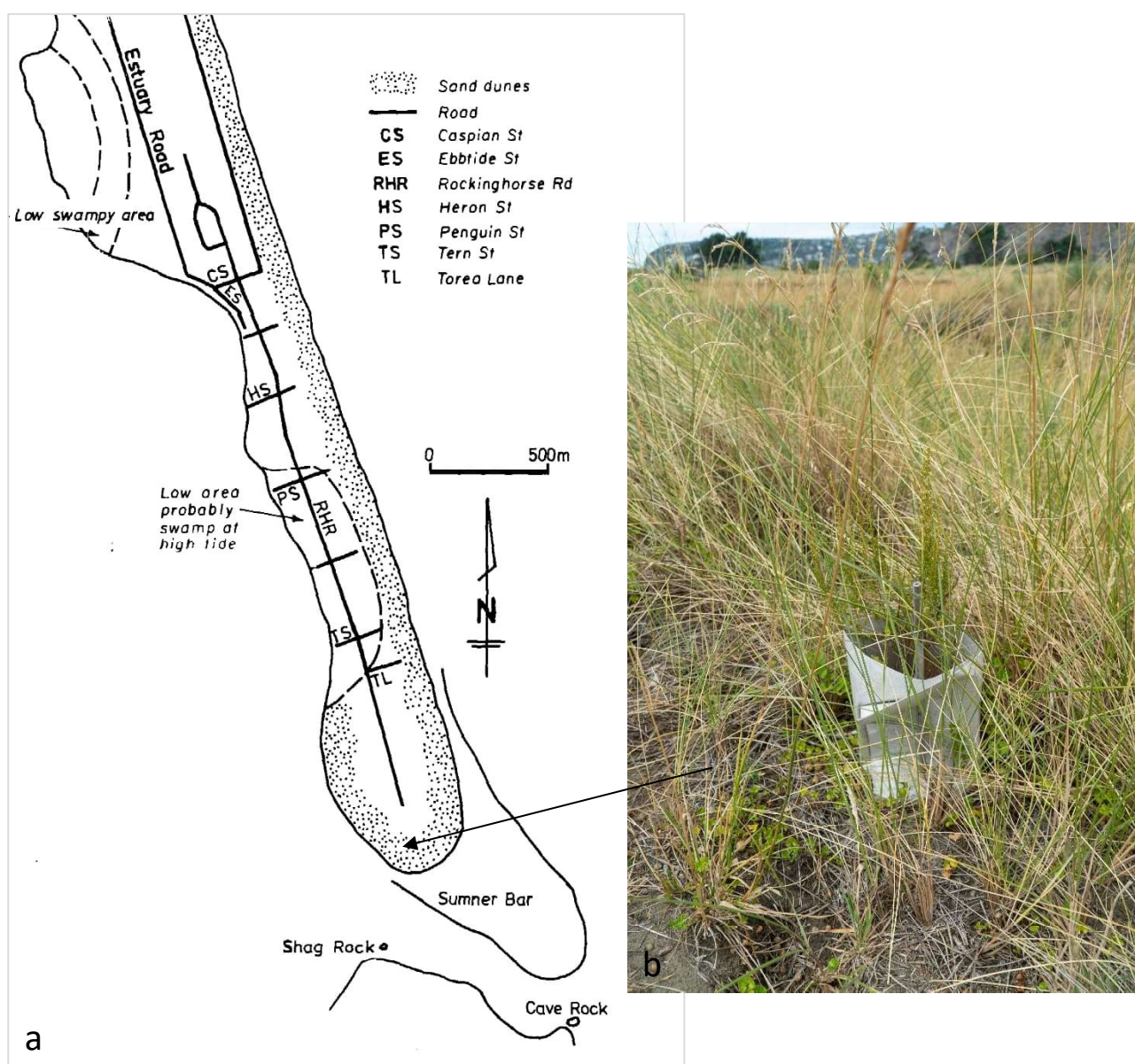


Figure 3. Sand dune ecosystem on Te Karoro Karoro / Southshore Spit. a) Overview of Southshore Spit in the 1920s with roads built after 1947 added for reference. Adapted from Findlay & Kirk (1988). b) Present-day dune restoration plantings with tauhinu at Southshore Spit near the proposed offset site.

Formal requirements of offsetting

In the recent past there have been some management experiments undertaken at Southshore Spit Reserve to establish areas of saltmarsh through re-contouring. In considered these developments, this review has concluded that there is nothing especially problematic with such informal management experiments due to their temporary and informative nature. However, it is doubtful if they should be extended to formal management arrangements to offset biodiversity losses from other areas under the auspices of the RMA. In this case, part of the reason for keeping such interventions 'informal' lies in the recognition that their spatial footprint may be required to accommodate the shifting nature of dune ecosystems in the coming years. If so, informal activities can simply yield ground to the natural dynamics. In contrast, the formal management of a biodiversity offset must provide enduring maintenance of the values that have been offset (Ministry for the Environment, 2023). In this case, a consideration of the natural dynamics of this area shows that the proposed offset site lies within the envelope of shoreline movement over just past few decades (Figure 5).

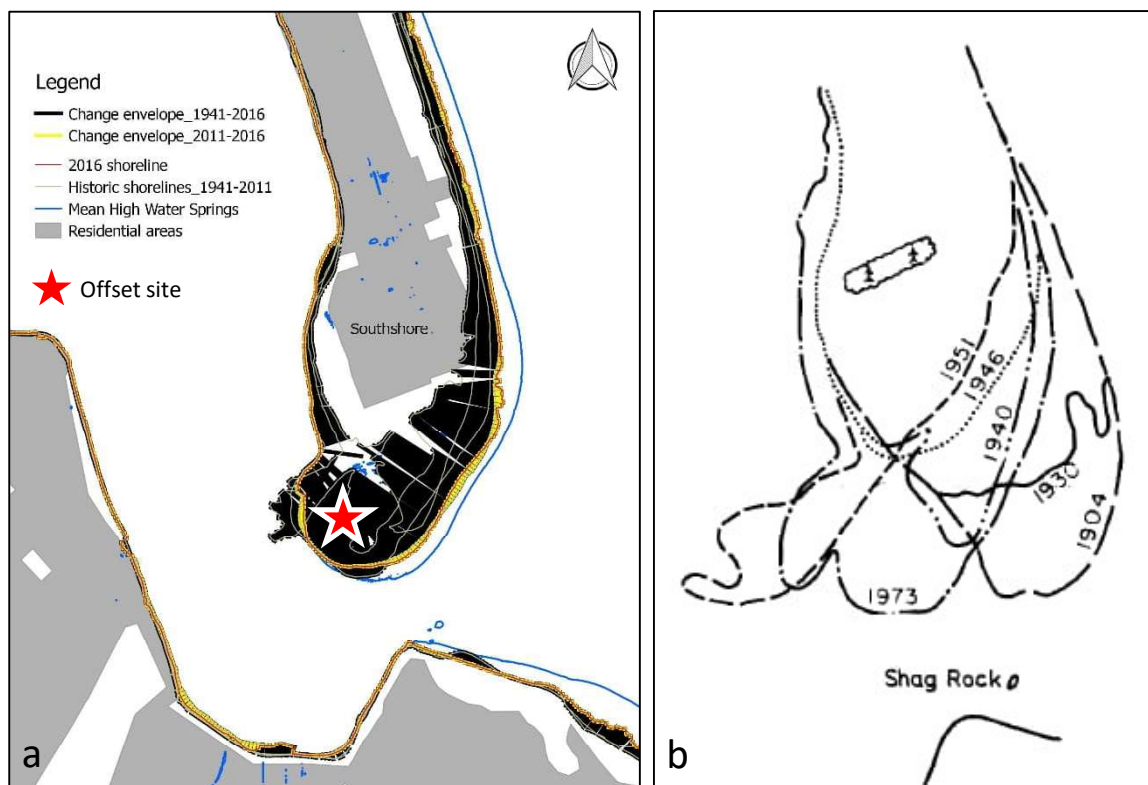


Figure 4. Natural dynamics of Te Karoro Karoro / Southshore Spit. a) Envelope of shoreline change between 1941 and 2016 as calculated on shore-perpendicular transects at 10 m spacings (S. Orchard, unpublished data). b) Shoreline changes between 1904 and 1973 (Findlay & Kirk, 1988).

Opportunities to remedy saltmeadow loss through project design

A walkthrough survey completed on 22nd January identified that most of the patches of saltmeadow that would be impacted by the project are located well above MHWS, often in shallow swales (Figure 5). As a working hypothesis, these swales may interact with wind-blown spray to promote the establishment of saline soil conditions that are favourable for saltmeadow establishment. This suggests that a similar strategy could be employed in the development of post-construction site recovery and landscaping plans within areas located between the proposed erosion protection structures and the inundation bund. Examples of where this may be suitable is at the top of sections of cobble beach or rock revetment where a swale could be readily created (e.g., see Figures 38 and 40 in Jacobs (2023) showing typical cross-sections at Southshore). If such a strategy could make room for areas of saltmeadow in the post-construction landscape, it could negate or reduce the requirement for a biodiversity offset.

It is recommended this this direction is further explored with a view to achieving coastal protection solutions that are embedded within a more naturalised landscape. To support this, amendments to the landscape plans to reflect a more adaptive approach are likely to be useful. This strategy might also be supported by practical measures such as re-salinisation of soils. Overall, the project site offers many opportunities to encourage natural recovery trajectories as an alternative to the current focus on targeted planting, and a combination of both approaches is likely to offer benefits.



Figure 5. Example of saltmarsh herbfield ('saltmeadow') that has naturally established in RRZ land above MHWS at Southshore.

5.1.5 Environmental compensation

There was no environmental compensation proposed for this project. No specific issues were identified.

6 Key recommendations

Key recommendations arising from this review include:

- prepare a climate change impact assessment to address the relevant statutory requirements which will require methodologies suitable for the evaluation of coastal squeeze. Within this, address the effect of recent (and potentially ongoing) subsidence on relative sea level rise.
- update the Coastal Processes and Natural Hazards section of the AEE to include risks to the natural environment, as informed by the above assessment. Update the statutory considerations identified in the EcIA, and similarly, update the Coastal Processes and Natural Hazards Assessment and Statutory Assessment sections of the AEE to reflect these aspects of the policy context.
- reconsider the potential requirements for biodiversity offsets following completion of the above assessment. If biodiversity offsets are required, they must not be designed around the modification of an existing protected ecosystem type. More appropriate offset sites (e.g., for the creation of coastal wetland habitat) may be available on the western shore of Ihutai (although such sites would require further investigation). There may also be additional opportunities for remedying impacts on indigenous vegetation / ecosystem types (e.g., saltmeadow) through actions taken directly within the project site as an alternative to offsetting. These could be further explored with a view to achieving coastal protection solutions that are embedded within a more naturalised landscape that supports these elements.
- separate the assessment of effects on saltmarsh ribbonwood shrubland from those on marram-dominated grassland and recognising the need to address effects on the latter. There are opportunities to replace the marram-dominated dune habitat that is affected with an equivalent area of restored indigenous duneland.
- include aspects that may be identified in relation to the above elements (and other considerations addressed in this review) within the landscaping plans for the project.
- include arrangements for monitoring potential effects associated with increased or altered patterns of access to the estuary that may arise from the proposed works.

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RMA2023 3243 - South New Brighton and South Shore Hazard Protection Works

TECHNICAL MEMORANDUM

Prepared by:
Shane Orchard

For:
Christchurch City Council
c/- Janice Carter

Date:
13 June 2025

Kia ora Janice,

Thank you for the invitation to provide an additional review of responses received to your most recent Request for Information (RFI) in respect of RMA / 2023 / 3243 dated 19 March 2025.

As requested, the scope of this memorandum is limited to providing comment on whether the additional material provided in response to the second RFI materially changes any of the conclusions and advice provided in my most recent report (Orchard 2025). Section 3.6 of the revised EclA (Site significance) is also excluded from the scope of considerations for this memorandum due to this being a complex topic for which comment is not needed at this time.

I have reviewed the new material provided that falls within the above scope and the findings are as follows:

Page and section	Comment
(i) May addendum	It is good to see this overview section added, and it is also essential that this or similar appears in any final / untracked version of EclA to describe relationship with earlier versions and changes. The red tracked changes are useful.
(i) May addendum	Changes to the originally proposed Saltmeadow Offset Plan should reference the peer review report (Orchard, 2024). It would be more accurate to state here that the previously proposed Saltmeadow Offset Plan has been replaced with an onsite 'Saltmeadow Management / Remediation Plan' (or similar) located within the project footprint, as suggested by Orchard (2024, 2025). Peer review should be seen in a positive light!
(iii) Executive Summary, saltmeadow information	It seems unnecessary to state a 'Net Gain' prediction here as the requirement is more simply No Net Loss and achieving that remains contingent on implementation of the Saltmeadow Management / Remediation Plan.
(iv) Executive Summary, seagrass information (final paragraph)	It would be more accurate to say that 'the project design is revised to ensure that the project has no effect on <i>current</i> seagrass habitat' – as there are likely to be effects on future seagrass habitat due to coastal squeeze which has not been adequately addressed (see below). I also note that the design amendments to address <i>current</i> seagrass habitat seem to be sound (e.g., repositioning the toe of the revetment structure).
(vi) Executive Summary, coastal squeeze assessment	These conclusions are not supported and reflect a flawed methodology and/or misunderstanding of the purpose of a coastal squeeze assessment. Details of the required approach were provided in previous comments, see Orchard (2024, 2025).
(vii) Executive Summary, avifauna assessment	The statement of a 'Net Gain in habitat for coastal species' in relation to an 'overall net gain of 2,237 m2 of extra mudflat area' is unsubstantiated. It would need to be shown that this additional mudflat area was functionally important. The generalisation to 'habitat for coastal species' seems unwarranted – as the mudflat environment is just one component of the

	habitat needs of coastal species. Please refer to more detailed advice from Andrew Crossland on the specific needs of avifauna species as is needed to ascertain the overall effect. As with the above comment noted above on the veracity of 'Net Gain' outcomes for saltmeadow, it may be better to simply focus on achieving No Net Loss through the design provisions and orienting the evidence and contributing assessments around this.
(vii) Executive Summary, coastal squeeze statement	As above, these conclusions are not supported and reflect a flawed approach to coastal squeeze.
(p3-4) Supporting information	It would be good to include other technical reports / peer reviews that have provided input to the EclA in this list.
(p10) 2.4.3 Coastal squeeze assessment (for seagrass)	The methodology for the coastal squeeze assessment for seagrass was reviewed in Orchard (2025) – see comments therein.
(p12-13) 2.6.2.2 Coastal bird species surveys	The stated purpose of these surveys was 'to obtain information on how different indigenous bird species utilise the estuarine habitat adjacent to the project site throughout the tidal cycle'. It seems unlikely that the series of six surveys using the methodology described could adequately cover the spatio-temporal variability that would need to be addressed to achieve this goal. Further, it would seem better to incorporate the results of previous surveys of this area which include an extensive amount of survey effort (e.g., from Andrew Crossland). These comments are important because the results of the six shorebird surveys detailed in this section (2.6.2.2) have subsequently been interpreted as providing the evidence of current shorebird habitat values in the project area (in section 3.4.2) where they are used as the basis of the impact assessment. Limitations of the surveys that were conducted are mentioned in section 2.7.1.4 and again in section 3.4.2 but they are nonetheless relied upon in the impact assessment (e.g., sections 7.5.1 and 7.5.6).
(p15) 2.6.3 Coastal squeeze assessment (for avifauna)	As noted above, this assessment approach relies mainly on the field survey data collected in 2022 and may not have adequately covered the spatio-temporal aspects.
(p20) Table 4	As noted in previous comments (Orchard 2024, 2025), there is relatively little attention to the ecosystem level of biodiversity in the EclA. Where it is mentioned in Table 4, a reference is provided for threatened ecosystems (Holdaway et al., 2012) but without acknowledgement of the scope of that assessment. It was an assessment undertaken using the IUCN Red List of Ecosystems methodology for a relatively small subset of ecosystem types, being those identified as historically rare / naturally uncommon ecosystems by Williams et al. (2007). There are several other ecosystem-level considerations that are missing from the matters that are considered.
(p92-93) 5.2 Post consent application	The changes to the originally proposed Saltmeadow Offset Plan should reference the peer review report (Orchard, 2024). It would be more accurate to state here that the previously proposed Saltmeadow Offset Plan has been replaced with an onsite 'Saltmeadow Management / Remediation Plan' (or similar) located within the project footprint, as suggested by Orchard (2024, 2025). This has simplified the project and should be seen in a positive light.
(p92-93) 5.2 Post consent application	It is noted that provisions for access to the estuary bed is a difficult topic that must strike a balance between increasing access at undesirable locations and maintaining or improving access at appropriate locations. This can, arguably, be guided by a through understanding of the locations of sensitive environments within the project area.
(p108-109) 7.2.1.6 Loss of saltmeadow above existing Estuary edge at Southshore	The Saltmarsh remediation area referred to in this section needs to be the subject of a Saltmarsh Remediation Plan that details, <i>inter alia</i>, the restoration methodology, monitoring and adaptive management arrangements that will be applied. Only through such a plan can the required outcome under the mitigation hierarchy be demonstrated. This is a major omission.
(p109-110) 7.2.2.1 Saltmarsh - altered	The material in this section does not adequately assess the coastal squeeze effects on saltmarsh.

sedimentation patterns and coastal squeeze	
(p118) 7.3.2.3 Increased access to the Estuary bed	As noted above, the provisions for access to the estuary bed must strike a balance between increasing access at undesirable locations and maintaining or improving access at appropriate locations. In this case many of the existing access points represent local trails and informal infrastructure (e.g., stairs) that were once situated close to private property boundaries and were not generally used or known by the wider public. In the current post-disaster regeneration context where this land is now publicly owned and accessible, it is appropriate that there would be a smaller number of formal access points.
(p120-126) 7.3.2.4 Coastal squeeze	The conclusions in this section are not supported as the scope of assessment is inappropriate as detailed in previous reports (Orchard 2024, 2025). Additionally: - In the assessment of coastal squeeze effects on seagrass, the statement that 'light is not heavily influenced by the tidal state and, therefore, good water clarity should mitigate the effects of increased immersion times/depths' is not substantiated. Instead, it is an important subject for further research. - The assessment of coastal squeeze effects on macroalgae and benthic invertebrates is also not supported. It would tend to suggest that they are not affected by tidal zone changes, which is not the case e.g., see evidence of significant changes to macroalgal from only small sea-level changes caused by the 2016 Kaikōura earthquake in Orchard et al. (2021). These taxonomic groups should be included within an appropriate coastal squeeze assessment.
(p138-139) - 7.5.6 Coastal squeeze	As noted above, the information on coastal bird species habitat that is relied upon in this assessment does not appear to be sufficient for the purpose due to the potential for temporal variability. This concern is additional to other issues with the scope of coastal squeeze assessments noted above and previously.
(p146-152) - 7.6 Summary of assessment	No comments are offered on this section as the component parts are addressed above.
(p153-159) - 8.0 Impact management measures	No comments are offered on this section as the component parts are addressed above.
(p159-164) - 9.0 Conclusions	No comments are offered on this section as the component parts are addressed above.

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Appendix 6

Wildlife Authority



Wildlife Act Authority for wildlife on non-public conservation land

Authorisation Number: 116013-FAU

THIS AUTHORITY is made this 14th day of October 2024

PARTIES:

The Director-General of Conservation and where required the Minister of Conservation (the Grantor)

AND

Christchurch City Council (the Authority Holder)

BACKGROUND

- A. The Director-General of Conservation is empowered to issue authorisations under the Wildlife Act 1953.
- B. The Authority Holder wishes to exercise the authorisation issued under the Wildlife Act 1953 subject to the terms and conditions of this Authority.

OPERATIVE PARTS

In exercise of the Grantor's powers the Grantor **AUTHORISES** the Authority Holder under Section 53 of the Wildlife Act 1953, subject to the terms and conditions contained in this Authority and its Schedules.

SIGNED on behalf of the Grantor by Andy Thompson as Operations Manager Mahaanui acting under delegated authority
in the presence of:

Witness Signature

A copy of the Instrument of Delegation may be inspected at the Director-General's office at 18-32 Manners Street, Wellington.

SCHEDULE 1

1.	Authorised activity (including the species, any approved quantities and collection methods). (Schedule 2, clause 2)	a) Activities authorised for a certain purpose: i. catch alive and liberate the protected wildlife referred to in Schedule 4. ii. incidentally kill protected wildlife referred to in Schedule 4 provided all reasonable steps are taken in accordance with this authority to avoid killing wildlife. b) Purpose of authorisation: i. to protect lizards by way of salvage. c) Quantity authorised: i. as required. d) Methodology: i. in accordance with the amended Lizard Management Plan attached as Schedule 6.
2.	The Land (Schedule 2, clause 2)	a) Catch alive and kill: South New Brighton Park and Southshore along the estuary edge, on the map attached as Schedule 5 b) Liberate: Bridge Reserve, South New Brighton.
3.	Personnel authorised to undertake the Authorised Activity (Schedule 2, clause 3)	a) Matthew Turner b) Katherine Muchna c) Suitably qualified ecologists employed or contracted by the Authority Holder provided that they are under the direct supervision of those listed in this Authority.
4.	Term (Schedule 2, clause 4)	Commencing on and including 15th October 2024 and ending on and including 14th October 2029
5.	Authority Holder's address for notices (Schedule 2, clause 8)	The Authority Holders address in New Zealand is: 53 Hereford Street Christchurch 8154 New Zealand Email: david.little@ccc.govt.nz
6.	Grantor's address for notices	The Grantor's address for all correspondence is: Permissions Team Level 4 73 Rostrevor Street Hamilton, 3204 Email: permissionshamilton@doc.govt.nz

SCHEDULE 2

STANDARD TERMS AND CONDITIONS OF THE AUTHORITY

1. Interpretation

- 1.1 The Authority Holder is responsible for the acts and omissions of its employees, contractors or, agents. The Authority Holder is liable under this Authority for any breach of the terms of the Authority by its employees, contractors or agents as if the breach had been committed by the Authority Holder.
- 1.2 Where obligations bind more than one person, those obligations bind those persons jointly and separately.

2. What is being authorised?

- 2.1 The Authority Holder is only allowed to carry out the Authorised Activity in the Land described in Schedule 1, Item 2.
- 2.2 The Authority Holder must advise the Department of Conservation's local Operations Manager(s) one week prior to carrying out the Authorised Activity in the District, when the Authority Holder intends to carry out the Authorised Activity.
- 2.3 Any arrangements necessary for access over private land or leased land are the responsibility of the Authority Holder. In granting this authorisation the Grantor does not warrant that such access can be obtained.
- 2.4 The Authority Holder and Authorised Personnel must carry a copy of this Authority with them at all times while carrying out the Authorised Activity.
- 2.5 The Authority Holder may publish authorised research results.
- 2.6 The Authority Holder must immediately notify the Grantor of any taxa found which are new to science. In addition, the Authority Holder must lodge holotype specimens and a voucher specimen of any new taxa with a recognised national collection.

3. Who is authorised?

- 3.1 Only the Authority Holder and the Authorised Personnel described in Schedule 1, Item 3 are authorised to carry out the Authorised Activity, unless otherwise agreed in writing by the Grantor.

4. How long is the Authority for - the Term?

- 4.1 This Authority commences and ends on the dates set out in Schedule 1, Item 4.

5. What are the liabilities?

- 5.1 The Authority Holder agrees to exercise the Authority at the Authority Holder's own risk and releases to the full extent permitted by law the Grantor and the Grantor's employees and agents from all claims and demands of any kind and from all liability which may arise in respect of any accident, damage or injury occurring to any person or property arising from the Authority Holder's exercise of the Authorised Activity.

5.2 The Authority Holder must indemnify the Grantor against all claims, actions, losses and expenses of any nature which the Grantor may suffer or incur or for which the Grantor may become liable arising from the Authority Holder's exercise of the Authorised Activity.

5.3 This indemnity is to continue after the expiry or termination of this Authority in respect of any acts or omissions occurring or arising before its expiry or termination.

6. What about compliance with legislation and Grantor's notices and directions?

6.1 The Authority Holder must comply with all statutes, bylaws and regulations, and all notices, directions and requisitions of the Grantor and any competent Authority relating to the conduct of the Authorised Activity. Without limitation, this includes the Conservation Act 1987 and the Acts listed in the First Schedule of that Act and all applicable health and safety legislation and regulation.

7. When can the Authority be terminated?

7.1 The Grantor may terminate this Authority at any time in respect of the whole or any part of Authorised Activity if:

- (a) the Authority Holder breaches any of the conditions of this Authority; or
- (b) in the Grantor's opinion, the carrying out of the Authorised Activity causes or is likely to cause any unforeseen or unacceptable effects.

7.2 If the Grantor intends to terminate this Authority in whole or in part, the Grantor must give the Authority Holder such prior notice as, in the sole opinion of the Grantor, appears reasonable and necessary in the circumstances.

8. How are notices sent and when are they received?

8.1 Any notice to be given under this Authority by the Grantor is to be in writing and made by personal delivery, by pre-paid post or email to the Authority Holder at the address, fax number or email address specified in Schedule 1, Item 5. Any such notice is to be deemed to have been received:

- (a) in the case of personal delivery, on the date of delivery;
- (b) in the case of post, on the 3rd working day after posting;
- (c) in the case of email, on the date receipt of the email is acknowledged by the addressee by return email or otherwise in writing.

8.2 If the Authority Holder's details specified in Schedule 1, Item 5 change then the Authority Holder must notify the Grantor within 5 working days of such change.

9. What about the payment of costs?

9.1 The Authority Holder must pay the standard Department of Conservation charge-out rates for any staff time and mileage required to monitor compliance with this Authority and to investigate any alleged breaches of the terms and conditions of it.

10. Are there any Special Conditions?

- 10.1 Special conditions are specified in Schedule 3. If there is a conflict between this Schedule 2 and the Special Conditions in Schedule 3, the Special Conditions will prevail.

11. Can the Authority be varied?

- 11.1 The Authority Holder may apply to the Grantor for variations to this Authority.

SCHEDULE 3

SPECIAL CONDITIONS

1. Adhere to approved application

- 1.1 The Authorised Activity must be undertaken in accordance with the Lizard Management Plan attached to Schedule 6 of this Authority.
- 1.2 The Authority Holder is responsible for the acts and omissions of its employees, contractors, or agents. The Authority Holder is liable under this Authority for any breach of the terms of the Authority by its employees, contractors or agents as if the breach had been committed by the Authority Holder.

2. Killing wildlife

- 2.1 The Authority Holder is permitted to kill wildlife provided reasonable efforts have been made to meet all of the terms and conditions expressed and implied in this Authority.

3. Salvage relocation and habitat enhancement

- 3.1 The Authority Holder must perform actions as set out in the contingencies/adaptive management sections of the Lizard Management Plan to ensure adequate mitigation of effects has been achieved.
- 3.2 The DOC Operations Manager for Mahaanui (mahaanui@doc.govt.nz) is to be contacted immediately for further advice if wildlife other than those listed in Schedule 4 are located within the footprint of the development or within the release site.

4. Ownership of absolutely protected wildlife

- 4.1 This Authorisation gives the Authority Holder the right to hold absolutely protected wildlife in accordance with the terms and conditions of the Authorisation, but the wildlife remains the property of the Crown. This includes any dead wildlife, live wildlife, any parts thereof, any eggs or progeny of the wildlife, genetic material and any replicated genetic material.
- 4.2 Unless expressly authorised by the Grantor in writing, the Authority Holder must not donate, sell or otherwise transfer to any third party any wildlife, material, including any genetic material, or any material propagated or cloned from such material, collected under this Authority.

5. Lizard capture and handling

- 5.1 If required in writing by the Grantor, the Authority Holder must make such improvements to techniques (including catching, handling, releasing, preserving and storing), and take such other steps as directed by the Grantor.
- 5.2 Lizards must only be handled by Authorised Personnel listed in Schedule 1 Item 3, or under the direct supervision of the Authorised Personnel
- 5.3 Lizard capture, handling and relocation should be undertaken at a suitable time of year, October – April, when lizards are active, as advised by a suitably experienced herpetologist.

- 5.4 Capture and handling of lizards must involve only techniques that minimise the risk of infection or injury to the animal.
- 5.5 Capture and handling methods shall follow those described in the Herpetofauna inventory and monitoring toolbox <http://www.doc.govt.nz/our-work/biodiversity-inventory-and-monitoring/herpetofauna/>
- 5.6 The Authority Holder must ensure all live capture traps are covered to protect lizards from exposure and minimise stress. Damp leaf litter or other material must be provided to reduce desiccation risk and the bottom of the pit-fall trap must be perforated to allow drainage of water.
- 5.7 The Authority Holder must ensure all live capture traps, (e.g., pitfall traps and G-minnow traps), are checked at least every 24 hours.
- 5.8 If any mortality is detected, due consideration shall be made, and documented, that show measures have been taken to reduce mortality. Measures may include, but are not limited to, providing additional protection from weather, undertaking rodent suppression by trapping and/or poisoning at the site; not conducting live-trapping where mouse numbers have irrupted following grass seeding (where predation has been the cause of mortality); twice-daily trap checks, switching catching devices, or some combination of these measures.
- 5.9 The Authority Holder must sterilise any instruments that come in contact with the lizards and/or are used to collect or measure lizards between each location. A separate holding bag must be used for each animal. All gear should be thoroughly cleaned and dried between sites.
- 5.10 The Authority Holder must ensure lizards are temporarily held individually in a suitable container (e.g., breathable cloth bag) and held out of direct sunlight to minimise the risk of overheating, stress and death.
- 5.11 The Authority Holder is strongly encouraged to adhere to current best practice hygiene protocols when visiting sites of known native frog populations to avoid the spread of pest organisms such as chytrid fungus.

6. Death of wildlife associated with salvage activities

- 6.1 If any lizards should die during the authorised activities of catch, transfer, or liberate, the Authority Holder must:
 - a. inform the Grantor within 48 hours; chill the body if it can be delivered within 72 hours, or freeze the body if delivery will take longer than 72 hours; and
 - b. send the body to Massey University Wildlife Post Mortem Service for necropsy along with details of the animal's history; and
 - c. pay for any costs incurred in investigation of the death of any lizard; and
 - d. if required by the Grantor, cease the Authorised Activity for a period determined by the Grantor.

7. Lizard Salvage Reporting

7.1 A report is to be submitted in writing to the DOC Operations Manager Mahaanui (mahaanui@doc.govt.nz) and permissionshamilton@doc.govt.nz within three months of the salvage being completed, summarising outcomes in accordance with the Lizard Management Plan. Each report must include:

- the permission number; and
- the species and number of any animals collected and released; and
- the GPS location (or a detailed map) of the collection point(s) and release point(s); and
- results of all surveys, monitoring or research; and
- description of how the Lizard Management Plan was implemented including any difficulties encountered with capture and handling, how release sites were assessed, post release monitoring and what contingency actions were required.

7.2 Completed Amphibian and Reptile Distribution System (ARDS) cards for all herpetofauna sightings and captures ([Report a sighting: Amphibian and reptile species sightings and observations \(doc.govt.nz\)](#)) must be sent to Herpetofauna, Department of Conservation, National Office, PO Box 10420 Wellington 6143 or herpetofauna@doc.govt.nz.

8. Termination

8.1 A new clause 7.1 (c) is added to Schedule 2, to read as follows: "Or for any other reason that the Grantor may decide".

9. Variation

9.1 A new clause 11.2 is added to Schedule 2, to read as follows: "The Grantor may vary this Authority for any other reason that the Grantor may decide."

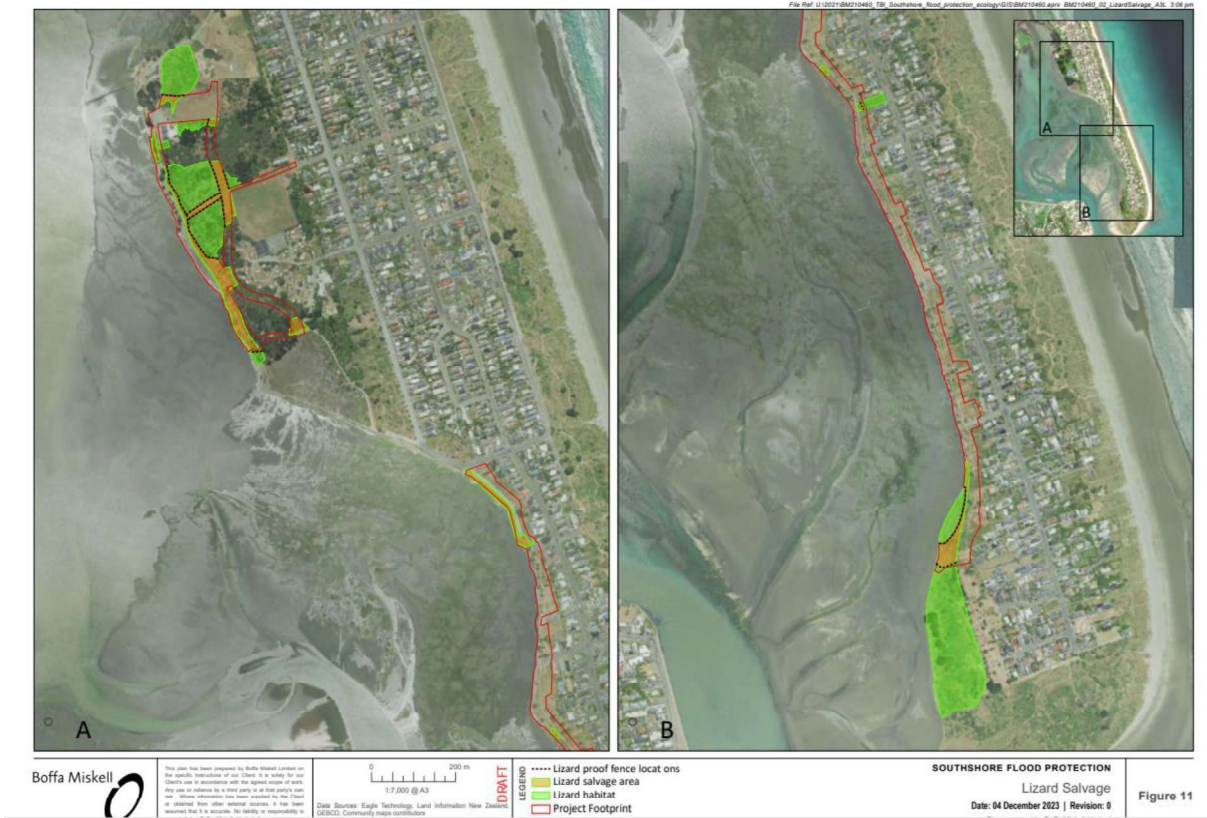
SCHEDULE 4

SPECIES

Common Name	Scientific Name
Southern Grass Skink	<i>Oligosoma aff. polychroma</i> Clade 5
McCann's Skink	<i>O. maccanni</i>

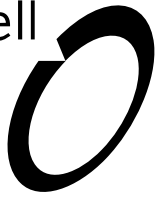
SCHEDULE 5

MAP OF THE LAND -Catch alive and kill



SCHEDULE 6

LIZARD MANAGEMENT PLAN



Lizard Management Plan

Southshore and South New Brighton Park Flood Protection Works
Prepared for Christchurch City Council

17 September 2024



Document Quality Assurance

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Prepared by:	Matt Turner Herpetologist Boffa Miskell Limited	
Reviewed by: Project manager:	Dr Tanya Blakely Associate Partner Ecologist Boffa Miskell Limited	
Status: FINAL	Revision / version: 1	Issue date: 17 September 2024
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Executive Summary

This Lizard Management Plan has been prepared for Christchurch City Council. This plan will provide sufficient detail for evaluation of the project by Canterbury Regional Council for resource consent, and the Department of Conservation (DOC) and their mandate under the Wildlife Act (1953). This plan is designed to explicitly address the 'Nine Principles for lizard salvage' (Department of Conservation, 2019). This plan describes the primary tool of lizard management as lizard salvage (i.e., a mitigation-driven translocation), and describes how and why this approach was chosen.

This plan addresses:

- The lizard values of the development site (habitat and species present, or likely present).
- Actual and potential effects of the development on lizards and lizard habitat.
- Evaluation of alternatives to salvaging lizards.
- Methodology for lizard salvage, transfer and release.
- Lizard release site characteristics.
- On-going lizard monitoring.
- Reporting requirements.
- Contingency actions for lizard release.

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Appendices

Appendix 1: Project herpetologist experience and contact details

Appendix 2: Lizard survey report

Appendix 3: Lizard Habitat Plan

1.0 Introduction

1.1 Project background

Christchurch City Council (CCC) is planning to undertake construction works to address future erosion and flood risks in Southshore, Christchurch, along the eastern edge of Ihutai / Avon-Heathcote Estuary. Problems with erosion and flooding in this area were worsened by the 2010-2011 Canterbury Earthquake Sequence (CES), which caused land subsidence and damage to existing private erosion protection structures.

The Project Footprint¹ includes erosion protection works and inundation bunds at both Southshore and South New Brighton Park (SNBP), as follows:

- Approximately 570 m of coastal erosion protection structures at SNBP, tying into existing gabion baskets and reno mattresses at its northern and southern extents.
- Approximately 640 m of inundation bund at SNBP, tying into high ground at its northern and southern extents.
- Approximately 1,580 m of coastal erosion protection structures at Southshore, nominally from Godwit Street to south of Tern Street and tying into existing coastal erosion protection structures along Ebbtide Street.
- Approximately 2,050 m of inundation bund at Southshore, with a 1.5 m wide shared user track formed along the bund crest and tying into an existing inundation bund along Caspian Street and into high ground south of Tern Street.

This plan has been developed by Matt Turner, based on survey information carried out by Dr Mandy Tocher (see the project Ecological Impact Assessment, EclA²).

All lizard surveys and salvage will be implemented by Chris McClure (Christchurch City Council Herpetologist) or Matt Turner (Boffa Miskell Herpetologist) with support from Boffa Miskell Ecologists. Their skills and experience are described in Appendix 1. The lizard survey fieldwork completed by Dr Mandy Tocher of Lizard Expert NZ was under Wildlife Act Authority (WAA) 96063-FAU.

1.2 Project site and context

The project site is located within the Low Plains Ecological District (Low Plains ED) in the Canterbury Plains Ecological Region (McEwen, 1987). The Ecological Region is one of the most modified regions in New Zealand. Following human settlement, significant losses of indigenous vegetation and habitats have occurred in lowland areas, being replaced for agriculture and settlement. Nearly all of the ED is intensively farmed or built (Harding, 2009) and only 0.1-0.5% of the Low Plains ED is thought to still be covered in indigenous vegetation (Ecroyd & Bockerhoff, 2005).

¹ Project footprint encompasses the maximum extent of all works associated with the construction of the erosion protection and inundation bunds at SNBP and Southshore, both permanent and temporary, and therefore defines the limit of direct effects on the project site's ecology.

² Boffa Miskell Ltd. (2023). *Southshore and South New Brighton Park Flood Protection Works: Ecological Impact Assessment* (Report BM210460). Prepared by Boffa Miskell Ltd for Christchurch City Council.

The current Project Footprint and surrounding area consists of residential areas and council-managed reserves. The northern extent of the site is within SNBP, which is predominantly made up of a mixture of exotic grassland (ranks and maintain) and treeland. The southern extent of the Project Footprint is along Southshore, between existing residential areas and the estuary mudflat; here, the narrow coastal margin is a modified habitat altered by former residential use (now known as residential red zone).

1.3 Statutory framework

All native lizard species are ‘absolutely protected’ under the Wildlife Act (1953, s63 (1) (c)), and lizard habitats are protected by the Resource Management Act (1991) and administered by the Department of Conservation (DOC) and local authorities, respectively.

Native lizards often occupy habitats of low ecological value that are not otherwise protected (i.e., weedy vegetation, vegetation margins), and guidelines have been developed to identify and address lizard habitat loss through land development (Anderson et al., 2012).

These guidelines identify the procedures involved to meet the legislative requirements for lizard fauna in Boffa Miskell Ltd, 2023 (the EclA). These matters are also addressed throughout this LMP and include:

- Obtaining a WAA (permit) from DOC to survey, capture and transfer lizards. Iwi consultation also forms part of permit approval.
- Undertaking lizard and / or habitat surveys.
- Development of a lizard management plan.
- Description of actions to mitigate adverse effects on lizards.

1.4 Lizard management approach

A design shaping process was carried out in collaboration with the project's technical specialists and CCC to identify opportunities for reducing the impact of the proposed work on habitats and species identified within the project site. This process was based on the effects management hierarchy and firstly aimed to avoid / minimise effects on seagrass, saltmarsh and mudflat habitats (as avoidance or minimisation of effects is required under the New Zealand Coastal Policy Statement, Policies 11(a) and 11(b) (Department of Conservation, 2010)). This has resulted in the Project Footprint overlapping with known lizard habitat. To minimise the impact on lizards within the Project Footprint, we consider salvage and release a viable option for this site given the surrounding landscape, likelihood of lizards persisting / thriving and long-term management. Any lizard management must be carried out in consultation with DOC and CCC.

This LMP has been developed to follow the principles provided in “Key principles for lizard salvage and transfer in New Zealand” (hereafter “Lizard Salvage Guidelines”, DOC, 2019).

2.0 Lizard values

2.1 Literature review

The DOC Bioweb Herpetofauna Database records within 20 km of the site were assessed to provide context for lizard fauna recorded within the site and inform an assessment of ecological values for the project. Data older than 20 years, and from predator-free islands were excluded from analysis because they are not considered representative of the likely lizard fauna within the Project Footprint (Table 1).

Table 1. Lizard species present within 20 km of the Project Footprint, taken from DOC's Bioweb Herpetofauna Database.

Species	Common name	Threat class	Nearest record	Preferred habitats
<i>Oligosoma</i> aff <i>polychroma</i> Clade 5	Southern grass skink	At Risk – Declining	Present on site	Grassland, tussock grassland, rocky areas, scree and talus slopes
<i>Oligosoma maccanni</i>	McCann's skink	Not Threatened	0.5 km, Southshore Spit Reserve	Open habitat, dry rocky environments, open rocky outcrops, montane grassland
<i>Oligosoma lineocellatum</i>	Canterbury spotted skink	Threatened – Nationally Vulnerable	4.6 km, Port Hills	Grassland, scrubland, forest edges, rock piles, scree slopes.
<i>Naultinus gemmeus</i>	Jewelled gecko	At Risk – Declining	4.6 km, Tauhinu-Korokio Scenic Reserve	Shrubland and beech and podocarp forest
<i>Woodworthia</i> cf. <i>brunnea</i>	Waitaha gecko	At Risk – Declining	2.8 km, Richmond Hill	Forests, rock outcrops, rocky scrubland, river terraces

2.2 Lizard survey effort

A detailed lizard survey of the Project Footprint and adjacent areas was undertaken by herpetologist, Dr Mandy Tocher between 17-21 February 2022 and findings of this assessment are presented in Appendix 2. We have summarised the methodology and findings below.

The five-day survey for lizards was carried out over a 22.7 ha area and utilised variety of survey methods to detect and capture lizards. Weather conditions for the duration of the survey were suitable for lizard emergence and are detailed in Table 2.

In total, 56 Gee's minnow traps were installed across thirteen sites (referred to as "Sites 1-13") within the Project Footprint (Figure 1). Traps were left out for between 1 and 4 trapping days and were checked daily for captured lizards. Traps were placed in areas of potential and representative lizard habitats, and in locations where hand-searching was considered ineffective, within the project footprint. Traps were shaded with vegetation and baited with

canned pear. Visual searches for lizards were undertaken by slowly walking through areas of vegetation and rock / cobble areas and visually scanning for emerged skinks (or listening for audible que from lizards moving). Manual hand searching of rocks, logs and other debris objects was also undertaken. These habitats were re-searched at different times of the day to increase the likelihood of detections.



Figure 1. Locations of where between 1 & 10 Gee’s minnow traps were deployed between February 17 and 21, 2022.

A site walkover was undertaken on 19 October 2023 by herpetologist Matt Turner to identify and map key areas of lizard habitat. Visual and manual searches for lizards were conducted simultaneously (Permit Number 82205-FAU). Conditions were ideal for lizard activity, with temperatures between 15°C and 17°C and little to no wind (Table 2).

Table 2. Lizard survey effort and weather conditions.

Date	Herpetologist	Weather	Activity and effort	Species detected
18 February 2022	Dr Mandy Tocher	Fine, 11-25 °C	Gee’s minnow trapping and visual / manual searches	18 x <i>Oligosoma</i> aff. <i>polychroma</i> Clade 5
19 February 2022	Dr Mandy Tocher	Fine, 11-25 °C	Gee’s minnow trapping and visual / manual searches	2 x <i>O. aff. polychroma</i> Clade 5
20 February 2022	Dr Mandy Tocher	Fine, 11-19 °C	Gee’s minnow trapping and visual / manual searches	2 x <i>O. aff. polychroma</i> Clade 5
21 February 2022	Dr Mandy Tocher	Fine, 11-19 °C	Gee’s minnow trapping and visual / manual searches	1 x <i>O. aff. polychroma</i> Clade 5
19 October 2023	Matt Turner	Fine, 15-17 °C	Visual / manual searches	2 x <i>O. aff. polychroma</i> Clade 5

Acknowledgement of the limitations of lizard survey methods

Lizard survey methods currently available may have poor detection rates because of typically low population densities, species' cryptic colouration, difficulty in surveying preferred habitats and behaviour / activity patterns. As such, even an intensive lizard survey is unlikely to detect all individuals in the population or, possibly, all species present.

2.3 Lizard survey results

The southern grass skink (*Oligosoma aff polychroma* Clade 5) (At Risk – Declining) was the only lizard species to be detected during the survey period.

A total of 29 southern grass skinks were captured across the four trapping days (refer to Appendix 2 for full details). All skinks were captured in exotic rank grassland habitats, predominantly located along the estuary edge (Figure 2). Skinks were captured from seven of the thirteen sites surveyed, including two skinks captured within two small and isolated marram grass / exotic grass islands surrounded by paths and roads. Six southern grass skinks were detected during visual surveys for lizards around rank grassland. An additional sighting of a skink by a local Lee Osborn, at 26 Ebbside Street was made following the completion of the survey.

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2.4 Lizard habitats

2.4.1 Key habitats within the site

Five major habitat types were identified during the lizard surveys with lizards being detected in all these habitat types. Habitat descriptions were taken from Appendix 2 and include:

Exotic rank grassland: rank grassland contained a mix of exotic grass species including browntop (*Agrostis capillaris*) and cocksfoot (*Dactylis glomerata*). Indigenous and exotic shrubs were present in places. Extensive areas of rank grassland were present including adjacent to the sports field at the end of Jellicoe Road (Figure 3), south of Tern Street along the estuary edge (Figure 4) and at 78 Rocking Horse Road (Figure 5). Pockets of rank grassland were only present where mowers were excluded (e.g., fenced off) and along the edge of the estuary in narrow strips.



Figure 3. Rank grassland west of Jellicoe Park.



Figure 4. Unmown rank grassland along the estuary edge south of Tern Street.



Figure 5. Rank grassland, fenced, at 78 Rocking Horse Road.

Exotic grassland with saltmarsh ribbonwood (*Plagianthus divaricatus*): a small area of exotic grassland with saltmarsh ribbonwood was present near the main track adjacent to the large saltmarsh, south of South Brighton Holiday Park (Figure 6). Whilst this was a small area (c.80 m²) relative to the survey area, high densities of southern grass skinks were present.



Figure 6. Saltmarsh ribbonwood and rank grass south of South Brighton Holiday Park.

Marram grassland: Marram grassland was most prevalent over a small part of the survey area c.220 m south of Tern Street, where the spit widens and eventually becomes the Southshore Spit Reserve (Figure 7). Here, marram exists with other vegetation communities towards the estuary, and woody weeds are common here. No southern grass skinks were detected here by Dr Tocher.



Figure 7. Marram grassland towards the southern extent of the project footprint.

Estuary edge lyme grass (*Leymus arenarius*) grassland: Lyme grass, a sand-loving exotic grass species, was common along the estuary edge either as a single species or growing with other lower-growing exotic grasses (Figure 8). Almost all areas trapped had southern grass skinks present.



Figure 8. Patch of lyme grass grassland area between existing residential areas and the estuary mudflat.

Abandoned gardens: Abandoned gardens were a feature of the survey area (Figure 9), and where suitable cover was present, were searched for lizards. No lizards were found by Dr Tocher in gardens despite appropriate habitat being present. On completion of Dr Tocher's survey, a local resident reported a skink at 26 Ebbitide Street (between Caspian and Godwit Street), in a garden where greywacke river cobble suitable for southern grass skink habitat was present.



Figure 9. Rock gardens present in abandoned gardens.

2.4.2 Extent of lizard habitats within the development site

The Project Footprint comprises approximately 10.5 ha of land spread across SNBP and Southshore. Lizard habitat areas were mapped (Figure 10) and the area was calculated following the lizard surveys. The estimated total area of lizard habitat within the project footprint is approximately 2.11 ha. This is an estimate, and it is possible that skinks could be more, or less, widely distributed throughout the project area.



2.5 Lizard values summary

The lizard values for the Project were assessed using the criteria in the Environment Institute of Australia and New Zealand (EIANZ) Ecological Impact Assessment (EcIA) guidelines (Roper-Lindsay et al., 2018), summarised in Table 3.

The species that were included in this assessment are species that have been recorded within the wider area, and species that may not have been recorded due to lack of detection during surveys but could still be present (Table 1).

As discussed previously, only southern grass skink (*At Risk – Declining*) has been detected within the project footprint. While this species is widespread throughout Christchurch and the Canterbury Plains, southern grass skinks have likely undergone substantial habitat loss within the region due to agricultural land use and are highly susceptible to mammalian predation. This species is considered of **High** ecological value.

While considered to be *Not Threatened* nationally, McCann's skinks are uncommon on the Canterbury Plains. As such, we have elevated the ecological value of this species from Low to **Moderate**, to reflect this.

No suitable habitat for jewelled gecko (*Naultinus gemmeus*) or Waitaha gecko (*Woodworthia* cf. *brunnea*) was present within the Project Footprint. Canterbury spotted skinks (*O. lineoocellatum*) is rare within Christchurch City and the Canterbury Plains and is considered to be very unlikely to be present onsite. As such, jewelled gecko, Waitaha gecko and Canterbury spotted skink are not further considered in this assessment.

Table 3. Values assessment of lizards present and potentially present based on the criteria in table 5 of the EIANZ EcIA guidelines (Roper-Lindsay et al., 2018).

Species	Common name	Threat class	Ecological value
<i>Oligosoma</i> aff. <i>polychroma</i> Clade 5	Southern grass skink	At Risk - Declining	High
<i>O. maccanni</i>	McCann's skink	Not Threatened	Moderate ³

³ McCann's skinks are uncommon on the Canterbury Plains so we have assigned the species as Moderate (rather than Low) ecological value.

3.0 Effects on lizards

3.1 Actual and Potential effects

3.1.1 Scale of assessment

Effects on lizards have been assessed at a local population scale, although we note that for species with small population sizes or limited distributions (i.e., Canterbury spotted skink) loss of animals will have national population scale effects. Actual and potential effects on lizards resulting from the proposed development are detailed below.

3.1.2 Injury/death during construction

Lizard fauna are mobile over short distances but may not be able to escape during site preparation and construction, particularly if carried out during colder months when lizards are less active. There is a risk to lizards during the construction of the erosion protection (rock reveinant and cobble beach) and inundation protection (bund) arising from vehicle and machinery movements and vegetation clearance and earthworks of areas of lizard habitat. In particular, around rank grassland areas along the estuary margin, which appear to support most of the population of lizard within the Project Footprint. Lizards are behaviourally cryptic and will shelter under available cover (e.g., within exotic grasses) when disturbed, thus, leaving lizards particularly vulnerable to injury or mortality by construction processes.

3.1.3 Disturbance

Disturbance and sub-lethal stress to lizards is difficult to quantify, but is likely that noise, and dust and vibrations during construction may impact lizards that are predominantly ground dwelling (i.e., southern grass skinks, McCann's skinks, Canterbury spotted skinks and Waitaha geckos – noting the last two species are not expected to be present).

3.1.4 Habitat loss and displacement

The proposed footprint of the erosion protection works and flood inundation bunds are known to overlap with habitat occupied by skinks. Construction of the bunds and protection works will alter grassland habitats within the Project Footprint, where this lizard habitat will be permanently lost. While the total amount of area to be lost is considered to be small, it likely holds the majority of the local skink population. Laydown areas for machinery / equipment and for aggregate / cobble / rock stockpiling adjacent to the construction works areas may result in temporary habitat loss for resident lizards for the duration of the works.

Additional sub-lethal effects of habitat alteration may include displacement of lizards to less suitable habitat, or increased stress to lizards from the loss of refugia and increased exposure to predators.

3.1.5 Increased predation

Loss of suitable refugia (concrete debris piles, slash piles, rank grass) may result in an increase in the likelihood of lizard predation, resulting in localised declines in lizard populations within the project footprint. We consider that current populations of lizards are under some level of predation pressure, with five of the eight skinks captured in Gee's minnow traps showing signs of tail regeneration (see Appendix 2). No predator management is currently occurring within the project footprint for biodiversity / conservation purposes.

3.1.6 Effects associated with lizard salvage

Potential effects on lizards resulting from salvage and transfer may include injury, death, competition, displacement, overheating and overcrowding. These effects will be minimised by using experienced handlers. An evaluation of the risk of these effects is provided in Section 4.3.

3.2 Residual effects

3.2.1 Inability to salvage all lizards within the footprint

We acknowledge that the methods of survey and capture of lizards are imperfect, and as a result, it may not be possible to salvage every lizard within the construction footprint. It is likely that some lizards may not be detected during salvage and will be injured or killed as a result.

3.2.2 Recolonisation of the Project Footprint during construction

Where the Project Footprint is shaped over existing lizard habitat, there is a high likelihood that skinks from directly outside the footprint may recolonise habitats that have previously been salvaged. This would likely result in the injury or mortality of skinks. Areas where this could occur are within South New Brighton Park, where lizard habitat is considered to be widespread around the Project Footprint.

3.2.3 Creation of temporary habitat within laydown areas

Stockpiles of aggregate, cobbles and rocks used for construction and deposited onsite in piles in laydown areas are at risk of colonisation by remaining skinks not captured during the lizard salvage or by resident skinks from outside of the project footprint. It is likely, if colonised lizards may be injured or killed when materials are removed for construction.

3.3 Management of effects

3.3.1 Lizard salvage as a management action

We recognise that there are inherent risks associated with lizard capture and salvage as a management tool for mitigation purposes. In particular, there is high risk of poor capture rates for lizards during pre-survey capture and salvage activities. This will be managed by maximising lead-in time for pre-clearance capture and using a range of tools suitable to the species in

question. We further recognise that communication with machinery contractors is key to ensuring that lizard salvage is carried out in such a way as to minimise risk to lizards (i.e., gradual habitat clearance, using appropriate machinery).

3.3.2 Recolonisation of the Project Footprint during construction

To address the recolonisation of the Project Footprint during construction, a lizard proof fence (made of a sheer polythene fencing material, similar to that of a silt fence) must be constructed around sections of the Project Footprint that are located through lizard habitat. The fences should be installed so that the bottom edge is either dug into the ground or faces outwards (away from the Project Footprint). The polythene should be pinned to the ground at no more than 50 cm intervals to prevent it lifting. A detailed map of where fencing should be installed is shown on Figure 11. The fence must be kept in place for the duration of construction and should be checked frequently to ensure there are no breaches to the fencing.

3.3.3 Colonisation of temporary aggregate piles

Any temporary stockpiles of aggregate, cobble or rock piles must be located a minimum of 10 m away from any grassland habitat to minimise the likelihood of colonisation. If not possible, a lizard proof fence (as described in Section 3.3.2) must be constructed between material piles and grassland habitat to create a physical barrier for skinks entering the stockpiles.



3.3.4 Lizard habitat creation and enhancement

Not all the residual effects of the construction of the flood protection works will be able to be avoided or mitigated. This includes the inability to salvage all lizards from within the Project Footprint and to ensure there is no net loss of lizard habitat. To address these residual effects, we propose to recreate 2.96 ha of lizard habitat (0.83 ha of habitat to be restored and 2.13 ha of new lizard habitat) within the Project Footprint along the new bund / coastal erosion works area, through inclusion of high-density plantings of ecologically suitable native vegetation, including plants like hard tussock (*Festuca novae-zelandiae*), silver tussock (*Poa cita*) and small leaved pohuehue (*Muehlenbeckia complexa*). This will be achieved via the Project Landscape and Lizard Habitat Plan (Appendix 3).

Over time, this recreation and enhancement of additional lizard habitat is expected to provide high-quality habitat for skink populations both within and directly outside of the Project Footprint. The establishment of lizard habitat along the length of Southshore may also restore connectivity to remnant small, isolated populations of southern grass skinks in time.

3.4 Significance of effects

The level of effects of the Project on lizards were assessed using the criteria in the EIANZ EcIA guidelines (Roper-Lindsay et al., 2018), summarised in Table 4.

The southern grass skink, which are present within the site, has a threat classification of At Risk – Declining. Any unmitigated impacts predicted to be of Moderate or a greater magnitude will result in a level of effect of High or Very High. The following assessment considers the level of effect prior to and following the implementation of mitigation activities.

Table 4. Potential significance of ecological effects on native lizards adapted from table 10 of EIANZ EcIA guidelines (Roper-Lindsay et al., 2018).

	Threat class	Ecological Value	Magnitude of Effect	Level of Effect	Level of effect after mitigation
Injury/death during construction	Not Threatened/At Risk (other)	Moderate	High	High	Low
	At Risk - Declining	High	High	Very High	Low
Disturbance	Not Threatened/At Risk (other)	Moderate	Low	Low	Very Low
	At Risk - Declining	High	Low	Low	Very Low
Habitat loss and displacement	Not Threatened/At Risk (other)	Moderate	High	High	Low
	At Risk - Declining	High	High	Very High	Low
Predation	Not Threatened/At Risk (other)	Moderate	Moderate	Moderate	Low
	At Risk - Declining	High	Moderate	Moderate	Low

4.0 Lizard salvage, transfer and release

4.1 Lizard salvage approach

To maximise the number of skinks salvaged from the affected area, a suite of tools / methods will be utilised and deployed prior to construction and earthworks. Such methods including live trapping methods and the hand capture of lizards during manual and visual searches. Any technique used to capture lizards will follow best practice methods outlined in DOC's herpetofauna inventory and monitoring toolbox.

The exact number of salvage tools to be installed within each bit of lizard habitat and the duration of the salvage will be dependent on the area and complexity of lizard habitat within it and the staging of works. While the timing of each stage may differ, the general salvage methodology would be similar between the two areas. Stage 1 includes works around SNBP and Stage 2 encompasses the area between existing residential areas and the estuary mudflat.

We consider that the density of lizards within the Project Footprint but outside of the lizard habitat mapped in Figure 10 (i.e., those areas consisting primarily of mown grassland), is likely

to be very low (no lizards have been detected in these areas during visual surveys). However, lizards could be present at very low densities even within areas not mapped as lizard habitat, or may move into the edges of these areas from mapped lizard habitat areas. As such, lizard salvage and translocation within these areas of mown grassland is not being proposed.

Any lizard salvage will occur immediately ahead of construction works, in suitable weather conditions during the warmer months from October to April and will be undertaken in mild conditions above 12 degrees.

4.2 Lizard salvage methods

Pitfall trapping: Pitfall traps are made using four-litre containers recessed into the ground, each with the tops of the containers level with the surface. Containers will have small holes in the bottom to allow water to drain out. To reduce the likelihood of trapped lizards overheating, plywood lids will be placed over each pitfall trap and secured using pegs leaving an approximate 10 mm gap between the lid and container rim to allow lizards to pass through. Each trap will contain a small amount of vegetation to provide cover, a piece of damp sponge and be baited with pear or banana.

Gee's minnow traps: In areas where pitfall traps are deemed to be inappropriate (e.g., steep sloping terrain or hard substrates), Gee's minnow traps may be used. Gee's minnow traps will be filled with grass to provide cover for trapped lizards, a piece of damp sponge and be baited with pear or banana. Traps will be placed in shaded areas or covered in vegetation to prevent lizards overheating.

Both pitfall traps and Gee's minnow traps will be installed in grids and / or transects at 5 m spacings within lizard habitat.

All live trapping methods (pitfall traps and Gee's minnow traps) will be inspected within 24 hours from the last check for up to ten consecutive trapping days in suitable weather. Trapping will be undertaken for up to ten consecutive trapping days, with trapping ceasing earlier if no lizards are caught (within an area) in any trap for three consecutive trapping days.

Destructive hand searching: Hand searching will occur throughout any suitable habitats for skinks. This will likely involve the searching of any potential objects that may provide lizard refugia including rock piles or woody debris. These piles / items will be checked daily for the duration of the salvage operation and then removed on the final day to prevent skinks from recolonising.

4.2.1 Data collection

The following data will be collected from each of the lizards captured: species, sex, reproductive condition, morphometrics (snout-vent length (SVL), vent-tail length (VTL) and tail regeneration), photos, GPS records, description of habitat where captured, date and time. Weather conditions will be recorded at the beginning of each day of the salvage.

Information collected will be collated in a report to be prepared for DOC following the conclusion of the salvage. Amphibian and Reptile Distribution Scheme (ARDS) cards will be completed and submitted to DOC.

4.2.2 Transportation

Lizards will be held individually in cloth bags in a secure, vented container out of the sun. Lizards will be transported to the release site (see Section 5.0) or captive holding facility within four hours.

4.3 Risk associated with proposed management

Potential risks associated with the proposed management plan:

- *Overheating*: pitfall and Gee's minnow traps will be checked every day during the morning and will be covered with plywood covers. Lizards will be placed in cloth bags individually within a hard container and stored in a cool place until they are released.
- *Overcrowding / competition*: it is not likely that overcrowding, or competition will be a risk as current populations of lizards at the release site are likely under predation pressure and below carrying capacity.
- *Displacement*: lizards are likely to be released within close proximity to capture site (i.e., within safe areas fenced off within SNBP and adjacent to the work site) it is unlikely that lizards will be displaced from their original home range. Additionally, Table 5 discusses how we propose to anchor lizards to the release site and reduce the risk of any attempts to home back to capture sites.
- *Injury / death*: lizards will be captured by a suitably trained herpetologist or individual. This will follow best practice and hygiene protocols to minimise the risk of injury, mortality or disease transmission.

Potential risks mentioned here will be minimised using an experience herpetologist or suitably trained handler and selecting release sites that are suitable with adequate pest control.

5.0 Lizard release site assessment

5.1 Release site and rationale

We propose Bridge Reserve at South New Brighton as an appropriate location for the relocation of salvaged skinks. Bridge Reserve consists of a c.2.1 ha area of largely exotic rank grassland, with some recently implemented native plantings (Figure 12). The release site has been selected based on its ability to accommodate lizards within habitats similar to those from which they were captured. Further considerations included Principles 6, 7 and 9 of the Lizard Salvage Guidelines (DOC, 2019).

Populations of southern grass and McCann's skinks are present within the proposed release site. Flood protection (bund construction) works were undertaken within Bridge Reserve in February 2021, and this involved salvage and relocation of the lizard community into an approved area within the reserve. In total, 72 skinks, comprised of 52 southern grass and 20 McCann's skinks, were captured from a high-density salvage effort, and released into the reserve. No post monitoring of skinks has occurred.

We consider that the current release site is not at carrying capacity given the suitability of the current habitat to support populations of grass dwelling skinks, the number (72 skinks) previously relocated during the lizard salvage in 2021, that the site is under some level of predation pressure, and that the southern grass skinks can reach high-density populations.

Table 5 below addresses the criteria for consideration of a site for lizard release.

Table 5. Assessment of lizard release site based on Principle 6 of the Lizard Salvage Guidelines (DOC 2019).

Principle relating to salvage and release	Description	Detail/Activity
1. The site must be ecologically appropriate and have long-term security	Resident lizard communities must be understood.	Southern grass skinks have been detected around the release site during a previous lizard salvage. Resident populations are likely at moderate densities based on the number of skinks salvaged in 2021, the extent of lizard habitat present and the current level of predation pressure on resident populations.
	The release site must be an appropriate distance from the impact site to prevent lizard homing, but close enough that it provides similar habitat.	The release site is approximately 0.4 km from the Project Footprint. Mown fields and roads likely present current barriers to skink homing from the release site to the Project Footprint. Further, lizard proof fences will be erected during construction works to prevent skinks re-entering the site during and following lizard salvage.
	The location must be within the species natural geographic range.	The release site is within the natural range of all species present in the area.
2. The habitat at the site must be suitable for the salvaged species	Vegetation composition and size:	Habitat within Bridge Reserve is predominantly exotic rank grassland with indigenous plantings, including cabbage trees (<i>Cordyline australis</i>), <i>Coprosma</i> spp., <i>Muehlenbeckia</i> spp., kōhūhū (<i>Pittosporum tenuifolium</i>), harakeke (<i>Phormium tenax</i>), and hard tussock (<i>Festuca novae-zelandiae</i>).
	Must contain sufficient resources for potential population.	At present, the release site contains abundant habitat for an additional influx in translocated skinks as the majority of the c.2.1 ha covered by rank grassland.
	Habitat enhancement	Maintained grassland around the walking track provides additional opportunities to further enhance the site through additional cover for skinks. Prior to salvage commencing, installation of natural refugia via rock piles throughout the release site will provide additional cover and suitable basking areas for lizards. Supplementary planting of hard tussock (<i>Festuca novae-zelandiae</i>) and silver tussock (<i>Poa cita</i>) should be planted between these piles and the walking track to discourage human interaction. Additionally, woody debris should be distributed throughout the site in areas,

Principle relating to salvage and release	Description	Detail/Activity
		and placed in areas that would not harm any lizards.
	Edge effects	The reserve is moderately sheltered from coastal weather due to a shelterbelt along the eastern edge of the reserve and residential development. Plants present are naturally found within the area.
3. The site must provide protection from predators	Habitat must protect from predators, or effective pest control must be in place.	A network of bait stations double set DOC200 traps and mouse traps (see Section 5.2), will be installed throughout the site. Rock piles will be constructed to exclude rats. We are not trying to exclude mice because we acknowledge that by attempting to exclude mice, larger lizards may also be excluded.
4. The site must be protected from future human disturbance	Land tenure must ensure long term protection from disturbance	Land is owned and managed by the Christchurch City Council and provides flood protection for South New Brighton, as such will not be disturbed in the long term.



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This plan has been prepared by Boffa Miskell Limited on the specific instructions of our Client. It is solely for our Client's use in accordance with the agreed scope of work. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate. No liability or responsibility is accepted by Boffa Miskell Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.


0 50 m
1:1,500 @ A3
Data Sources: Eagle Technology, Land Information New Zealand, GCSO, Community maps contributors
Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND
 Release site boundary
 Supplementary planting areas
 Rock pile areas

SOUTHSHORE FLOOD PROTECTION
Lizard Release Area
Date: 12 August 2024 | Revision: 0
Plan prepared by Boffa Miskell Limited
Project Manager: Tanya Blakely@boffamiskell.co.nz | Drawn: HCo | Checked: MTU

Figure 12

5.2 Preparation of the Release Site

5.2.1 Predator control at the release site

Predator control targeting rodents (in particular mice), mustelids and hedgehogs will be implemented within the release site at least three months prior to the release of lizards. Pests will be controlled using a combination of snap traps and DOC200 traps. Stations consisting of DOC200 traps will be spaced at 50 m intervals. Snap traps are to be installed at 25 m intervals throughout the site. Traps will be checked and re-baited regularly, following best practice methods for the types of traps and lures used, until skinks are released. Due to the proximity of the release site to residential properties we consider pest control not to be feasible in the long term to sufficiently protect lizards and, as such, are focusing on site enhancement through adding additional suitable cover.

5.2.2 Creation of natural refugia

Prior to any lizard salvage, three rock piles will be created within the release site. In total the rock piles will encompass an area of approximately 177 m² and all be up to 0.5 metres tall and will be located in areas of maintained grass along the bund walking track (Figure 12). Rock piles for southern grass and McCann's skinks will be constructed using 60-80 mm river cobbles (or another similar size alternative rock material). Supplementary planting of hard tussock and silver tussock should be planted between these piles and the walking track to discourage human interaction.

Additional refugia should be created through the placement of woody debris throughout the site. Log piles should be placed in areas where they are likely to not harm any skinks when placed and should be done under the supervision of the project herpetologist. A minimum of 30 log piles should be added to the site of approximately 1x1 m.

5.3 Release methods

Lizards will be released into habitat within the release site depending on the habitat requirements of the species. Such habitats will include into existing dense rank grasses or created rockpiles.

6.0 Contingency actions

It is well known that lizards can inhabit the most unlikely of locations and sometimes be found in surprising abundance. Therefore, Table 6 identifies potential issues that could arise and contingency actions to address them.

Table 6. Proposed contingency actions.

Activity	Contingency Action(s)	Frequency / timing
Unexpected species is found within the Project Footprint	If a Canterbury spotted skink or Waitaha gecko is found during the salvage or construction, DOC will immediately be contacted for advice on how to proceed. The lizard salvage will be temporarily paused until approval to resume works is granted by the relevant DOC office (or other appropriate DOC staff). Or, an alternative approach may be agreed with DOC, or a management plan for relevant species may be provided to DOC, prior to resumption of works.	During the lizard salvage and construction.
Post-release monitoring	If more than 20 lizards are released into the release site, post-release monitoring is proposed.	To ensure that monitoring is justified according to the resulting impact on lizards, monitoring requirements shall be scaled according to lizard capture numbers and threat status. The suggested thresholds are below: • 0-20 = No monitoring • 20-50 = 3 years monitoring • 50+ or any threatened species = 5 years monitoring
Predator control	As skinks were largely found around cover (suggesting a dependence on refugia habitat), predator control targeting mice, rats, mustelids and hedgehogs using a combination of toxic baiting, snap traps and DOC200 traps will be installed throughout the release site prior to release.	Bait stations will be baited, checked and refilled for 3 years.

7.0 Post release monitoring and reporting

7.1 Post-release monitoring

It is widely acknowledged that lizard management and salvage related activities are not well reported or very successful. Therefore, monitoring is required to evaluate the success of the salvage operation. Post-release monitoring will only be triggered if enough lizards are captured that make it a feasible activity. The below capture thresholds are recommended:

- <20 individuals of a 'Not Threatened' or 'At Risk' species = no monitoring.
- 20-50 individuals of a 'Not Threatened' or 'At Risk' species = three-year minimum monitoring programme.
- 50+ lizards salvaged or any number of any 'Threatened' species = five-year minimum monitoring programme.

If >20 lizards are released, a monitoring plan will be prepared following the salvage in conjunction with the Department of Conservation. All relevant and appropriate data will be collected at the time of salvage to facilitate successful monitoring outcomes. The plan shall be designed to ensure that resources are used in a meaningful way that will directly address knowledge gaps in lizard monitoring and lizard conservation efforts that are relevant to the local species.

7.2 Reporting

Outcomes of salvage and surveys will be reported by the project herpetologist to DOC following the completion of the lizard salvage in order to determine the ongoing success of the salvage and/or whether management regimes should change.

ARDS cards will be submitted to DOC within 1 month following the end of the salvage by the project herpetologist.

8.0 Adaptive Management

Minor flexibility or adaptations to the current methods proposed in this LMP may be made at the discretion of the project herpetologist. This will enable the appropriate management of lizard populations that are encountered during the lizard salvage relevant to each staging, habitat quality and type of species encountered.

9.0 References

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Appendix 1: Project herpetologist experience and contact details

Chris McClure (Christchurch City Council) – Herpetofauna skills and experience

Chris McClure has over sixteen years of experience working with New Zealand's skinks and geckos. Chris completed BSc Hons (first class) in Ecology and Conservation at Lincoln University where she focused her studies on the behavior of translocation of arboreal geckos and the comparison of terrestrial trapping techniques. Since then, she has volunteered and worked alongside other professionals in her field to develop her skills and understanding of New Zealand herpetology.

Currently Chris works as an independent consultant and for Christchurch City Council as their sole herpetologist (93529-FAU). Elements of her role include providing advice on all relevant Council projects, RMA applications, writing and developing internal systems, policies and procedures. As well as reviewing external consultants' documentation, and undertaking all tasks associated with Department of Conservation wildlife act authority applications, such as lwi consultation, government department liaison, field work and report writing.

She is a member of the Society for Reptile and Amphibian Research in New Zealand, the New Zealand Herpetological Society, and a past member of the DOC Herpetofauna Technical Advisory Group.

Appropriate qualifications as an ecologist:

BSc, First Class Honors Ecology and Conservation, Lincoln University

BSc, Conservation and Ecology, Lincoln University

Suitable and relevant field experience with a range of different New Zealand lizard species:

Short list of some of the species and wildlife act authority permit numbers Chris has work on:

- Pitfall trapping and visual (night) searching *Oligosoma elium*, *Woodworthia cf. brunnea* long term population monitoring 35196-FAU, 93529-FAU Department of Conservation
- Funnel trapping for population monitoring of *Oligosoma maccanni*, *Oligosoma aff. polychroma* Cade 5 and *Oligosoma lineoocellatum*: 93529-FAU, 50628-FAU
- Pitfall trapping for annual *Oligosoma waiamatense* survey, hand and visual searching for *Woodworthia "pygmy"*, *Woodworthia "Southern Alps"* 35196-FAU and 93529-FAU
- Visual searching for *Naultinus manukanus* 93529-FAU, 35196-FAU
- Funnel trapping for population monitoring of *Oligosoma hoparatea* and *Oligosoma aff. longipes*, 35196-FAU and 93529-FAU
- Visual searches *Naultinus gemmeus* numerous projects: 35196-FAU, 93529-FAU
- Tracking tunnel monitoring *Oligosoma* species: 100518-FAU, 93529-FAU

- Funnel, pitfall trapping, artificial cover objects *Oligosoma maccanni*, *Oligosoma* aff. *polychroma*, Clade 5, *Oligosoma* aff. *polychroma*, Clade 4: 93529-FAU, 96306-FAU; 48452-FAU, 82232-FAU, 91425-FAU, 38862-FAU, 93045-FAU, 81776-FAU, 81571-FAU, 96060-FAU, 95996-FAU, 81491-FAU, 86138-FAU
- Funnel trapping for population monitoring of *Oligosoma* aff. *infrapunctatum*: 93529-FAU and Department of Conservation
- Visual survey and winking of *Woodworthia* cf. *brunnea* 96306-FAU, 96306-FAU, 82232-FAU, 38862-FAU, 96305-FAU

Matt Turner (Boffa Miskell) – Herpetofauna skills and experience

Matt Turner has over two years of experience working with New Zealand's skinks and geckos. Matt has recently completed his MSc in Ecology at the University of Canterbury under the supervision of Professor Dave Kelly and Dr Marieke Lettink. Matt's research focused on current monitoring tools used for lizards, testing the effectiveness on new artificial refuge (ACO) designs for both terrestrial and arboreal lizards, and addressed ethical concerns associated with internal temperatures within pitfall traps. He has field experience conducting and participating in lizard survey's, monitoring and translocations using variety of monitoring methods including artificial refuges, live trapping and diurnal visual searches in accordance with the DOC inventory and monitoring toolbox.

Matt has worked under his own research permit, 82205-FAU and under the permit of Marieke Lettink for a variety of herpetology projects, 35196-FAU.

Appropriate qualifications as an ecologist:

MSc, Ecology, University of Canterbury, 2021. Thesis: Improving the management of Canterbury's lizards.

BSc, Biological Sciences, University of Canterbury, 2018

Suitable and relevant field experience with a range of different New Zealand lizard species:

- Diurnal *Naultinus gemmeus* searches on Banks Peninsula, 35196-FAU
- Hand searches for *Mokopirirakau* "Cascades" in alpine environments near Haast, 35196-FAU
- Pitfall trapping for annual *Oligosoma waiamatense* surveys around Mt Harper, 35196-FAU
- Visual searches for *O. hoparatea* in the Rangitata head waters, 35196-FAU
- Funnel trapping for population monitoring of *O. maccanni*, *O. aff polychroma* Cade 5 and *O. lineoocellatum* on the Port Hills, Christchurch, 35196-FAU and Christchurch City Council
- Monitoring of *Woodworthia cf. brunnea* using terrestrial and arboreal artificial refuges, including handling and measurements, 82205-FAU and 35196-FAU.
- Providing assistance with urban skink translocation for the Christchurch City Council

Table of species and relative survey hours:

Species	Approx. survey hours
<i>Woodworthia cf. brunnea</i>	105
<i>Naultinus gemmeus</i>	30
<i>Mokopirirakau</i> "Cascades"	20
<i>Oligosoma waiamatense</i>	12
<i>O. hoparatea</i>	8
<i>O. lineoocellatum</i>	4
<i>O. maccanni</i>	65
<i>O. aff polychroma</i> Cade 5	65

Appendix 2: Lizard survey report

Southshore Flood Protection Works, Avon-Heathcote Estuary

Lizard survey to Inform AEE & Wildlife Act permit



September 2023



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1. Introduction

Christchurch City Council (CCC) plan to undertake four erosion and inundation protection projects over red-zoned land situated along the of Ihutai / Avon Heathcote Estuary (Figure 1). Red-zoned land was once residential-zoned land, and much has been abandoned for c. 10 years in the aftermath of the Christchurch earthquakes. Although much of the red-zoned land is kept tidy and regularly mown by CCC, some areas have remained unmown and provide habitat for southern grass skinks, an indigenous lizard known to occur over the wider area^{1,2,3}. Other areas, especially over the northern areas near the yacht club have retained a wild character and also have southern grass skinks present.

In order to ascertain actual and potential effects of the proposed erosion and inundation protection works on any resident southern grass skinks, a lizard survey of the project area was undertaken between February 17-21st 2022. The following report details the lizard values of the four project areas (Figure 1). This report will ultimately inform a wider assessment of effects, that will accompany the application for consent; and a Lizard Management Plan for the project, that will accompany a Wildlife Act (1953) permit application to DOC to allow works over habitat of absolutely protected wildlife.

2. Proposed Works

Works across project sites will involve a combination of vegetation clearance, rock armouring, cobble beach and salt marsh restoration/regeneration, above and below MHWS. The proposed works include the following sub-projects:

- The South New Brighton Park estuary edge erosion protection works, situated on the estuary edge from Pleasant Point yacht club and the start of Jellicoe Marsh (yellow line in Figure 1).

¹K. MacDonald & M. Lettink 2019. Lizard Management Plan for the Bexley Landfill Remediation Project, Christchurch.

²M. Tocher & C. McClure November 2019. Bridge Reserve Lizard Management Plan.

³ M. Tocher, March 2020. Lizard Survey Estuary Green Edge Pathway. Report prepared by Ryder Environmental for Boffa Miskell.

- The South New Brighton Park inundation protection works situated directly inland from the South New Brighton Park estuary edge erosion protection works (red line in Figure 1).
- The Southshore estuary edge erosion protection works situated on the estuary edge between Godwit Street and Tern Street (green line in Figure 1), and
- The Southshore inundation protection works which is situated inland and setback 5 m from the Southshore estuary edge erosion protection works and extended further south (blue line in Figure 1).



Figure 1: Overview of the project area showing the indicative locations of the project footprints. Red line=South New Brighton Park inundation protection works; yellow= South New Brighton Park estuary edge erosion protection works; green= Southshore estuary edge erosion protection works; blue=Southshore inundation protection works.

3. Survey Methods

A 5-day lizard survey was carried out over the c. 22.7 ha survey area from February 17-21st 2022 (Figure 2). Weather conditions during survey were suitable for lizard activity (Table 1) and active lizards were observed on most days at sites where

vegetation was conducive to sighting lizards e.g., in rank grass near Jellicoe Park.

A range of methods were employed to detect and capture lizards over the survey area, including:

- The entire survey area was scoped and then 56 gee's minnow traps were deployed across 13 sites baited with tinned pear. Traps were deployed in groups of up to 11 over areas that were either deemed likely southern grass skink habitat and where handsearching would have been ineffective (e.g., Figure 3); or were placed in representative habitats of the survey area. Some traps were moved to new locations as the survey progressed. Gee's minnow traps were primarily used as a detection tool, but some quantitative data were collected (Table 2).
- Slowly walking through areas of vegetation and over rock/cobble and the remains of domestic gardens whilst conducting a visual search and listening for the distinctive rustle of a disturbed lizards.
- Searching for skink faecal pellets on top of any litter present, the remains of garden fences and walls, fence stays/posts and rocks, and under rocks.
- Turning over rocks, and logs/fence posts and any litter wherever they are encountered, in search of lizards and/or their sign.
- Re-searching areas thought to have lizard habitat and lizards present at different times of day, to detect/capture lizards thought to be present, but not sighted.
- All lizards captured were measured and georeferenced and all lizard survey was carried out in accordance with Wildlife Act permit 96063-FAU issued to the author.

Table 1: Weather conditions for survey & gee's minnow trapping of the Southshore survey area (see Figure 1). VES=visual encounter survey.

Date	Daily Minimum Air Temperature °C	Daily Maximum Air Temperature °C	Method
17/2/22	11	20	Gee's minnow traps and VES
18/2/22	11	25	Gee's minnow traps and VES
19/2/22	10	25	Gee's minnow traps and VES
20/2/22	11	19	Gee's minnow traps and VES
21/2/22	11	19	Gee's minnow traps and VES



Figure 2. Upper: Northern part of the survey area taking in c. 7.1 ha of estuary edge, rank grassland and tree land habitats. Lower: Southern part of the survey area taking in c. 15.6 ha of estuary edge, rank and mown grassland and abandoned garden plantings habitats. Both areas were simultaneously surveyed over February 17-21st 2022, using mix of walkthrough survey and gee's minnow trapping (total lizard survey area = c. 22.7 ha).



Figure 3. Gee's minnow trap in situ near the estuary edge near Penguin Street (red arrow) that caught a southern grass skink. Traps were covered in vegetation to provide shade for any skinks captured and marked with blue flagging tape. Some traps were labelled to explain to the public why shade was important.

4. Survey Results

Lizard Habitats

Overview

Five major lizard habitats were identified over the c. 22.7 ha survey area, and each are described below, with photographs. Other areas within the 22.7 ha search area were not considered lizard habitat because they were shaded and had been shaded

for some time and were therefore not expected to support sun-loving skinks, except perhaps at the edges where sunny habitat with suitable cover remained e.g., trees around the South Brighton Holiday Park (see Figure 2). Some of the now shaded areas, will have almost certainly been suitable southern grass skink habitat in the past before trees created shade beneath (e.g., Figure 4).



Figure 4. View north towards the Pleasant Point yacht club showing open habitat becoming progressively shaded by yellow lupin after being clear felled of all large trees in 2014.

1. Rank exotic grassland

Exotic grassland contained a mix of exotic grass species including browntop (*Agrostis capillaris*) over less disturbed areas, and cocksfoot (*Dactylis glomerata*) where some disturbance had taken place in the recent past. Occasional indigenous shrub species were also present, including both naturally occurring and planted shrubs.

Rank exotic grassland was extensive over some areas (e.g., adjacent to the sports field at the end of Jellicoe Road (Jellicoe Park; Figure 5), and pockets were present over the southern part of the survey area where CCC mowers were not able to

access (e.g., Figure 5). Along the estuary edge, thin bands of rank grass (<2 m wide), at times, provided habitat for grass skink (e.g., see Figure 7) and at 78 Rocking Horse Road, an empty section was fully covered in rank grass (Figure 8 & 9).

Near the Pleasant Point yacht club, a mix of exotic woody weeds and plantings (*Pinus* spp.) were systematically shading the exotic grassland habitat present (Figure 10) and are probably displacing southern grass skinks to the periphery of such areas. Other parts of the survey area had rank exotic grassland that was shaded, or experienced heavy foot traffic (Figure 11). Over these areas, southern grass skinks were not detected.



Figure 5. View north over the dense, undisturbed rank exotic grassland adjacent to Jellicoe Park (Site 2 in Figure 19); nowhere else over the survey area were skinks so abundant as in the rank grass and adjacent indigenous plantings of this area.



Figure 6. Rank grassland habitat south of Tern Street (Site 12) where southern grass skinks were captured; the presence of the low wire fence had protected the habitat from mowing both before and after the Christchurch earthquakes. Grassland habitat here had characteristics of a well-established grassland, that had not been disturbed for decades.



Figure 7. Left: Thin strip of rank grassland habitat along the estuary edge that provided habitat for southern grass skink. This area was north of Penguin Street. Right: View south across a thin strip of grassland habitat adjacent to a small area of saltmarsh near Penguin Street that did not have resident southern grass skinks.



Figure 8. Rank exotic grassland habitat, fenced, at 78 Rocking Horse Road that was trapped and searched for southern grass skinks; none were detected.



Figure 9. View east showing rank exotic grassland habitat of 78 Rocking Horse Road.



Figure 10. Upper: Rank exotic grassland habitat at the back of the Pleasant Point yacht club being slowly invaded by yellow lupin and overtopped by planted pine trees. A single skink was captured here on the last day of trapping. **Lower:** View south along rank grass suitable as southern grass skink habitat, south of the yacht club. A skink was sighted here during the walkthrough survey, February 21st, 2022.



Figure 11. Rank exotic grassland habitat, fenced, at 78 Rocking Horse Road that was trapped and searched for southern grass skinks; none were detected Yacht club where I got skink on last day – 10 GMs here all survey got nothing. Habitat at 471. & Habitat at waypoint 462

2. Exotic grassland with saltmarsh ribbonwood (*Plagianthus divaricatus*)

A small area (c. 80 m²) of exotic grassland with saltmarsh ribbonwood was present near the main track adjacent to the large saltmarsh, south of the South Brighton Holiday Park (Figure 12). The area, although small in relation to the survey area, had very high densities of grass skinks present, with 12 captured over the 4 days trapping (Table 2; see next Section).



Figure 12. Upper: Location of the 80 m² area of open and sunny grassland with saltmarsh ribbonwood. Lower: View east across the 80 m² area of grassland that was home to a very high density of southern grass skinks (Site 5 in Figure 19).

3. Marram grassland

Marram grassland (*Ammophila arenaria*) (Figure 13) was most prevalent over a small part of the survey area c. 220 m south of Tern Street, where the spit widens and eventually becomes the Spit Reserve. Here, marram exists with other vegetation

communities towards to estuary, and woody weeds are common here. No southern grass skinks were detected here.



Figure 13. Marram grassland adjacent to Petrel Lane over the southern part of the survey area where 10 gee's minnows were deployed but no southern grass skinks detected.

4. *Estuary edge lyme grass (Leymus arenarius) grassland*

Lyme grass, a sand-loving exotic grass species, was common along the estuary edge either as a single species (Figure 14) or growing with other lower-growing exotic grasses (Figure 15). Lyme grass was more common over the northern part of the survey area, and almost all area trapped had southern grass skinks present.

5. *Abandoned gardens with greywacke river cobble mulch and occasional rocks*

Abandoned gardens were a feature of the survey area, and where suitable cover was present, were searched for lizards (e.g., Figure 16). No lizards were found in gardens despite appropriate habitat being present. On completion of survey, a local resident reported a skink at 26 Ebbtide Street (between Caspian and Godwit Streets, in a garden where I noted greywacke river cobble suitable for southern grass skink habitat was present. This sighting, in my opinion is very

credible and close to where I detected skinks during my survey (see next Section).



Figure 14. View south showing lyme grass growing near Godwit Street. The red arrow shows where Southern grass skinks were found.



Figure 15. Lyme grass growing with other exotic grasses and succulents near the Pleasant Point yacht club. No southern grass skinks detected here but habitat is suitable.



Figure 16. An example of a red-zone garden near Mermaid Place showing weedy plantings with a small area of greywacke cobble used as mulch.

Lizard Captures & Sightings

Southern grass skinks (*Oligosoma* aff *polychroma* clade 5) was the only lizard species detected over the survey area, and a mix of striped and speckled patterned skinks were captured (e.g.,

Figure 17 and Figure 20). Southern grass skinks are currently classified as At Risk – Declining by DOC⁴. Skinks were sighted very rarely during the survey (n=6; Figure 18), despite suitable weather for skink activity occurring during the survey period (Table 1).



Figure 17. An example of a strongly striped southern grass skink captured over the survey area.



Figure 18. Locations (n=6; red dots) where southern grass skinks were observed actively foraging over the survey area. The additional sighting of local Lee Osborn, at 26 Ebbtide Street soon after my survey was completed, is also shown (red arrow).

⁴ Hitchmough et al. 2021. Conservation status of New Zealand reptiles, 2021. New Zealand Threat Classification Series 35. Department of Conservation, Wellington. 15 p.

The majority of skinks detected during the survey (82 %) were captured in gee's minnow traps (Figure 19 and Table 2). A total of 29 skinks were captured (versus six sightings) that ranged in size from adult to sub adult (Table 3). No new-born skinks were captured and 65.5 % of captured skinks had regenerating tails indicating levels tail loss that were not notable (Table 3). Trapping rates were highest at Sites 5 and 6 (Table 2), but these data are too few to determine actual densities. Skinks were, however, very obviously abundant at Site 5 near the saltmarsh/small estuary (see Figures 12 & 19); and within the exotic grassland adjacent to Jellicoe Park (Site 2 in Figure 19 and Table 2). At these sites 2 & 5, between 0.2-1 southern grass skinks were captured per trap day, and on more than one occasion, multiple skinks were captured in each trap (Table 2 and Figure 21). Site 6 was two very small, isolated marram grass/exotic grass islands surrounded by paths and roads (Figure 22); here 1 trap caught 2 skinks over 2 nights, but the limited habitat meant the skink population was small despite the trapping rate. This site was also a little outside the development footprint being on the corner of Ebbside Street and Caspian Street but was nonetheless included in Table 2 and Figure 21 for context.

Table 2: Summary of location (site as per Figure 18), dates, number of gee's minnow's traps deployed and captures over the survey area.

Dates	No. days trapping	Site	Number of Traps deployed	Skink captures	Skink captures per trap day
17-21 st	4	Site 1	10	1	0.024
17-21 st	4	Site 2	10	8	0.2
17-21 st	4	Site 3	6	0	0
20-21 st	1	Site 4	4	0	0
17-20 th	3	Site 5	4	12	1.0
19-21 st	2	Site 6	1	2	1.0
17-19 th	2	Site 7	3	2	0.33
17-19 th	2	Site 8	4	0	0
17-21 st	4	Site 9	3	2	0.16
17-21 st	4	Site 10	1	0	0
17-21 st	4	Site 11	6	0	0
17-21 st	4	Site 12	5	2	0.1
17-21 st	4	Site 13	6	0	0
Totals	42			29	



Figure 19. Locations ($n=13$ sites; numbered white dots) where between 1-10 gee's minnow traps were deployed between February 17-21st 2022.



Figure 20. Example of a speckled patterned southern grass skink captured at Site 1 (Figure 18), 21st February 2022.

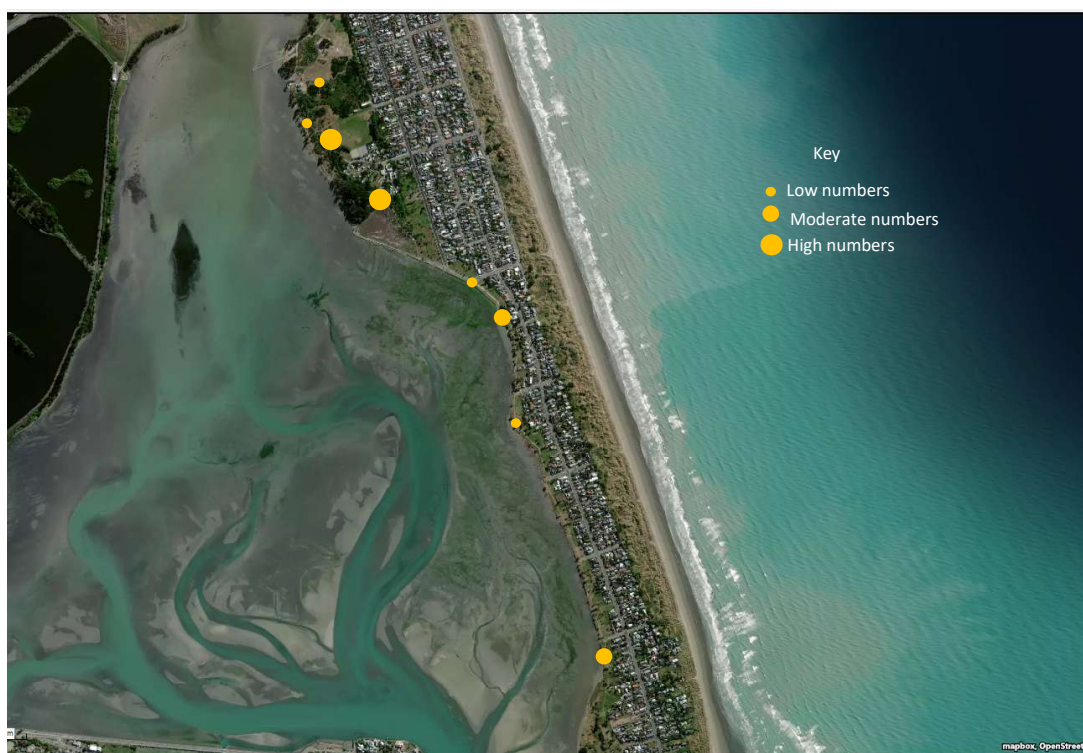


Figure 21. Overview of skink captures & sightings and perceived relative abundances (based on captures, sightings, and quality/extent of habitat present) across sites February 17-21st 2022.

Table 3: Summary of sex & size measurements taken from captured skinks, 17-21st February 2022.

Skink #	Site	Date	SVL (mm)	VTL (mm)	Tail regeneration (mm)	Sex/age
1	Site 2	18/02/2022	70	93		male
2	Site 2	18/02/2022	65	83	15	male
3	Site 2	18/02/2022	66	76		female
4	Site 2	18/02/2022	70	87	40	male
5	Site 2	18/02/2022	55	60	22	male
6	Site 2	18/02/2022	56	63	42	female
7	Site 5	18/02/2022	55	68	9	male
8	Site 5	18/02/2022	60	73		female
9	Site 5	18/02/2022	65	67	29	male
10	Site 5	18/02/2022	48	41	28	female
11	Site 5	18/02/2022	65	68	26	male
12	Site 5	18/02/2022	52	65	7	male
13	Site 5	18/02/2022	70	44	37	female
14	Site 7	18/02/2022	33	47		sub adult
15	Site 7	18/02/2022	35	48		sub adult
16	Site 9	18/02/2022	58	58	39	male
17	Site 12	18/02/2022	67	75	28	female
18	Site 2	19/02/2022	65	83	15	male
19	Site 2	19/02/2022	70	93		male
20	Site 5	19/02/2022	60	77		male
21	Site 5	19/02/2022	38	53		sub adult
22	Site 5	19/02/2022	57	72	Tip gone	male
23	Site 5	19/02/2022	72	72		male
24	Site 12	19/02/2022	66	63	35	male
25	Site 5	20/02/2022	70	43	39	female
26	Site 6	20/02/2022	55	61	21	male
27	Site 1	21/02/2022	71	70	53	male
28	Site 6	21/02/2022	65	35	27	male
29	Site 9	21/02/2022	54	53		sub adult



Figure 22. Two small exotic grass/marram grass islands on the corner of Caspian Street and Ebbitide Street where two grass skinks were captured (red arrows).

5. Summary & Mitigation Suggestions

- Southern grass skink populations were found over both the northern and southern parts of the c. 22.7 ha survey area, primarily in rank exotic grassland and marram/lyme grasslands. This species is classified as 'at risk declining' by DOC. No other lizard species were detected over the site.
- Over the southernmost part of the survey area, south of Heron Street, skinks were only detected in two places. Here they occurred in low-moderate numbers over two isolated areas of rank grass near the estuary edge. Apart from these two areas, no skinks or their habitat was detected, including over abandoned gardens and marram grassland.
- At Caspian Street and south to Godwit Street, southern grass skinks were present in low-moderate numbers in rank grassland, including marram & lyme grass, at the estuary edge and at one location in an abandoned garden (26 Ebbside Street). Skinks could occur at other locations along the estuary edge here, where these habitat types exist, despite not being detected during this survey.
- Southern grass skinks were more common north of Caspian Street, with highest perceived densities occurring at two quite different sites; one adjacent to Jellicoe Park where extensive areas of rank grass were present, and the second at a small site adjacent to the small saltmarsh (Site 5). The high density at the saltmarsh site could be explained by skinks becoming concentrated there as the surrounding habitat has become progressively shaded by *Pinus* spp. and other woody weeds; google earth imagery from 2005 and then 2014 (Figure 23) shows the area has remained unshaded for many years despite surrounding areas being shaded at times.



Figure 23. Extent of closed-canopy forest over the northern part of the survey area in 2005 (left) and the extent of grassed area once they were felled in 2014 (right).

- Figure 23 shows the extent of closed canopy in 2005 versus the area cleared of trees in 2014. The area of grassland adjacent to Jellicoe Park was unshaded in 2005 and has remained so, explaining the high southern grass skink populations there.
- The images in Figure 23, together with the observation of a skink foraging at the edge of a closed canopy area, and another trapped at a similar edge behind the yacht club during the survey, indicates skinks are present at low densities throughout the now wooded areas of South New Brighton Park, where some canopy gaps still occur.
- Southern grass skinks are protected under the Wildlife Act (1953), administered by DOC. A Wildlife Act permit from DOC will be required to carry out the proposed works.
- Mitigation will be required should CCC works proceed. I recommend creating rocky habitat ahead of works, in collaboration with the local community, that could then be used as a release site for southern grass skinks rescued from works areas. Rodent control using new generation rodenticides (e.g., Double Tap) would be a useful method to support skink establishment at the newly created release site. The location of the rocky habitat could help link currently isolated populations of skinks.

Appendix 1: ARDS Cards

ARDS CARD		NEW ZEALAND AMPHIBIAN/REPTILE DISTRIBUTION SCHEME Herpetofauna Administrator, RD&I, Department of Conservation, P.O. Box 10420, Wellington.				Card No:	
Observer: <u>MD</u> <u>Tocher</u> Initials Surname			Date: 17-21st February 2022		Locality Name: Southshore, Christchurch		
Address: 1 Cleghorn Street, Dunedin 9085			Alt (m):sealevel		44° 6'54.29"S 169°50'1.04"E		
Affiliation: LizardExpertNZ			GPS Series Map No. Easting Northing		Area Office: Conservancy: Ecol. District: Canterbury		
Species name	No.	Time	Habitat	Weather	Weather	Major Habitat Types	
<i>Oligosoma</i> aff. <i>polychroma</i> clade 5 - sighted	6		13, 17,H	1,2,1	<u>Light</u> 1 Fine/Sunny 2 Part Cloudy 3 Overcast 4 Showers 5 Rain 6 Night 7 0-½ Moonlit 8 ½-1 Moonlit	1 Beech Forest 2 Podocarp forest 3 Broadleaf forest 4 Exotic forest 5 Scrub 6 Sub-alpine 7 Alpine 8 Undeveloped tussock land 9 Developed farmland 10 River terrace 11 Fresh water	
<i>Oligosoma</i> aff. <i>polychroma</i> clade 5- trapped in gee's minnow traps.	29		13, 17,H	1,2,1	<u>Temperature</u> 1 Hot 2 Warm 3 Moderate 4 Cool 5 Cold	12 Wet land 13 Coastal 14 Scree 15 Bare rocks 16 Beach 17 Urban	
Voucher specimen(s)	No	Specify:			<u>Wind</u> 1 Calm 2 Light breeze 3 Mod breeze 4 Gusty 5 Strong winds	18 19 20	
Photograph(s)	Yes					Micro habitats A Foliage B Trunk C Branches D Under stones E Under wood F Open ground G Crevices H Rank grass	
Extra notes on reverse side	No						
Notes: Survey for Boffa Miskell (for CCC) from pleasant point yacht club to south of Tern Street ahead of flood protection works. Survey report produced and issued to Tanya Blakely, Boffa Miskell. Map of sightings attached.							
Identified by: Mandy Tocher Authority used:							

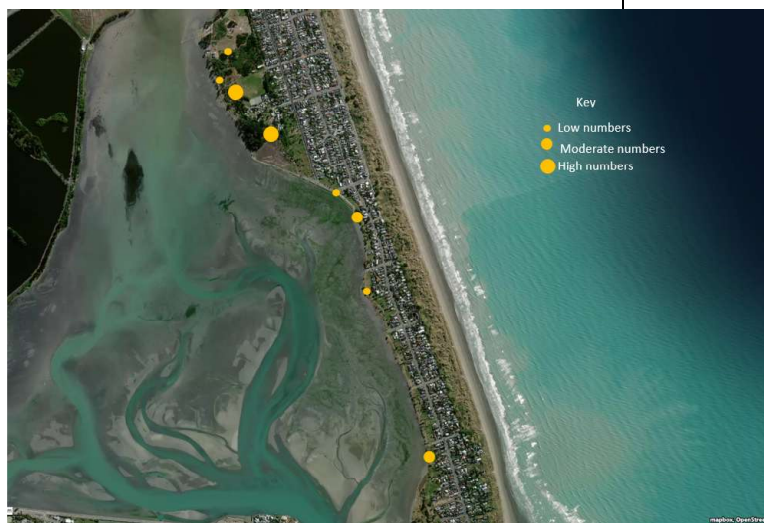
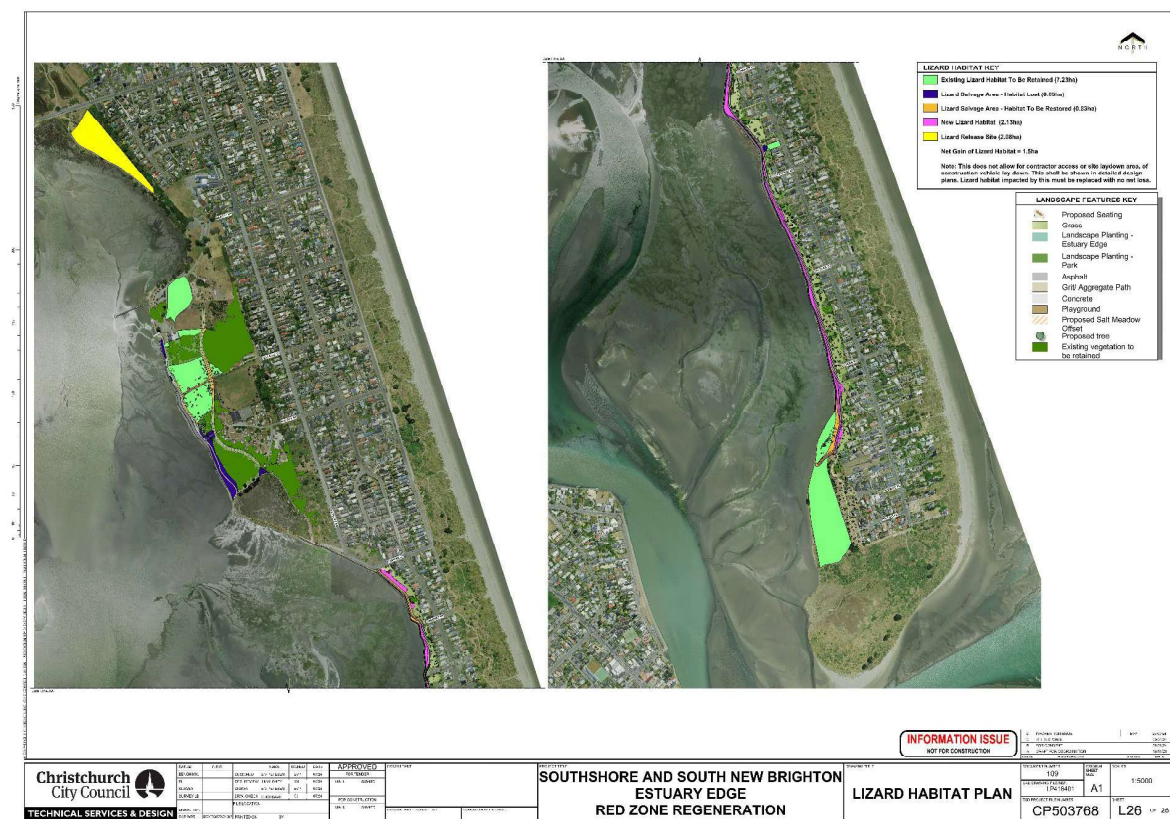


Figure 20. Overview of skink captures & sightings and perceived relative abundances (based on captures, sightings, and quality/extent of habitat present) across sites February 17-21st 2022.

Appendix 3: Lizard Habitat Plan



Together. Shaping Better Places.

Boffa Miskell is a leading New Zealand environmental consultancy with nine offices throughout Aotearoa. We work with a wide range of local, international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, Te Hīhiri (cultural advisory), engagement, transport advisory, climate change, graphics, and mapping. Over the past five decades we have built a reputation for creativity, professionalism, innovation, and excellence by understanding each project's interconnections with the wider environmental, social, cultural, and economic context.



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