

HALDON STATION SOLAR ARRAY SITE

VEGETATION ASSESSMENT



Report prepared for

DEPARTMENT OF CONSERVATION

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1.0 Introduction

This document provides a description of the vegetation and flora at a proposed solar array site at Haldon Station, Mackenzie District, Canterbury. It includes an assessment of ecological significance. This document has been prepared at the request of the Department of Conservation to assist with its response to this Fast Track Approvals Act application.

2.0 Survey Method

The field survey upon which this report is based was undertaken by two ecologists (Mike Harding & Susan Walker) over a period of approximately five hours on 20th November 2025, with the assistance of DOC community ranger Marianne Marot. Two principal methods were employed: quantitative survey of vegetation at locations representative of the vegetation using the RECCE plot method¹ (Mike Harding); and time-limited searches for notable flora close to predetermined points at 500-m spacings (Susan Walker & Marianne Marot). Survey tracks and plot locations are illustrated in Figure 1.

This survey should not be regarded as comprehensive. Instead, it is a time-limited sample of vegetation and flora at some parts of the solar array site in one season (late spring/early summer). Other species are likely to be present at other parts of the site and in other seasons, such as dryland annual species in early spring. More comprehensive survey would be needed to determine the distributions of Threatened and At Risk species across the site.

3.0 Vegetation

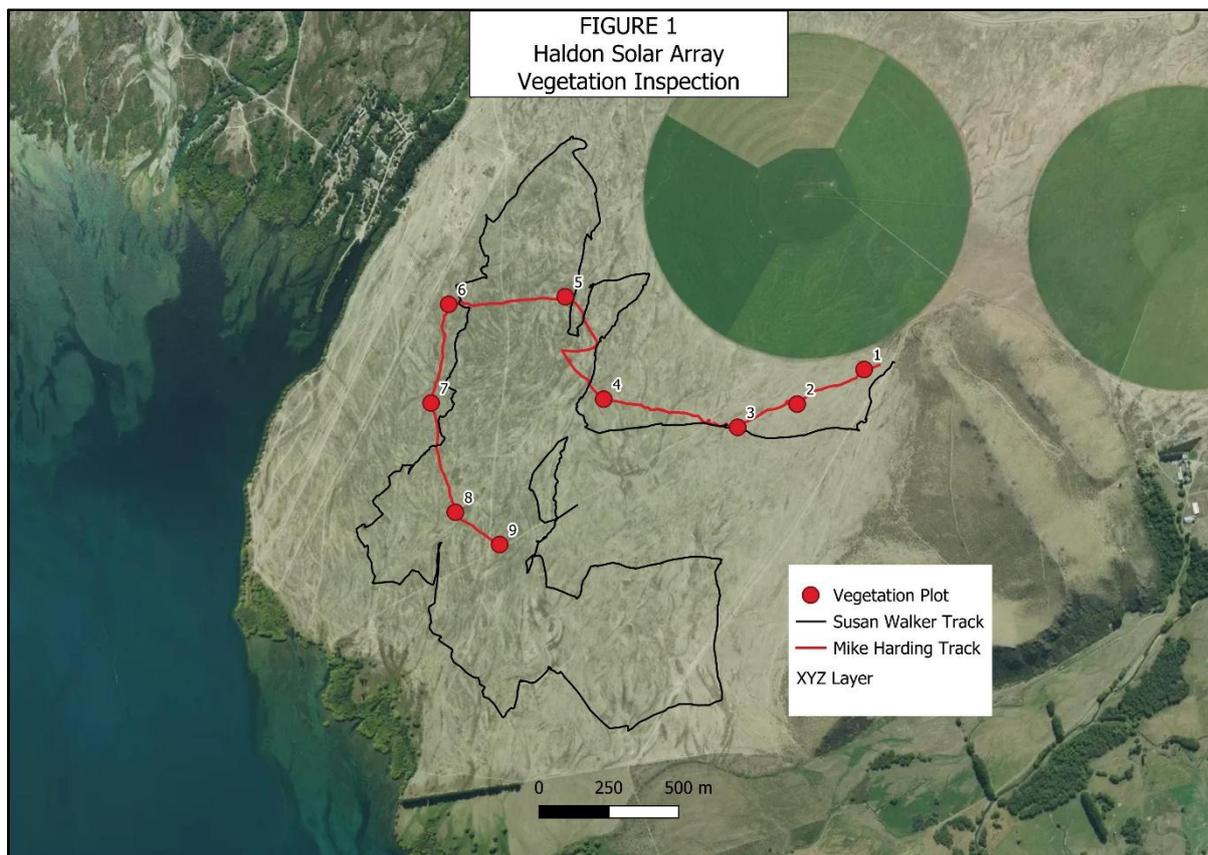
The solar array site supports vegetation typical of a degraded outwash surface at this part of the Mackenzie Basin. The vegetation is dominated by indigenous lichens, notably *Xanthoparmelia semiviridis* and *Cladia* species, and naturalised (exotic) species, notably mouse-ear hawkweed (*Pilosella officinarum*), sheep's sorrel (*Rumex acetosella*) and the grass *Festuca filiformis*. These five species are common at all parts of the site except at locations close to the pivot irrigator.

The respective dominance of these species is influenced by substrate. Silty sites support a higher percentage cover of exotic species; stony sites support a higher percentage cover of indigenous species, including a higher number of Threatened and At Risk species.

The plot data (Appendix 1) indicate the presence and dominance of plant species at each surveyed location. All the surveyed plots except plots 1 and 8 are dominated by the five species listed above. Other species commonly present are silvery hair grass (*Aira caryophyllea*), *Carex breviculmis*, grassland forget-me-not (*Myosotis discolor*), sun orchid (*Thelymitra* sp.), spring speedwell (*Veronica verna*), wire moss (*Polytrichum juniperinum*) and lichen species.

¹ Hurst, J.M.; Allen, R.B.; Fergus, A.J. 2022. The Recce Method for describing New Zealand vegetation – expanded manual, Version 5. Landcare Research-Manaaki Whenua, Lincoln, New Zealand.

Figure 1: Location of Vegetation Plots and Tracks, Site Inspection 20th November 2025



Plot 1, which is close to the pivot irrigator, supports several additional exotic species and fewer indigenous species (lichens are almost absent). Plot 8, which lies in a shallow swale at the lower (south-west) part of the site, is dominated by creeping pohuehue (*Muehlenbeckia axillaris*).

The applicant's ecological assessment describes Chewing's fescue (*Festuca rubra*) as common and widespread at the site, forming 5% cover and occurring in 91% of the surveyed plots.² The only *Festuca* species recorded during this survey was *Festuca filiformis*, which was common in all surveyed plots.³ *Festuca filiformis* is a naturalised species, common in dry inland basins.⁴ It is an unpalatable species, not a pasture grass.

4.0 Flora

Sixteen (16) indigenous vascular species and at least eight (8) indigenous non-vascular species (mosses & lichens) were recorded during this brief site survey. Twenty-two (22) naturalised (exotic) species were recorded.

² AgScience Limited, 31 July 2025. Haldon Solar Project Ecological Impact Assessment, 52p.

³ Species identity was confirmed at the Manaaki Whenua-Landcare Research Allan Herbarium (Kerry Ford).

⁴ Edgar, E.; Connor, H.E. 2000. Flora of New Zealand Volume V Gramineae. Manaaki Whenua Press, Lincon.

The following vascular species listed⁵ as Threatened or At Risk were recorded during the site survey.

- *Carex resectans* At Risk (declining)
- *Convolvulus verecundus* At Risk (declining)
- *Lepidium solandri*..... Threatened (nationally critical)
- *Luzula ulophylla* At Risk (declining)
- *Muehlenbeckia ephedroides*..... At Risk (declining)
- *Poa maniototo*..... At Risk (declining)
- *Raoulia australis*..... At Risk (declining)
- *Raoulia parkii*..... At Risk (declining)

The lichen *Xanthoparmelia semiviridis*, which is an important component of the vegetation at the site, is also listed⁶ as At Risk (declining).



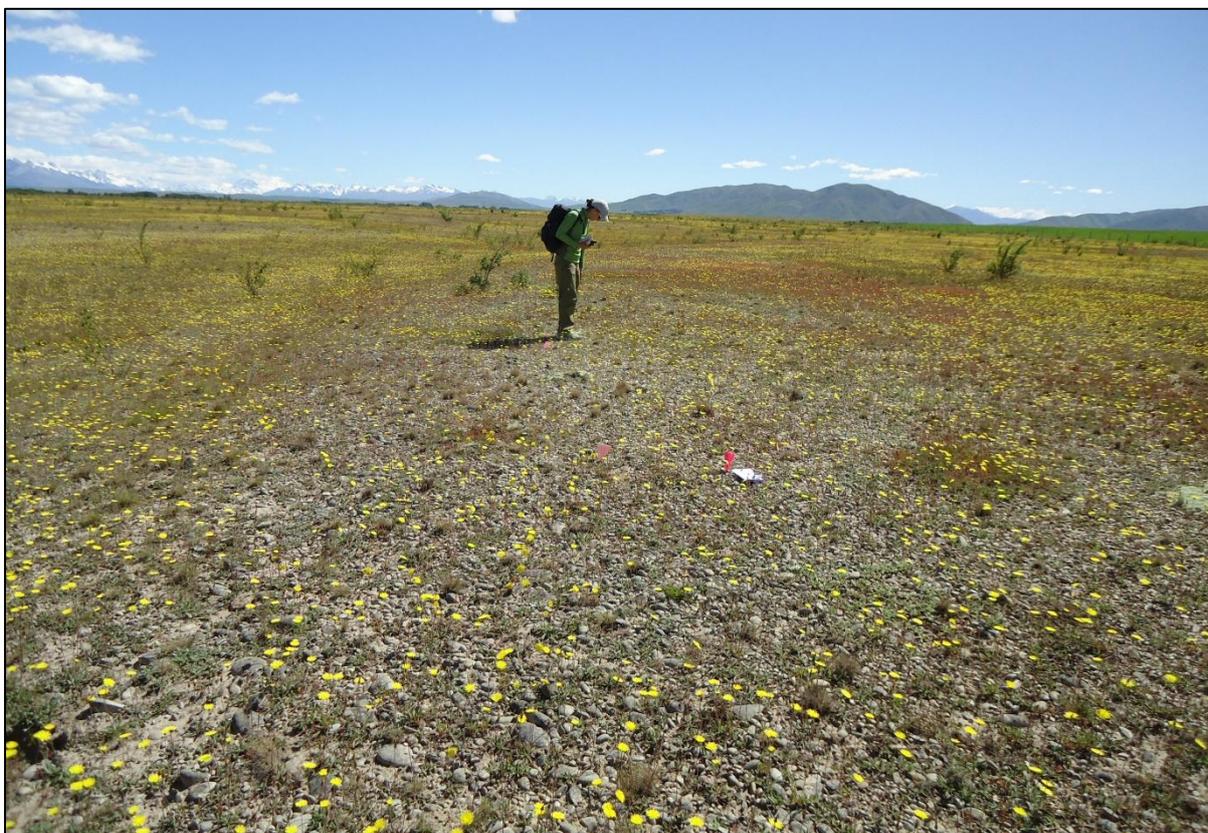
Lepidium solandri at the solar array site (Susan Walker photo).

⁵ de Lange, P.J.; Gosden, J.; Courtney, S.P.; Fergus, A.J.; Barkla, J.W.; Beadel, S.M.; Champion, P.D.; Hindmarsh-Walls, R.; Makan, T.; Michel, P. 2024. Conservation status of vascular plants in Aotearoa New Zealand, 2023. *New Zealand Threat Classification Series 43*. Department of Conservation, Wellington, New Zealand.

⁶ de Lange, P.J.; Blanchon, D.; Knight, A.; Elix, J.; Lücking, R.; Frogley, K.; Harris, A.; Cooper, J.; Rolfe, J.R. 2018. Conservation status of New Zealand indigenous lichens and lichenicolous fungi, 2018. *New Zealand Threat Classification Series 27*. Department of Conservation, Wellington, New Zealand.



A typical silty location at which the naturalised grass *Festuca filiformis* is common (Plot 6).



A typical stony site at which some of the notable indigenous plant species are typically present.

5.0 Ecological Assessment

5.1 Indigenous Vegetation

In the Mackenzie District Plan (MDP) definitions, ‘indigenous vegetation’ *“means a community of vascular plants, mosses and/or lichens that includes species native to the ecological district and many include exotic species.”*⁷ Vegetation at the solar array site, except possibly at areas directly adjacent to the pivot irrigator, meets the MDP definition for indigenous vegetation as it comprises a community of species native to the ecological district (regardless of the presence/dominance of exotic species).

The applicant’s ecological assessment challenges the MDP definition for indigenous vegetation.⁸ For completeness, vegetation at the solar array site also meets the earlier MDP definition for indigenous vegetation as the number of indigenous species exceeds 30% of the total number of species present: 52% of all species; 42% of vascular species.

5.2 Ecological Significance

In the Mackenzie District Plan definitions, ‘significant indigenous vegetation and significant habitats of indigenous fauna’ *“means areas of indigenous vegetation or habitats of indigenous fauna which: meet the criteria listed in the Canterbury Regional Policy Statement’s Policy 9.3.1 and Appendix 3; or are listed in Appendix I as a Site of Natural Significance.”*⁹

The site meets the criteria for a significant natural area because it supports:

- Indigenous vegetation or habitat of indigenous fauna that is typical or characteristic of the ecological district (Criterion 1).
- Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the ecological district (Criterion 2).
- Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened or at risk (Criterion 4). The site supports one Threatened and eight At Risk plant species; 50% of the indigenous vascular plant species recorded at the site are listed as Threatened or At Risk.
- Indigenous vegetation that occurs within an originally rare ecosystem (Criterion 6). The site is located on ‘inland outwash gravels’ which are listed as a rare ecosystem.¹⁰

⁷ Mackenzie District EPlan 14 November 2025.

⁸ AgScience Limited, 31 July 2025. Haldon Solar Project Ecological Impact Assessment, p40-41.

⁹ Mackenzie District EPlan 14 November 2025.

¹⁰ Williams, P.A.; Wiser, S.; Clarkson, B.; Stanley, M.C. 2007. New Zealand’s historically rare terrestrial ecosystems set in a physical and physiognomic framework. NZ Journal of Ecology 31: 119-128.

Further survey would likely reveal that the site meets other significance criteria, such as important habitat for indigenous fauna (Criterion 10). An At Risk (declining) bird species, banded dotterel (*Charadrius bicinctus*)¹¹, and a Threatened (nationally vulnerable) grasshopper (*Sigaus minutus*)¹² were observed during the vegetation assessment.

Mike Harding

10 December 2025



Convolvulus verecundus at the solar array site.

¹¹ Robertson, H.A.; Baird, K.; Elliot, G.P.; Hitchmough, R.A.; McArthur, N.J.; Makan, T.D.; Miskelly, C.M.; O'Donnell, C.F.J.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A.; Michel, P. 2021. Conservation status of birds in Aotearoa New Zealand, 2021. New Zealand Threat Classification Series 36. Department of Conservation, Wellington.

¹² Trewick, S.; Hegg, D.; Morgan-Richards, M.; Murray, T.; Watts, C.; Johns, P.; Michel, P. 2022. Conservation status of Orthoptera (wētā, crickets and grasshoppers) in Aotearoa New Zealand, 2022. New Zealand Threat Classification Series 39. Department of Conservation, Wellington.

Appendix 1 - RECCE Plot Data

Plant species recorded in the nine vegetation RECCE plots. Shaded rows indicate indigenous species. Percentage ground cover is indicated as follows:

- + = present but uncommon
- 1 = present
- 2 = 1-5% cover
- 3 = 5-25% cover
- 4 = 25-50% cover

Species name	Vegetation RECCE Plots (10m x 10m)								
	1	2	3	4	5	6	7	8	9
Vascular species									
<i>Acaena agniphila</i>	+								
<i>Aira caryophyllea</i>	3			3			1	3	
<i>Bromus diandrus</i>	2								
<i>Bromus</i> sp.	2							+	
<i>Carex breviculmis</i>	+		2	2				2	
<i>Cerastium fontanum</i>	3	2							
<i>Convolvulus verecundus</i>							1		
<i>Cuscuta</i> sp.								1	
<i>Echium vulgare</i>	+								
<i>Erodium cicutarium</i>	2								
<i>Erophila verna</i>	1	+							
<i>Festuca filiformis</i>	3	3	3	2	3	3	2	2	3
<i>Geranium brevicaule</i>						+			
<i>Hypericum perforatum</i>		+				2			
<i>Luzula rufa</i> var. <i>albicomans</i>				1					
<i>Microtis unifolia</i>						1		+	
<i>Muehlenbeckia axillaris</i>								4	
<i>Myosotis discolor</i>	2	2		1		1	+	+	
<i>Pilosella officinarum</i>	4	4	4	3	4	4	3	3	4
<i>Poa maniototo</i>	2	3							
<i>Raoulia parkii</i>						1	1	+	
<i>Rosa rubiginosa</i>	2	+				1	1	2	
<i>Rumex acetosella</i>	3	3	3	2	3	2	2	1	3
<i>Silene gallica</i>	2	+							1
<i>Thelymitra longifolia</i> (?)				1	1	2	1	1	1
<i>Trifolium arvense</i>	3	1						2	
<i>Veronica verna</i>	2	1	+	1	1		1	1	1

Non-vascular species									
<i>Cladia</i> species		+	3	3	3	3	3		4
lichen (crustose)		1		2	1	2	1		
lichen (foliose)		1			2		2	1	2
<i>Polytrichum juniperinum</i>		+	2	2	1			+	2
<i>Racomitrium ptychophyllum</i>		+	1	1					1
<i>Xanthoparmelia semiviridis</i>	1	+	2	3	3	3	2	2	3
Other Cover									
animal dung	1		1						
silt (% cover)	15	30	20	5	25	10	10	5	15
stones (% cover)	1	5	20	10	10	0	40	0	15

Appendix 2 – Species List

Plant species recorded at the parts of the site traversed by Mike Harding, Susan Walker and Marianne Marot. Abundance classes are:

- f = frequent
- c = common
- o = occasional
- r = rare

Scientific Name	Common Name	Abundance
Indigenous Vascular Species		
<i>Carex breviculmis</i>	a sedge	c
<i>Carex resectans</i>	a sedge	o
<i>Convolvulus verecundus</i>	a dryland convolvulus	r
<i>Geranium brevicaule</i>	native geranium	r
<i>Lepidium solandri</i>	a dryland cress	r
<i>Luzula rufa</i> var. <i>albicomans</i>	a woodrush	o
<i>Luzula ulophylla</i>	a woodrush	r
<i>Melicytus alpinus</i> agg.	porcupine shrub	r
<i>Microtis unifolia</i>	grassland orchid	o
<i>Muehlenbeckia axillaris</i>	creeping pohuehue	o
<i>Muehlenbeckia ephedroides</i>	leafless pohuehue	r
<i>Poa maniototo</i>	a grass	o
<i>Prasophyllum colensoi</i>	onion-leaved orchid	r
<i>Raoulia australis</i>	scabweed (a mat daisy)	r
<i>Raoulia parkii</i>	a mat daisy	o
<i>Thelymitra longifolia</i> (?)	sun orchid	c

Indigenous Non-Vascular Species		
<i>Cladia</i> species	lichens	f
<i>Hypnum cupressiforme</i>	a moss	o
crustose lichen	an unidentified lichen	c
foliose lichen	an unidentified lichen	c
<i>Polytrichum juniperinum</i>	wire moss	c
<i>Racomitrium pruinosum</i>	woolly moss	r
<i>Racomitrium ptychophyllum</i>	a moss	o
<i>Xanthoparmelia semiviridis</i>	a lichen	f
Naturalised (Exotic) Species		
<i>Acaena agnipila</i>	Australian sheep's bur	r
<i>Aira caryophyllea</i>	silvery hair grass	c
<i>Anthoxanthum odoratum</i>	sweet vernal	r
<i>Bromus diandrus</i>	riggut brome	o
<i>Bromus</i> sp.	an unidentified brome	o
<i>Bromus tectorum</i>	downy brome	o
<i>Cerastium fontanum</i>	mouse-ear chickweed	c
<i>Cuscuta</i> sp.	dodder	r
<i>Echium vulgare</i>	viper's bugloss	r
<i>Erodium cicutarium</i>	storksbill	r
<i>Erophila verna</i>	whitlow grass	o
<i>Festuca filiformis</i>	a grass	f
<i>Hypericum perforatum</i>	St John's wort	o
<i>Myosotis discolor</i>	grassland forget-me-not	c
<i>Pilosella officinarum</i>	mouse-ear hawkweed	f
<i>Rosa rubiginosa</i>	sweet brier	o
<i>Rumex acetosella</i>	sheep's sorrel	f
<i>Silene gallica</i>	catchfly	o
<i>Trifolium arvense</i>	haresfoot trefoil	o
<i>Verbascum thapsus</i>	woolly mullein	r
<i>Verbascum virgatum</i>	moth mullein	r
<i>Veronica verna</i>	spring speedwell	f

Appendix 3 – *Lepidium solandri*

This appendix provides further information about the observed locations of a threatened (nationally critical) dryland cress, *Lepidium solandri*, at the request of Lodestone Energy.

It is important to understand that the recorded locations are only those observed during a brief (five-hour) and incomplete search of the solar array site. Advice from Manaaki Whenua-Landcare Research is that adequate survey of this type of dryland site requires at least 28 person-hours per 100 hectares. The solar array site is approximately 320 hectares. A full survey, adequate to provide robust data to inform an assessment of effects, would require approximately 90 hours searching by ecologists with experience in the identification of dryland species.

The locations at which populations of *Lepidium solandri* were observed are listed below. Waypoints are illustrated in Figure 2. The size of each population was not assessed. The survey method was a time-limited search for the presence of notable plant species (not population size) at pre-determined locations.

- Waypoint 002..... 1380068E-5085223N
- Waypoint 008..... 1379586E-5085895N
- Waypoint 024..... 1379043E-5084800N

Figure 2: Route and Waypoints from Notable Plant Search, 20th November 2025

