ARDROSSAN NATIVE GRASSLAND

SITE MANAGEMENT PLAN 2021

Mick Durant & Adrian Shackley 2021.

Supported by the National Trust of South Australia through funding from the Northern and Yorke Landscape Board

ACKNOWLEDGEMENT OF COUNTRY

The Government of South Australia acknowledges and respects Aboriginal peoples as the state's first peoples and nations, and recognises them as traditional owners and occupants of land and waters in South Australia. Further, we acknowledge that the spiritual, social, cultural and economic practices of Aboriginal peoples come from their traditional lands and waters, that they maintain their cultural and heritage beliefs, languages and laws which are of ongoing importance, and that they have made and continue to make a unique and irreplaceable contribution to the state.

We acknowledge that Aboriginal peoples have endured past injustice and dispossession of their traditional lands and waters.

Furthermore, the Authors would like to acknowledge the Narungga people as the Traditional Custodians of the Ardrossan Grassland, and pay respect to their elders past, present and emerging.

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Contents

1 Introduction

In a small parkland within the Ardrossan township, bounded by Park Terrace, Jetty Road, Bridge Road and the Esplanade, is a significant native grassland which has been recognised for many years as an important botanical record of the original vegetation of the Ardrossan area. There is a rich history to discover in the early descriptions of the vegetation by Otto Tepper and the early surveyors of the Ardrossan township. The fact that over 80 native plant species still occur in such a small area is remarkable and gives an indication of the incredible biological diversity that existed prior to European colonisation and the change in utilisation of Australia's temperate landscapes. It is also of interest in relation to the land management practices of the traditional Narungga custodians of the area.

Native grasslands in temperate Australia have significantly declined in extent and condition since the arrival of European agriculture and livestock and are now among the most threatened ecosystems in the country. On Yorke Peninsula these more sparsely treed areas were the first to be targeted for livestock grazing, and subsequently many areas were converted to cropland.

Temperate grasslands are usually dominated by a diverse mix of perennial native grass species and a high diversity of herbs and lilies. They are generally treeless although sparse trees and shrubs may occur. In many instances the treeless situation may be the result of long-term burning strategies of traditional custodians of an area and this has been widely discussed in research and academia. This is likely to be the case around Ardrossan where trees have been widely planted in previously treeless areas in recent times, without any obvious restrictions on growth.

In South Australia the common grass genera in native grasslands include *Austrostipa* (spear grasses), *Rytidosperma* (wallaby grasses), *Themeda* (kangaroo grasses), *Enneapogon* (nine-awn grasses) and *Aristida* (three-awn grasses). On Yorke Peninsula, grasslands are naturally rare and tend to have a significant cover of Irongrasses (*Lomandra* spp.) and various sedges (e.g. *Gahnia lanigera, G. deusta, Lepidosperma viscidium, L. congestum*), particularly from Ardrossan to the south. In the early accounts of the vegetation on Yorke Peninsula, many of these sedge and tussock species are referred to as black grasses.

The recent Northern & Yorke Coastal Management Action Plan (Durant, Ling & Hope 2020) recognised the uniqueness of the remnant grasslands around Ardrossan and recommended action to 'Develop a specific management plan involving the local community, interest groups and Council'. The Action Plan also assigned a "High priority" to this action due to the significant and ongoing threats to the integrity of the site.

It is hoped that this Plan will provide managers, botanists and the general community with sufficient guidance to ensure that the area known colloquially as the 'Ardrossan Grassland' will persist and hopefully improve in condition into the future. The Authors would also like to see the area become known by an appropriate Narungga name and consultation for this is underway.

This work has been instigated by the Friends of Park Terrace and Esplanade Reserves Ardrossan with sponsorship support from the National Trust of South Australia. Funded by the Northern and Yorke Landscape Board through the Grassroots Grant Program 2020.

Yorke Peninsula Council is currently developing a Coastal Management Strategy covering the main coastal reserves managed by the Council, including the area covered by this plan. Background from this draft Strategy has assisted the development of this plan, including an August 2020 vegetation survey by Sonia Croft. We would particularly like to thank Yorke Peninsula Council staff Stephen Goldsworthy and Deb Furbank for their assistance in the preparation of this plan.

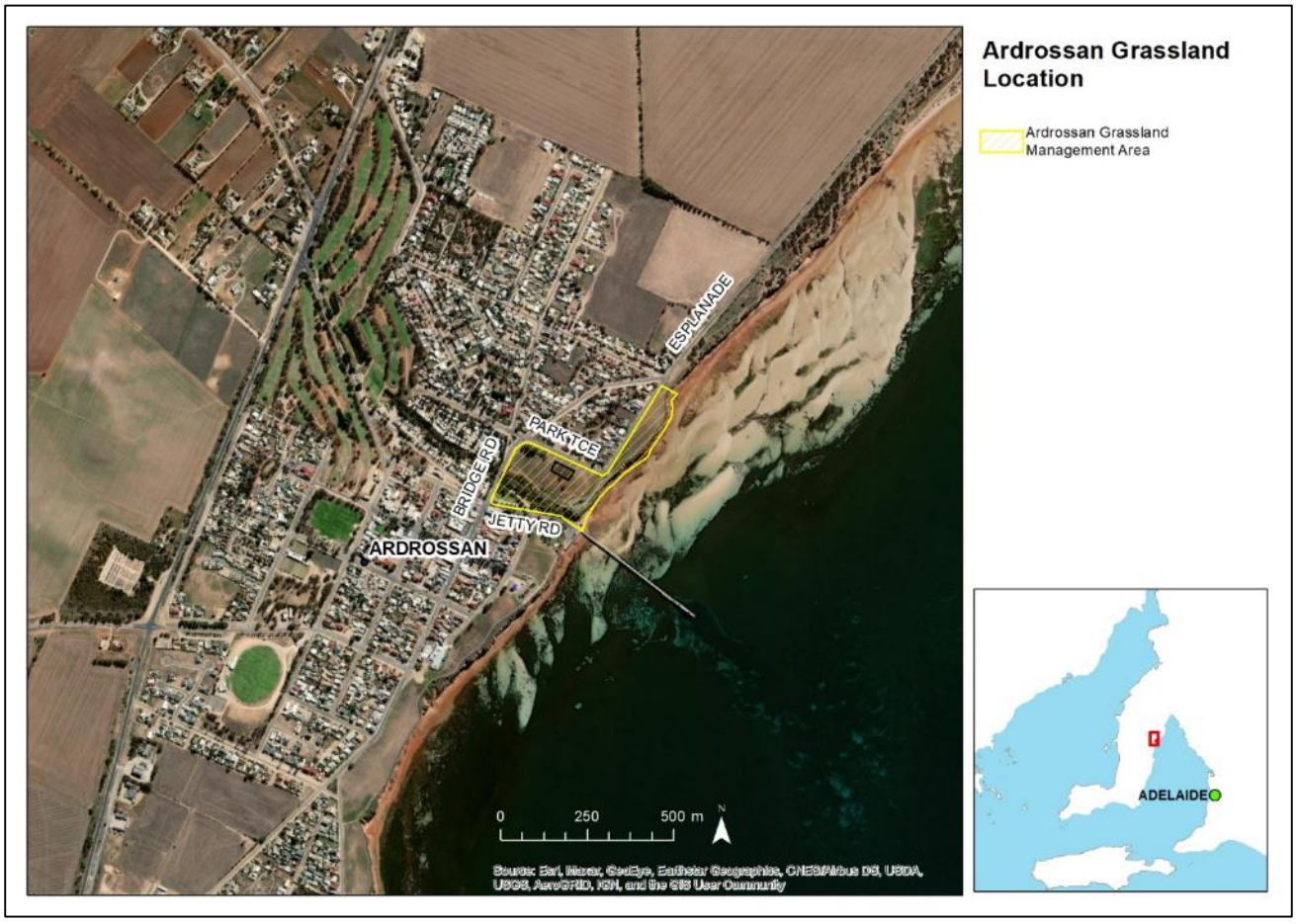
2 Site Details and Management Context

2.1 Location

The Ardrossan grassland is located toward the northern part of Ardrossan township, north of Clay Gully which is the watercourse running through the golf course and caravan park to the coast. The most significant remnant vegetation occurs in the open parkland bounded by Park Terrace, Bridge Rd, Jetty Rd and Clay Gully and the coastal cliffs. There is also a significant narrow grassland remnant on the eastern side of the Esplanade.

Map 1 below shows the general location of the site and a loosely defined management area which will be referred to interchangeably as the Management Area, the Project Area or the Ardrossan Grassland in this Plan.

Figure 1: Ardrossan Grassland Location



2.2 Land Information

The Management Area covers approximately 6.8 hectares and is comprised of parts of five Sections in the Hundred of Cunningham (S355, S360, S308, S405 and S414) as shown in Figure 2. All of the land is Crown land with the relevant history of dedications under the various Crown Lands acts described below.

In 1918 the Ardrossan Harbor based on the original jetty was gazetted and an area now comprising Sections 355 and 360 Hundred of Cunningham were dedicated as a reserve for Harbors Board purposes.

In February 1970 Section 405 Hundred of Cunningham was re-dedicated as a reserve for park lands purposes along with other major park lands in the Ardrossan. The Central Yorke Peninsula Council at the time was assigned care, control and management of this Section.

In March 2005 sections 355 and 360 were dedicated as a Reserve for car park, recreation, public jetty and access purposes under the care, control and management of the District Council of Yorke Peninsula, subject to the same terms and conditions as are contained in Memorandum of Lease 8914342. The lease deals with management of the jetty only and has minimal relevance to section 355 which contains most of the small car park near Clay Gully and the short access road from Park Terrace/Esplanade.

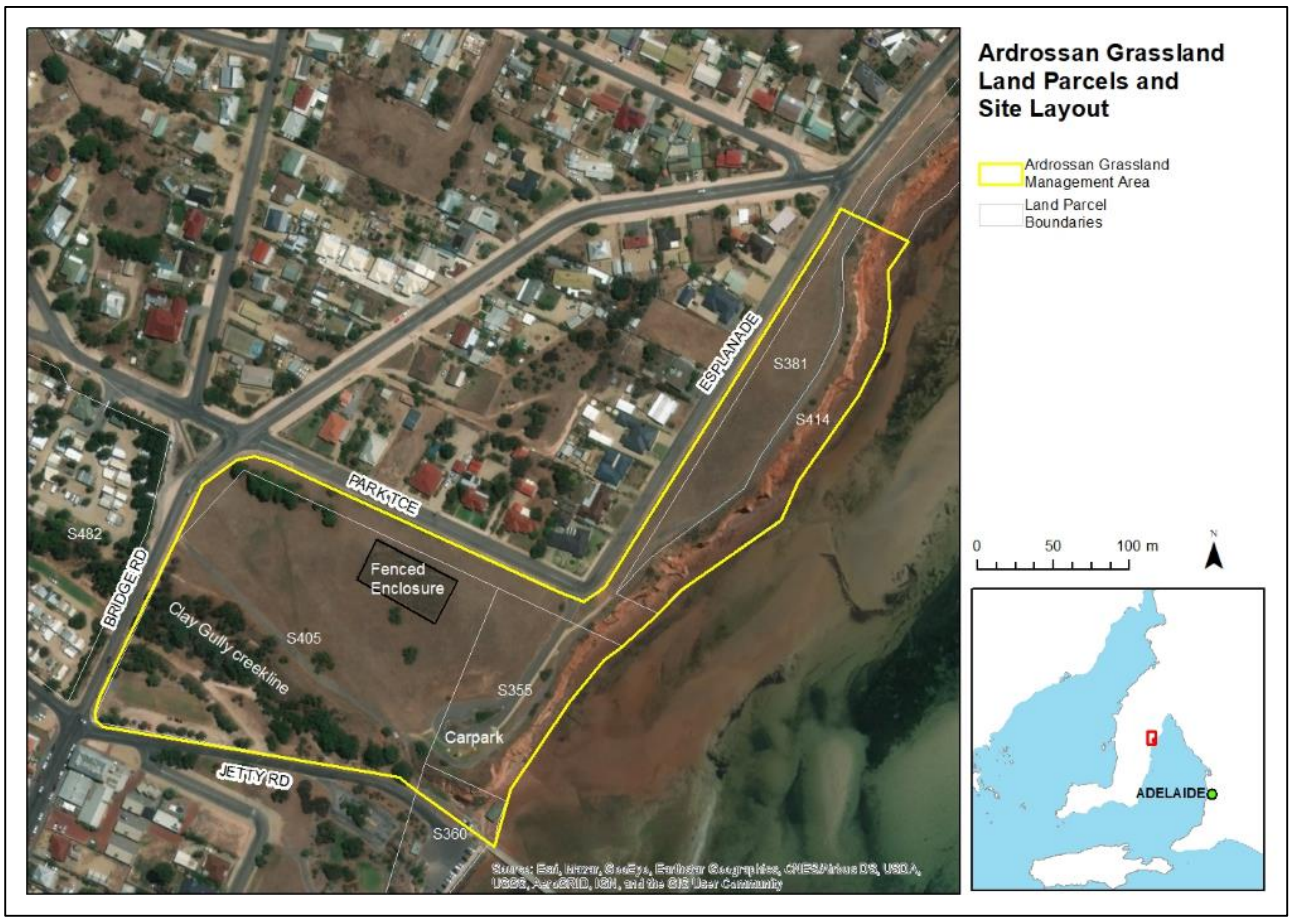
Section 381 is Crown Land which has never been subject to dedication and remains under the control of the Minister responsible for Crown Lands. Section 414, being the coastal reserve adjacent section 381, is not subject to dedication and remains under the control of the Minister responsible for Crown Lands.

The site is part of the traditional lands and waters of the Narungga people and Native Title exists over the majority of the site apart from Sections 355 and 360, related to the Harbor reserve. Native title rights in the area are 'non-exclusive" rights meaning that public access rights remain unchanged and management by Council continues. Yorke Peninsula Council undertake the majority of the management actions on the site.

2.3 Site Features and Layout

The Project Area consists of a gently sloping clifftop with a mild southerly aspect leading down to a moderately deep creekline (Clay Gully) and a small section of flat land on the corner of Bridge Road and Jetty Road. There is also a narrow strip of flat clifftop land heading north along the coast.

Figure 2: Project Area and Site Features



The main infrastructure features of the site include:

- Sealed carpark and access road in the south east corner
- Gravel pathway following the northern side of the gully from the carpark to Bridge Road
- A fenced enclosure near Park Terrace which was installed for conservation purposes
- Several large Aleppo Pine trees on the corner of Bridge Rd and Park Tce
- A storm water outlet just south of the pine trees
- Clay Gully with a culvert under Bridge Rd and various native tree and shrub plantings
- Flat section of land on the corner of Jetty Rd and Bridge Rd with a walking trail and used for car parking
- A fence running parallel with the coast with native tree and shrub plantings on top of the eroding cliff.

2.4 Stakeholders

Key stakeholders in the future protection and management of the site could include:

- Local community and residents (e.g. Ardrossan Progress Association, Friends group)
- Narungga Aboriginal people and organisations (e.g. Narungga Nations Aboriginal Corporation, Narungga Aboriginal Progress Association)
- Yorke Peninsula Council
- Northern and Yorke Landscape Board
- The Department for Environment and Water (including Coast Protection Branch and Native Vegetation Council)
- Environmental Non-Government Organisations
- Australian Plant Society (NYP branch)
- National Trust of South Australia
- Ardrossan Museum
- Local schools (Ardrossan Area School)
- Yorke Peninsula Tourism

2.5 Relevant Protections and Legislation

The principal legislative protection for the vegetation at the site is the Native Vegetation Act 1991. Under that legislation all native vegetation is protected although applications for clearance can be made. However, in the case of the Ardrossan grassland the vegetation would be deemed an Intact Stratum meaning that any clearance would be Seriously at Variance with the Principals of the Act. Hence clearance for any reason (apart from a Major Project) would not be approved by the Native Vegetation Council.

Other legislation that directly provides protections includes:

- National Parks and Wildlife Act 1972 (plants and animals listed as threatened under Part 2)
- Landscape South Australia Act 2019
- Coast Protection Act 1972
- Native Title Act 1993
- Aboriginal Heritage Act 2006
- Planning and Development Act 2020

3 Historical Context

3.1 Aboriginal Land Management

The Yorke Peninsula region is the Traditional Land of the Narungga Aboriginal people and custodianship continues today. While there many accounts of European encounters with Aboriginal people around the Peninsula, including Ardrossan at the time of colonisation, there is relatively little written detail on Narungga land management practices and how this influenced ecology of the Peninsula. There are however Narungga people who know this land and could provide valuable information.

Certainly, the coastal plain at Ardrossan was actively managed for thousands of years before Europeans arrived and it is highly likely that this management, and in particular the application of fire, influenced the open nature of the vegetation.

3.2 History of Ardrossan District, Township and Parklands

The original pastoral lease around Ardrossan (No 232 issued 1 January 1852) was to William Sharples, for 14 years at an annual rent of 10 shillings per square mile for c. 27 square miles (see Figure 3). As well as coastal grassy areas, Lease 232 included an area west of Price (Winulta Plains) which was subsequently transferred to Edmund Bowman in May 1856. In 1859 a new Lease 232 was issued to William Bowman, Edmund Bowman and Edmund Parnell and another was issued in October 1868 to William Bowman, Parker Bowman and Edmund Bowman, renewed in 1870 at one pound eight shillings and sixpence per square mile. The lease was resumed in January 1873 for sale for farming.

Figure 3: Early pastoral leases in the Ardrossan district (from SLSA map C-1021 N, dated c. 1860.
Note: the map is an approximation based on limited information.

data).

Formation of the Ardrossan township.

The Hundred of Cunningham was established in 1873 and included setting out the township of Ardrossan. Park lands were designated around the town centre bounded by North, South, East and West Terraces. The Hundred Plan dated 1876 is reproduced in Figure 4 and shows the first layout of land parcels.

The Rev. Robert Kelly wrote an article in 1922 recalling experiences on Yorke Peninsula in the first part of the 1870s. The following excerpt is from Sat 14 January 1922 The Pioneer (Yorketown) (source: Trove).

Page 4 OLD PENINSULA DAYS. BIG ESTATES CUT UP.

> "The Bowmans reigned at Parara, and the copper mine of that name was managed by Capt. Tregoweth, a burly Cornishman…….. All there was of Ardrossan was a few score of white pegs among the tussocks, but in less than four years it became a solid-looking little town with excellent prospects." *The significance of the reference to "tussocks" follows later*.

Another early report on the town in the Adelaide Observer Sat 15 August 1874 (Page 10) covered a ship visit with a government Minister as follows.

> MINISTERIAL INSPECTION OF PORT WAKEFIELD AND ARDROSSAN. The steam being up, we were not long in making a start, and having got clear of the shallows steered a direct course for Ardrossan on the opposite coast. This is the name of a township recently surveyed and sold, at a spot about two miles north of Messrs. Bowman & Parnell's Parara Station, and within the same distance of the Parara Mine. The locality has been chosen on account of its being the most suitable place for a jetty to accommodate the numerous settlers on the rich lands of Yorke Valley. At daylight on Saturday morning we found by the peculiar bank of red clay cliffs which were in view that Captain Ferguson had been very close to the mark in his calculations, and after a few minutes' steaming we anchored within half a mile of the shore, and put off in the dingy for a small steep beach, which afforded a favourable landing-place.
>
> Clambering up the cliffs, lines of white survey pegs indicated what is to be the town of Ardrossan. It is most pleasantly and advantageously situated, as beside being the outlet for Yorke Valley there is good wheat land along the coast on either hand, and if the mine should realize the expectations entertained of it, we shall ere long see a considerable population at Ardrossan. The site is an admirable one for a jetty, as the requirements of calm water and good anchorage are abundantly satisfied. A pool of fresh water at the bottom of the clay gully being covered with ice is sufficient to show the self-denying zeal of the explorers, who on their return were glad of a cup of hot coffee, which thanks to the steward they had not long to wait for.

Photo: Current view from the mine lookout looking out across what was once the coastal grassland plain of Ardrossan.

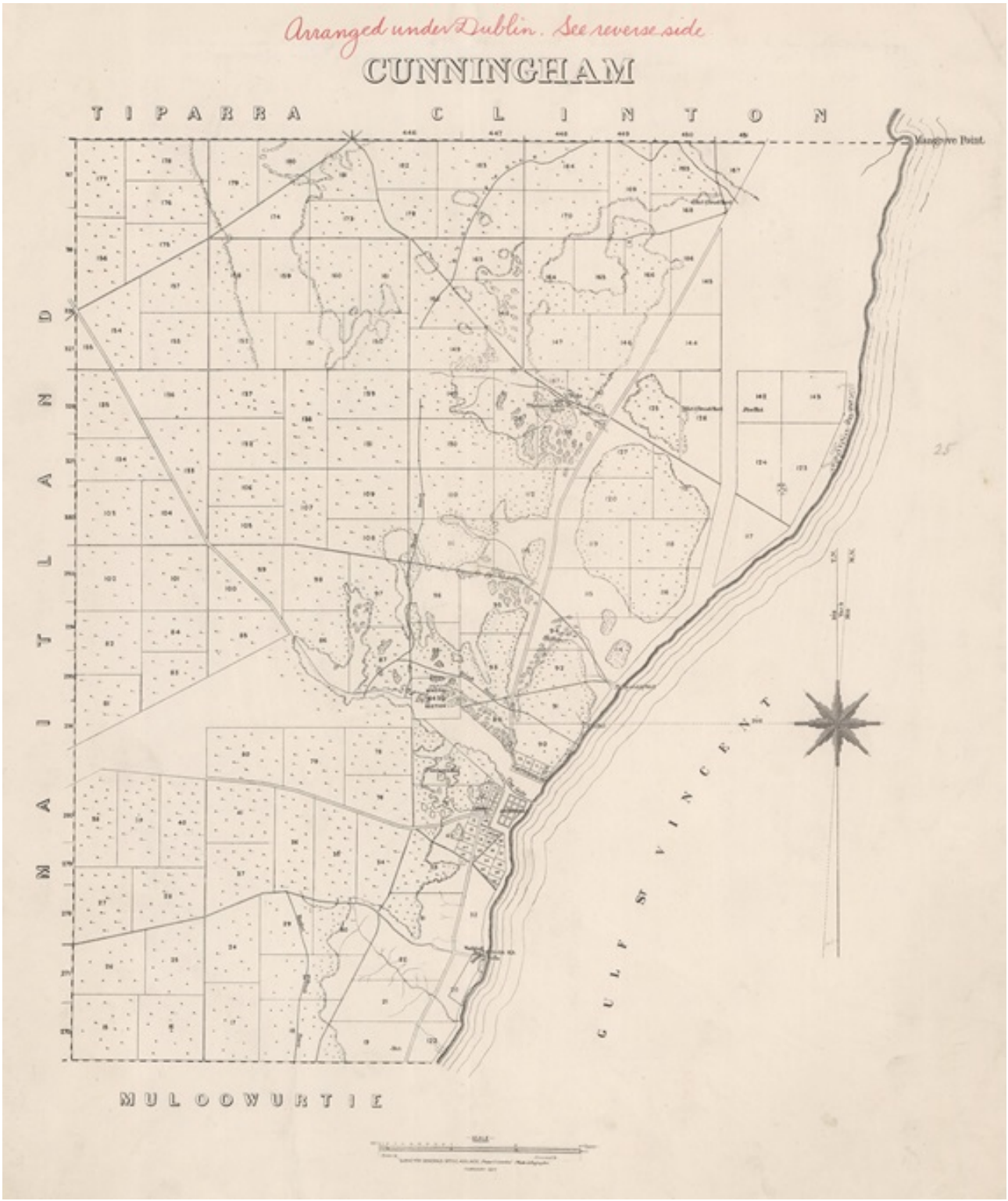


Figure 4: Early Map of the Hundred of Cunningham, 1876

Figure 5: Left: Ardrossan town plan 1883 post jetty construction showing the reservoir constructed in Clay Gully and the areas of taller Mallee etc vegetation and open plain. Right: Town plan 1895 showing 4 new suburban blocks on Park Terrace and also showing Water Reserve area (W. Con. Res.)

Following the initial layout of the town, four additional suburban blocks were created between what is now Park Terrace and High Street in 1886. Later these large blocks were divided for the housing blocks now present (see Figure 5 above). This decision upset Ardrossan residents as the Adelaide Observer reported on Sat 11 December 1886 Page 16:

ARDROSSAN. December 8.

> A large and influential meeting was held in the Ardrossan Institute on Tuesday night with regard to the sale of working men's blocks in the vicinity of the township. The meeting regretted the action of the Commissioner of Crown Lands, and resolutions were passed urging upon Mr. W. H. Beaglehole, M.P., to lay the matter before him with a view to withdrawing the three allotments, Nos. 256, 257, and 258, from sale, being the only park lands on the north of the township.

The request was not agreed to and the lots remained. There was also a large area of crown land set aside in the catchment of what was called Clay Gully – the creekline to the north of North Terrace.

Local government in Ardrossan

Local government in Ardrossan did not commence until 1888 when it became part of the original District Council of Yorke Peninsula which included Maitland. Until then the Commissioner of Crown Lands managed the park lands. The SA colonial government was responsible for funding early works such as the jetty in 1877, the road and culvert across Clay Gully (early 1880, cost 270 pounds – see Figure 6) and water tanks and reservoirs for town water (a small reservoir of 52,000 capacity gallons was built on Clay Gully in the current golf course land around 1877).

Figure 6: Ardrossan - approach over a bridge [built c 1880] in 1907. - State Library of SA - B 11048

At some time after the original small reservoir was built, a larger one was constructed. In March 1891 a substantial area of Crown Land extending out from the north-west edge of the town park lands [being the main local catchment area for Clay Gully] was officially declared a water conservation reserve as part of attempts to provide a town water supply.

In October 1893 the Ardrossan park lands were dedicated as a reserve for park lands. The District Council of Yorke Peninsula was assigned care control and management.

By 1911 after many years of problems with the town water supply, which included carting of water from various tanks and the wells at Tiddy Widdy, a connection was constructed to Clinton which provided water from the Beetaloo Reservoir to the town. Subsequently the Water Reserve in the Clay Gully catchment was removed and blocks of land sold off along the Arthurton Road (shown in Figure 7 below).

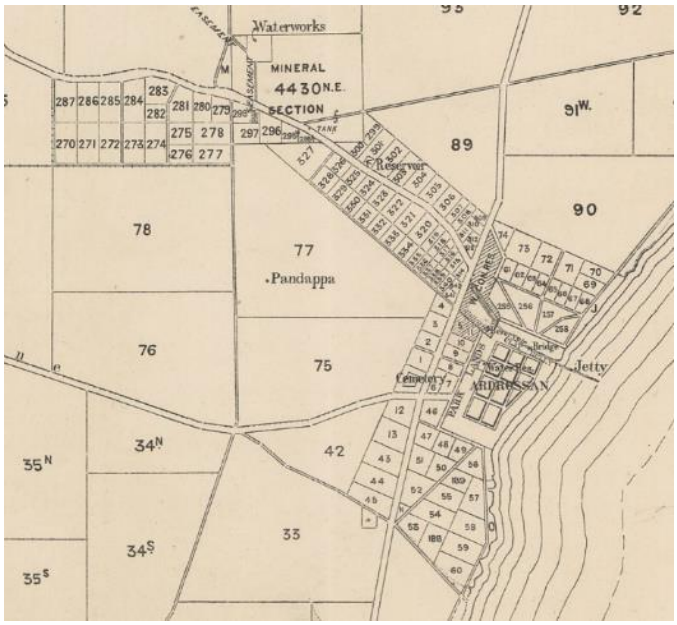


Figure 7: Plan of Ardrossan town 1914

3.3 Historical Accounts of the Vegetation Around Ardrossan

The Hundred of Cunningham maps and associated Survey Diagram Books dating from as early as 1872 contain good information on the vegetation present at the time.

The Hundred Map shows a delineation line and markings which distinguish between the Mallee Scrub which was common in the locality, and the open plains toward the coast.

Figure 8 shows the Hundred map with colours added to highlight the vegetation types described. The white areas show the vegetation described as Mallee Scrub and the yellow areas show the open plains country (usually described as "black-grass" [i.e. *Gahnia, Lepidosperma and Lomandra spp.*]) based on surveys conducted up to 1876.

Also on the map land near Price changes from grass plain to a saltbush and samphire plain with some native pines (*Callitris gracilis*) and Mallee on higher ground near the town (area coloured reddish brown and with likely transition areas from grass plain to saltbush plain).

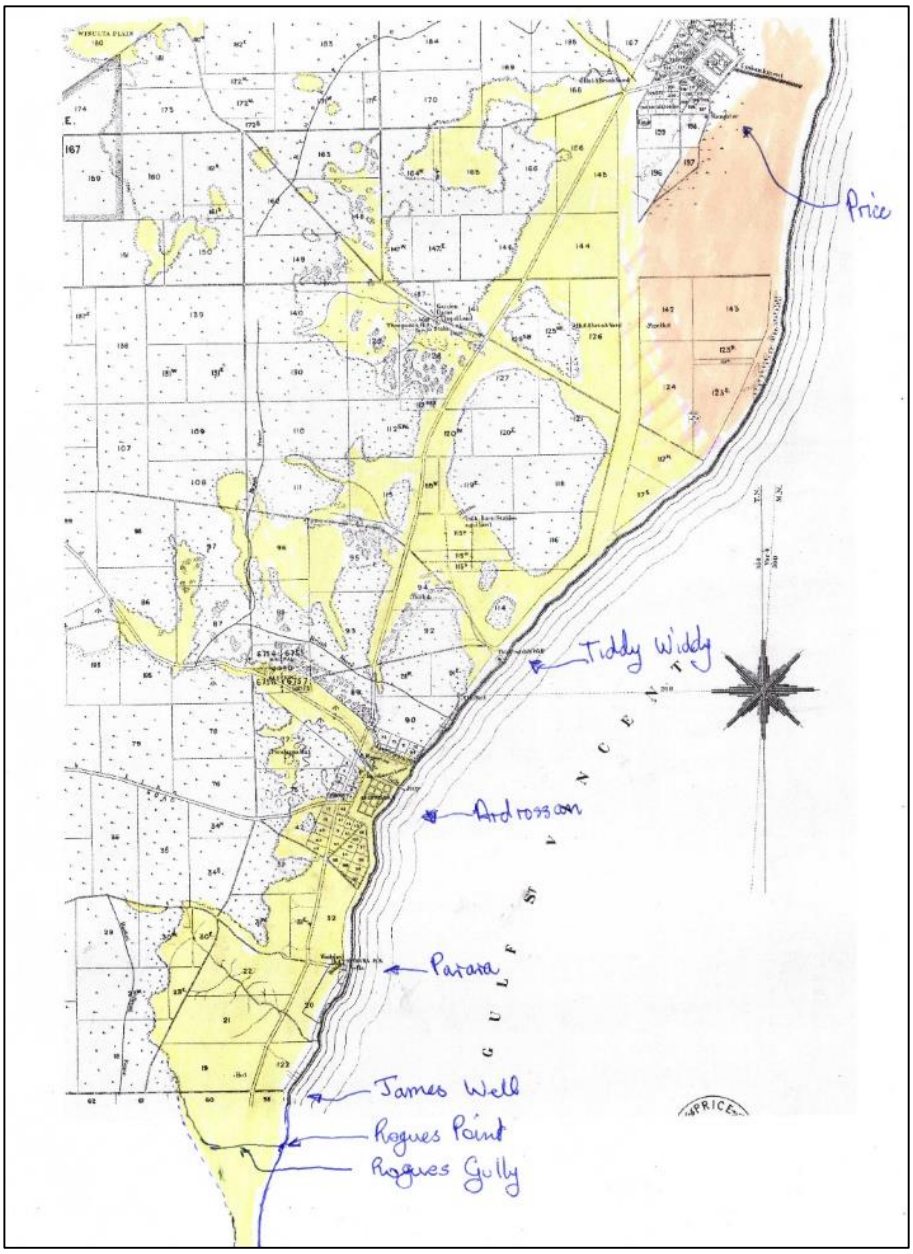


Figure 8: Hundred of Cunningham Map with vegetation types highlighted (courtesy of A .Shackley)

General details of vegetation are also often found in the surveyors' Diagram Books. Figure 9 shows some of the detail these books provide. The closest example of vegetation related to the Park Terrace site are contained in Hundred of Cunningham Diagram Book Page 32 [1886]. Sections 255-257 are described as containing "Fair and open black-grass cutting-grass red and brown clayey loam limestone rubble". Section 258 is described as "Open black-grass cutting grass soil light loam clay limestone and red loam in patches".

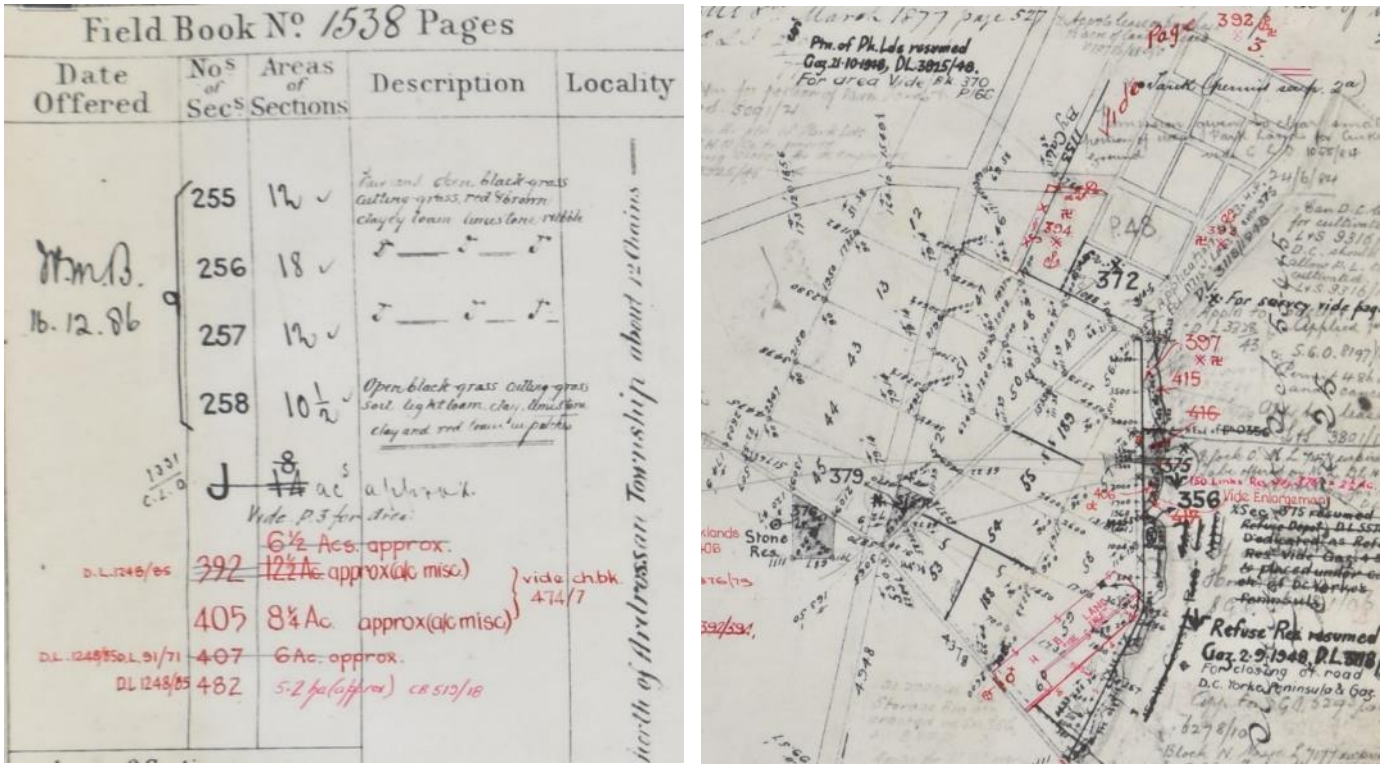


Figure 9: Examples of the early surveyors' Diagram Books for original blocks 255-8 on Park Tce and suburban blocks south of Ardrossan town centre containing useful descriptions of the vegetation at the time.

The Hundred of Cunningham Diagram Book Page 11 [1876] excerpt (Figure 9) includes all the suburban blocks south of Ardrossan centre and also provides a vegetation description. The surveyor's comments are "All the Suburban sections are fair arable land open Blk (Black) grass plains." This is land south of the town centre and includes the current grain storage and port area.

The township land near the Yorke Highway (e.g. sections 12-13, 43-45 on DB page 11 excerpt above) is described as a mix of Mallee scrub and open land. The Cemetery land [not numbered in above Figure 9 but in the NW corner of Yorke Highway, Maitland Road intersection] was and still is mostly Mallee scrub.

Maps and descriptions such as above describe almost all of the land around Ardrossan. The exception is the parklands and the town centre which were not sold in the same way.

3.4 History of Plant Records: Otto Tepper Collections

Ardrossan has a special place in the botanical history of Yorke Peninsula, principally associated with Johann [Otto} Tepper. Tepper taught at the new Ardrossan school in 1878-81 and recorded in a Royal Society of South Australia article in 1880 more than 500 native plant species in the wider region, almost all from Ardrossan or close by. Tepper also wrote articles related to the coast, fossils, insects and reptiles around Ardrossan.

Tepper, in relation to where he collected, noted that "Being limited in time and means of locomotion, the area examined is necessarily small, mainly comprised within a radius of three or four miles [of Ardrossan]". Tepper clearly walked out to get most of his specimens from Ardrossan and presumably took a horse and cart on the more extensive trips he made to Maitland, the Kilkerran coast, Muloowurtie and the coast south of Ardrossan to Black Point.

The particular area around Ardrossan to which this management plan relates was described by Tepper as "coast-plain" as follows- [ ]italics comments added by authors:

> "The coast-plain and other open patches are thickly studded with large tufts of grass-like Cyperaceae and Xerotideae. The most common is *Cladium lanigerum*, [*now Gahnia lanigera*] with cylindrical, needle-like, pungent leaves, associated with four species of Xerotes [*Lomandra* spp. irongrasses] and one of *Lepidosperma* (undetermined) [*Lepidosperma congestum* or *viscidum*], the latter distinguished from the preceding by its flat, leaf-like flower-stalk. The most common of the Xerotids is *X. effusa* [*Lomandra effusa*]. All these are almost useless as food for domestic animals, and lend to the landscape a weird, forbidding aspect.
>
> Among their tufts other grasses find a precarious domicile, of which *Stipa scabra*, *S. crinita*, *Danthonia penicillata*, *Poa caespitosa*, and *Agropyrum scabrum* are the most conspicuous, together with the introduced *Festuca bromoides*, *Koeleria phleoides*, and *Hordeum murinum*. *Anthistiria ciliata*, the "kangaroo grass," is in the whole very scarce. Wherever a fire sweeps away the scrub, *Stipa semibarbata* and *S. aristiglumis* appear in profusion, often growing a stalk three to five feet high, producing a singular effect at certain seasons by their large waving seed-plumes.
>
> During the season of spring these grasslands are enlivened by the thousands of yellow and white flowers of many Composites, Goodenovaea, and Orchids, the blue of *Wahlenbergia gracilis*, the blue or pink of *Dampiera rosmarinifolia*, and many others; few only, among which is *Stackhousia linarifolia* [*Stackhousia monogyna*], being at all remarkable for any pleasant scent.
>
> Of shrubs, dotting the open country near Ardrossan, &c, the most remarkable are the low, dense *Styphelia patula* [*Acrotriche patula*], with dark green, glabrous, myrtle-like leaves and red edible berries; Hakea rugosa and the unavoidable Bursaria spinosa, with its large white clusters of snow-white flowers, but very spiny branches.
>
> *Grevillea huegeli* and a variety of *Eremophila brownii* [*Eremophila glabra*] , both with fine red flowers, occasionally find their way from the hills to the plain, increasing the variety agreeably in company with the much smaller Pimeleas, dressed in a profusion of white or yellow." [*page 29*].

This coast-plain described briefly by Tepper is the "open Black Grass plain" described by the land surveyors. As well as "Black Grass" which describes the *Gahnia* and similar species, the surveyors also mention Silvergrass and Whitegrass as well as porcupine grass in a few spots (not near Ardrossan). Silvergrass and Whitegrass are not commonly used names for native grass species but likely refer to spear grasses and wallaby grasses. Silver

grass is also a name applied to introduced *Vulpia* species and this could be the reference – it is mentioned by Tepper in 1880 as present (*Festuca bromoides*) but it is very unlikely this weed had a significant presence in the areas where it is mentioned, which had very little impact of grazing or farming at the time. The term "porcupine grass" usually refers to *Triodia* species, also referred to as spinifex. Tepper in his 1880 article refers to "*Festuca irritans*" as only present in inland places including Kilkerran but does also have a specimen in Melbourne Herbarium described as *Triodia scariosa* from Ardrossan.

For the purpose of the management plan we have produced and interpreted data from Tepper. That is no easy task as the names of the majority of the plant species in the 1880 article have changed; many changes related to families, genus and species of the plants have occurred.

For example, Tepper recorded 4 species of spear grasses related to the Ardrossan area and 1 more inland. At the time these were the only ones recorded for the whole of Yorke Peninsula. And there were only 10 recorded for the state. These numbers have now increased a lot as more detailed study has meant new species have been described. Our current lists for the Park Terrace area show 12 spear grass species and there are close to 40 recorded for the state. With Bluebells (*Wahlenbergia* spp.) Tepper recorded 1 species (with 2 varieties). Now our lists show 4 species. Other separate species or varieties described by Tepper have now been included into a single species.

Tepper recorded general localities for his species – coastal, inland hills and inland plains and in some cases specific inland localities. With Ardrossan we are interested in Tepper's "coastal" area. Tepper listed about 220 species as either coastal or general (which included coastal). The Park Terrace area would have been part of what Tepper called the "coast plain". Tepper said "The width of the Ardrossan coast-plain is about a mile." In addition to the higher areas such as at Park Terrace, Tepper's coastal plant list included plants from the sandy beachfront and the coastal cliffs. We have excluded these plants where appropriate from relevance for the Park Terrace Project Area but clearly many of them are relevant for assessing vegetation on the coastal cliffs on the eastern side of the site.

Appendix 1 provides a list of species Tepper recorded that are relevant to his "coast-plain" area and our site as species that would be expected or likely to be in a native grassland. The benefit of Tepper's records are that many species that have not been recorded at the Park Terrace site or indeed elsewhere in or near Ardrossan by other botanists have potential to be reintroduced to the area based on Tepper.

We have developed a list of about 100 species in addition to the c. 80 recorded as remnant on site which would be suitable for planting for an Ardrossan grassland area. See Appendix 1. There are approximately a further 100 species which might be considered for planting for an Ardrossan grassland area but lower priority. Or for planting in a botanical garden setting in Ardrossan away from the project area. Again, almost all of these species are based on the Tepper article and on Herbarium records of Tepper. An extraordinary legacy.

Tepper went on to work for the SA Museum for about 30 years as a collector of plants, insects and other invertebrates and wrote extensively on these and other topics in South Australian publications and in some small booklets (see Bibliography for some). His connection with Ardrossan is a wonderful opportunity to promote the flora and fauna of the area through interpretative signs on this site and elsewhere on the Walk the Yorke path, exhibitions in the Ardrossan Museum, Ardrossan Area School or other places.

Figure 10: Digital copy of a Tepper "type" specimen in Melbourne Herbarium – Goodenia pusilliflora collected from "Yorke Peninsula". Courtesy of the National Herbarium of Victoria.

4 Site Description and Conservation Values

4.1. Uniqueness and conservation context

The historical descriptions and accounts by Otto Tepper are not widely known, however the Ardrossan Grassland area has been known to contemporary botanists and environmental managers for many years as an important remnant of the original vegetation around Ardrossan, and probably the most significant 'true' native grassland remnant area on Yorke Peninsula.

Recent Botanical Recognition

A Department of Environment Biological Survey report in 1994 (published 2000) said the site was "of significance at a state level, due to its uniqueness and because it contains four species of conservation significance at a state and regional level" (p57). The report went on to say "The plants of conservation significance combined with the colourful display of Compositae (daisy) species in spring, make this area not only botanically attractive but also important in terms of conservation. This area, if managed for the purpose of conservation, could provide a possible tourist attraction for the Council whilst preserving a unique vegetation association" (p60). A small area in the open parkland was later fenced for protection.

Context within the Broader Grasslands of the Ardrossan Area

The Authors have estimated that there was approximately 4,000 hectares of grassy plains vegetation in and around Ardrossan existing prior to European colonisation. Possibly 100 hectares (2.5%) of the current vegetation could be said to be remnant areas. However, with minor exceptions, and apart from the Park Terrace site, all retain only moderate numbers of native species. The Park Terrace parkland area contains around 4 hectares (0.1% of the original grassland) and is the only good quality remnant, therefore affording it exceptionally high conservation significance and botanical interest.

A site inspection of some original grassy areas around Ardrossan was conducted by the Authors in April and May 2021 with the assistance of a number of landowners south of the current dolomite mine. The visit confirmed that the areas shown as open land in the Hundred maps still contain only very limited remnant trees and shrubs (a few in creeklines close to the coast and a few elsewhere in gullies and creeklines). Apart from areas of stony and steep topography, most of the areas which appear uncultivated in recent aerial photographs, also appear uncultivated on the ground. But while the uncultivated areas had a moderate range of native species, there was a low cover of native grasses and other grassland species. The likely reasons for this are the accumulated impacts of grazing (including rabbits), weed invasion and likely additional impacts from use of fertilisers and spreading of pasture species in some areas. An assessment in spring after good rain would produce a greater number of native species and many additional weeds.

The road reserves in this grassland plain area have also lost most of their original grassland character through a combination of weeds, rabbits, and no doubt some stock grazing, especially during droughts and the Depression. Cultivation and widespread planting of trees and shrubs on road reserves have also occurred.

A few stony rises in paddocks on the west side of the grassland area retain a moderate diversity of grassland species. The only publicly accessible or viewable areas apart from the Park Terrace/Esplanade site which provide some indication of original appearance are sections of Bosh Road west of Stevies Road, a tiny section of road reserve where Rogues Gully crosses Yorke Highway (south-east verge) and private land near the corner of Arthurton Road and Kenny Road (north of the planted road verge revegetation). There are also small areas in the coastal Crown land reserves near the main port and further south. In total these areas are smaller than the project site and each contain much less than half the species diversity.

There are some other small remnant areas of significance in Ardrossan township. A small section of Clay Gully opposite the Golf Course clubhouse had 20 native species present on an April 2021 visit. The creekline in the

Ardrossan Caravan Park contains some 30 native species (mainly hardier shrubs). The cliff-face edge of the main town park lands and port, and parts of the coastal park lands away from the fenced cliff area, contain a similar number of grassy ecosystem species and additional shrubs.

Why has the Grassland Persisted?

The fact that the remnant vegetation is a grassland and resembles an open urban park may have helped it slip under the radar. Undoubtedly the regular mowing of the site by the Council, while not intended for biodiversity enhancement, has helped maintain the perennial grass basis to the vegetation and the perennial herbs. The regular mowing has also restricted the proliferation of native shrubs and weedy shrubs. The fenced enclosure contains a higher cover of shrubs which appears to be why the site was selected.

Additional Values of the Site

In addition to the intrinsic natural and botanical values, the project site has potential to provide a native seed resource due to the high concentration of daisies, grasses and goodenias in particular. Seed collected from the site has a monetary value and could be used for grassland restoration and enhancement projects in Ardrossan and elsewhere in the region.

4.3 Native Plant Species of the Ardrossan Grassland.

Plant surveys to date have recorded at least 80 naturally occurring plant species, including 3 which are significant within the State and at least 17 which have conservation significance in the local region. The small daisy known as Lanky Buttons (*Leptorhynchos elongatus*) is considered Endangered within the State and the Ardrossan Grassland remnant is one of the few Yorke Peninsula sites where it occurs (Klein Point being the only other recorded site).

The following list has been compiled by Adrian Shackley of the Friends of Park Terrace community group.

Table 1: Native Plant Species Recorded at the Park Terrace Grassland *(source: Biological Survey No. 63 1994, recent observations of Sonia Croft, Mick Durant and Adrian Shackley).*

State Conservation Ratings: E = Endangered, V = Vulnerable, R = Rare. NY Regional and St. Vincent sub-regional ratings: EN = Endangered, VU = Vulnerable, RA = Rare, NT = Near Threatened, LC = Least Concern, DD = data deficient, ne = not evaluated.

SPECIES	COMMON NAME	FAMILY NAME	AUS	SA	NY region	St Vin subreg
Acacia hakeoides	Hakea Wattle	LEGUMINOSAE			LC	LC
Acacia spinescens	Spiny Wattle	LEGUMINOSAE			LC	LC
Acrotriche patula	Prickly Ground-berry	EPACRIDACEAE			RA	NT
Alyxia buxifolia	Sea Box	APOCYNACEAE			LC	LC
Arthropodium fimbriatum	Nodding Vanilla-lily	LILIACEAE			NT	LC
Arthropodium strictum	Nodding Vanilla-lily	LILIACEAE			NT	LC
Asteridea athrixioides f. athrixioides	Wirewort	COMPOSITAE			DD	DD
Austrostipa acrociliata	Graceful Spear-grass	GRAMINEAE			NT	LC
Austrostipa drummondii	Cottony Spear-grass	GRAMINEAE			LC	LC
Austrostipa elegantissima	Feather Spear-grass	GRAMINEAE			LC	LC
Austrostipa eremophila	Rusty Spear-grass	GRAMINEAE			LC	LC
Austrostipa flavescens	Coast Spear-grass	GRAMINEAE			LC	LC

SPECIES	COMMON NAME	FAMILY NAME	AUS	SA	NY region	St Vin subreg
Austrostipa nodosa	Tall Spear-grass	GRAMINEAE			LC	LC
Austrostipa platychaeta	Flat-awn Spear-grass	GRAMINEAE			LC	LC
Beyeria lechenaultii	Pale Turpentine Bush	EUPHORBIACEAE			NT	LC
Bulbine bulbosa	Bulbine-lily	LILIACEAE			RA	EN
Bursaria spinosa ssp. spinosa	Sweet Bursaria	PITTOSPORACEAE			LC	LC
Calocephalus citreus	Lemon Beauty-heads	COMPOSITAE			NT	DD
Cassinia arcuata maybe planted	Drooping Cassinia	COMPOSITAE			NT	NT
Chrysocephalum apiculatum	Common Everlasting	COMPOSITAE			LC	LC
Convolvulus angustissimus ssp. angustissimus	Australian Convolvulus	CONVOLVULACEAE			NE	NE
Convolvulus angustissimus ssp. peninsularum	Grassland Convolvulus	CONVOLVULACEAE			NE	NE
Convolvulus remotus	Grassy Convolvulus	CONVOLVULACEAE			LC	LC
Craspedia variabilis	Billy-buttons	COMPOSITAE			RA	?
Dampiera rosmarinifolia	Rosemary Dampiera	GOODENIACEAE			RA	NT
Dianella brevicaulis	Short-stem Flax-lily	LILIACEAE			LC	LC
Dianella revoluta var. revoluta	Black-anther Flax-lily	LILIACEAE			LC	LC
Dodonaea baueri	Crinkled Hop-bush	SAPINDACEAE			LC	LC
Elachanthus pusillus	Elachanth	COMPOSITAE			LC	DD
Enchylaena tomentosa var. tomentosa	Ruby Saltbush	CHENOPODIACEAE			LC	LC
Enneapogon nigricans	Black-head Grass	GRAMINEAE			LC	LC
Enteropogon acicularis	Umbrella Grass	GRAMINEAE			LC	LC
Eremophila deserti	Turkey-bush	MYOPORACEAE			LC	LC
Eremophila glabra ssp. glabra	Tar Bush	MYOPORACEAE			LC	LC
Eremophila longifolia	Weeping Emubush	MYOPORACEAE			LC	LC
Eucalyptus porosa all planted?	Mallee Box	MYRTACEAE			LC	LC
Euchiton sphaericus	Annual euchiton	COMPOSITAE			LC	LC
Eutaxia microphylla	Common Eutaxia	LEGUMINOSAE			LC	LC
Gahnia deusta	Limestone Saw-sedge	CYPERACEAE			LC	LC
Gahnia lanigera	Black Grass Saw-sedge	CYPERACEAE			NT	LC
Goodenia pinnatifida	Cut-leaf Goodenia	GOODENIACEAE			NT	LC
Goodenia willisiana	Silver Goodenia	GOODENIACEAE			NT	LC
Isoetopsis graminifolia	Grass Cushion	COMPOSITAE			LC	LC
Lepidosperma congestum	Sword-sedge	CYPERACEAE			LC	LC
Lepidosperma viscidum	Sticky Sword-sedge	CYPERACEAE			LC	LC
Leptorhynchos elongatus	Lanky Buttons	COMPOSITAE		E	VU	VU
Lomandra collina	Sand Mat-rush	LILIACEAE			LC	LC
Lomandra effusa	Scented Mat-rush	LILIACEAE			LC	LC
Lomandra multiflora ssp. dura	Hard Mat-rush	LILIACEAE			LC	LC
Maireana brevifolia	Short-leaf Bluebush	CHENOPODIACEAE			LC	LC
Maireana enchylaenoides	Wingless Fissure-plant	CHENOPODIACEAE			LC	LC
Maireana rohrlachii	Rohrlach's Bluebush	CHENOPODIACEAE		R	VU	VU
Malva preissiana	Australian Hollyhock	MALVACEAE			RA	VU
Minuria leptophylla	Top-fruit Bluebush	CHENOPODIACEAE			LC	LC

SPECIES	COMMON NAME	FAMILY NAME	AUS	SA	NY region	St Vin subreg
Myoporum viscosum/petiolaris (possibly planted)	Sticky Boobialla	MYOPORACEAE			LC	LC
Nitraria billardierei	Minnie Daisy	COMPOSITAE			LC	LC
Pimelea glauca	Nitre-bush	ZYGOPHYLLACEAE			LC	LC
Pimelea micrantha	Smooth Riceflower	THYMELAEACEAE			NT	NT
Pimelea serpyllifolia ssp. serpyllifolia	Silky Riceflower	THYMELAEACEAE			NT	RA
Pittosporum angustifolium	Native Apricot	PITTOSPORACEAE			LC	LC
Plantago varia	Variable Plantain	THYMELAEACEAE			LC	LC
Podolepis decipiens – recent name change	Showy Copper-wire Daisy	COMPOSITAE		R	NT	CR
Pomaderris paniculosa ssp. paniculosa	Mallee Pomaderris	RHAMNACEAE			VU	VU
Ptilotus spathulatus	Pussy-tails	AMARANTHACEAE			LC	LC
Rhagodia crassifolia (possibly planted)	Fleshy Saltbush	CHENOPODIACEAE			LC	LC
Roepera glauca	Pale Twinleaf	ZYGOPHYLLACEAE			LC	LC
Rytidosperma caespitosum	Common Wallaby-grass	GRAMINEAE			LC	LC
Sclerolaena diacantha	Grey Bindyi	CHENOPODIACEAE			LC	LC
Senna artemisioides ssp. petiolaris	Punty Bush	LEGUMINOSAE			LC	LC
Sida corrugata var. angustifolia	Grassland Sida	MALVACEAE			NT	LC
Sida corrugata var. corrugata	Grassland Sida	MALVACEAE			LC	NT
Stackhousia monogyna	Creamy Candles	STACKHOUSIACEAE			NT	LC
Teucrium sessiliflorum	Mallee Germander	LABIATAE			NT	LC
Themeda triandra	Kangaroo Grass	GRAMINEAE			LC	LC
Velleia arguta	Toothed Velleia	GOODENIACEAE			LC	LC
Vittadinia blackii	Narrow-leaf New Holland Daisy	COMPOSITAE			RA	RA
Vittadinia cervicularis var. cervicularis	Waisted New Holland Daisy	COMPOSITAE			LC	LC
Vittadinia cuneata var. cuneata	Fuzzy New Holland Daisy	COMPOSITAE			LC	LC
Vittadinia gracilis	Woolly New Holland Daisy	COMPOSITAE			LC	LC
Vittadinia megacephala	Giant New Holland Daisy	COMPOSITAE			LC	LC
Wahlenbergia communis	Tufted Bluebell	CAMPANULACEAE			LC	LC
Wurmbea dioica ssp. brevifolia	Early Nancy	LILIACEAE			ne	ne

Previous tree planting efforts

Historical accounts and aerial photography confirm that the trees and most of the taller shrubs around the reserve and township have been planted in recent decades. In fact as early as the late 1800s the local community saw value in planting trees in the township and this no doubt reflects the fact that there were few trees present when the town was founded.

The Yorke Peninsula Council planted the majority of the native shrubs and trees in Clay Gully, including the River Red Gums which were grown from seed collected from the local form which occurs at Gum Flat near Minlaton (the only River Red Gums on Yorke Peninsula).

Today the vast majority of the trees now visible on the coastal plain at Ardrossan have been planted.

4.3 Fauna

The small size and urban location of the project area limits the diversity of animals likely to be present, particularly in relation to mammals and birds. However, the invertebrate fauna is scarcely documented and may be significant, and many smaller reptile species could be present.

Grasslands are known to provide habitat for a range of animals in South Australia, including the Nationally Threatened Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*) which occurs nearby at Kulpara and the southern Hummock Ranges. This species may also have occurred at Ardrossan.

Reptiles

Table below shows the species of native snakes and lizards recorded within 10 Kms of Ardrossan town (Atlas of Living Australia May 2021). Noticeably absent are Eastern or Western Blue-tongue Lizards which are known to be present in the district. Keeping records of reptile sightings would be a useful exercise for volunteers. Additional surveys would be expected to uncover additional species.

Table 2: Reptile Species Recorded within 10km of the Project Area (source ALA 2021)

Scientific name	Common name	Aus	SA	NY reg	St Vin subreg
Acanthophis antarcticus	Death Adder			VU	VU
Menetia greyii	Dwarf Skink			LC	LC
Pseudonaja textilis	Eastern Brown Snake			LC	LC
Ctenotus orientalis	Eastern Ctenotus			LC	RA
Strophurus intermedius	Southern Spiny-tailed Gecko			LC	LC
Lerista edwardsae	Edwards' Slider			LC	LC
Varanus gouldii	Gould's Goanna, Sand Goanna			LC	LC
Hemiergis peronii	Lowlands Earless Skink			LC	LC
Ctenophorus pictus	Painted Dragon			LC	RA
Ctenophorus fionni	Peninsula Dragon Tepper only YP record			ne	ne
Anilios bituberculatus	Prong-snouted Blind Snake Few YP, incl. Tepper			ne	ne
Tiliqua rugosa	Shingle-back Lizard			LC	LC
Lerista dorsalis	Southern Slider			LC	LC
Underwoodisaurus milii	Thick-tailed Gecko			LC	LC
Hemiergis decresiensis	Three-toed Earless Skink			LC	LC
Diplodactylus vittatus	Wood Gecko – Only a few YP records			ne	ne

At the October 2020 Field Day questions were asked about brown snakes related to the project area. Brown snakes are occasionally seen in Ardrossan and are attracted to gardens with water, poultry sheds or bird cages, yards with mice, and sheds or other materials providing shelter. It is unlikely that the grassland project area would be attractive to brown snakes, even with some increase in grass cover resulting from changes in management.

The other venomous snake in the general locality is the Death Adder. Death adders look for areas with a lot of debris on the ground to provide cover while they wait for prey. Areas near beaches with dried seaweed or areas of woodland with bark and other debris on the ground provide good habitat. The project area would not be favourable habitat for Death Adders.

Butterflies and other insects

Butterfly and insect diversity is generally high in native grasslands and there are many larval food plants within the Ardrossan grassland plant list.

Grassland insect fauna is important to understand because it provides the food resources to sustain many of the other animals in the ecosystems. Many of the butterflies and moths are also very attractive and of interest to people.

The only species of native butterflies and moths currently officially recorded at Ardrossan are shown in Table 3 (Atlas of Living Australia May 2021).

Table 3: Butterflies and Moths Recorded in the Ardrossan District (source ALA 2021)

Scientific name	**Common name**
Candalides hyacinthinus	Varied Dusky-blue
Candalides heathi heathi	Rayed Blue
Eurema smilax	Small Grass-yellow
Helicoverpa punctigera	Heliothis Moth
Herimosa albovenata albovenata	White-veined Grass-skipper
Hyalarcta nigrescens	Ribbed Case Moth
Jalmenus icilius	Icilius Blue
Synemon nais	Orange Sun Moth
Vanessa kershawi	Australian Painted Lady

Undoubtedly many more species exist in the area. Roger Grund in Caton [2006] produced a list of butterflies for Yorke Peninsula which included several species using grassland habitat that were considered to be rare (see Appendix 3).

Otto Tepper in 1882 produced a paper on *The Papilionidae of South Australia* in which he recorded 34 species including some 18 species observed near Ardrossan. Only four of these species appear to be listed in the Atlas of Living Australia [name changes could mean the addition of some species on further investigation].

Being the highest quality patch of native grassland for some distance means that monitoring is likely to produce some very interesting results. Butterfly Conservation South Australia have been approached to assist with this. Although the site seems very isolated, the survey work undertaken for this plan has recorded 65 of the approximately 80 grassland plant species present at the project site on other scattered sites within 10 kms of Ardrossan. For insects, including butterflies and moths, this means that the site may not be so isolated as to prevent viable populations of most species being able to exist. Recording them is the challenge – butterflies and moths are most commonly seen in spring but year-round monitoring over several years is needed to develop a complete picture.

One of the most useful outcomes of focussing on the project area would be if a much more comprehensive list of insects could be recorded over future years.

Birds

Common grassland birds still present in the broader Ardrossan grasslands include Rufous Songlarks, Australian Pipit and Stubble Quail. Table 4 lists the terrestrial birds recorded on the Atlas of Living Australia within 10km of Ardrossan. Many of these species are woodland dependant and may be found in the woodlands of Clay Gully or similar habitats nearby. Few of these birds would be considered grassland specialists (apart from quails and pipits), though many of the raptors regularly hunt in open country.

Table 4: Terrestrial Bird Species Recorded within 10km of the Project Area (source ALA 2021)

Scientific Name	Common Name	Introduced
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	
Acanthiza apicalis	Inland Thornbill	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	
Acanthiza iredalei	Slender-billed Thornbill	
Accipiter cirrocephalus	Collared Sparrowhawk	
Accipiter fasciatus	Brown Goshawk	
Alauda arvensis	Eurasian Skylark	Y
Anas castanea	Chestnut Teal	
Anas gracilis	Grey teal	
Anas platyrhynchos	Mallard	
Anas superciliosa	Grey duck	
Anthochaera carunculata	Red wattlebird	
Anthus novaeseelandiae	Australian Pipit	
Aquila audax	Wedge-tailed Eagle	
Artamus cyanopterus	Dusky Woodswallow	
Artamus superciliosus	White-browed woodswallow	
Aythya australis	Hardhead	
Biziura lobata	Musk Duck	
Cacatua sanguinea	Little Corella	
Cacomantis pallidus	Pallid Cuckoo	
Cereopsis novaehollandiae	Cape Barren Goose	
Chalcites basalis	Horsfield's Bronze-cuckoo	
Chalcites lucidus	Shining Bronze-cuckoo	
Chenonetta jubata	Maned Duck	
Cheramoeca leucosterna	White-backed Swallow	
Chroicocephalus novaehollandiae	Silver Gull	
Cincloramphus cruralis	Brown Songlark	
Circus assimilis	Spotted Harrier	
Colluricincla harmonica	Grey Shrike-thrush	
Columba livia	Rock Dove	Y
Coracina novaehollandiae	Black-faced cuckoo-shrike	
Corvus coronoides	Australian Raven	
Corvus mellori	Little Raven	
Coturnix pectoralis	Stubble Quail	
Coturnix ypsilophora	Swamp Quail	
Cracticus torquatus	Grey Butcherbird	

Scientific Name	Common Name	Introduced
Daphoenositta chrysoptera	Varied Sittella	
Dromaius novaehollandiae	Emu	
Egretta novaehollandiae	White-faced Heron	
Elanus axillaris	Black-shouldered Kite	
Eolophus roseicapilla	Galah	
Epthianura albifrons	White-fronted Chat	
Epthianura tricolor	Crimson Chat	
Falco berigora	Brown Falcon	
Falco cenchroides	Nankeen Kestrel	
Falco longipennis	Australian Hobby	
Falco peregrinus	Peregrine Falcon	
Falco subniger	Black Falcon	
Fulica atra	Eurasian Coot	
Gavicalis virescens	Singing Honeyeater	
Geopelia striata	Peaceful Dove	
Glossopsitta concinna	Musk Lorikeet	
Grallina cyanoleuca	Magpie-lark	
Gymnorhina tibicen	Australian Magpie	
Haliastur sphenurus	Whistling Kite	
Hieraaetus morphnoides	Little Eagle	
Hirundo neoxena	Welcome Swallow	
Lalage sueurii	White-winged Triller	
Leipoa ocellata	Malleefowl	
Lichenostomus cratitius	Purple-gaped Honeyeater	
Malurus cyaneus	Superb Fairy-wren	
Malurus lamberti	Variegated Fairy-wren	
Manorina flavigula	Yellow-throated Miner	
Manorina melanocephala	Noisy Miner	
Megalurus gramineus	Little Grassbird	
Melanodryas cucullate	Hooded Robin	
Melithreptus brevirostris	Brown-headed Honeyeater	
Melopsittacus undulatus	Budgerigar	
Merops ornatus	Rainbow Bee-eater	
Microcarbo melanoleucos	Little Pied Cormorant	
Microeca fascinans	Jacky Winter	
Milvus migrans	Black Kite	
Mirafra javanica	Horsfield's Bushlark	
Myiagra inquieta	Restless Flycatcher	
Neophema elegans	Elegant Parrot	
Ninox novaeseelandiae	Southern Boobook	
Northiella haematogaster	Bluebonnet	
Ocyphaps lophotes	Crested Pigeon	
Oreoica gutturalis	Crested Bellbird	
Pachycephala inornate	Gilbert's Whistler	
Pachycephala rufiventris	Rufous Whistler	

Scientific Name	Common Name	Introduced
Pardalotus punctatus	Spotted Pardalote	
Pardalotus striatus	Striated Pardalote	
Parvipsitta porphyrocephala	Purple-crowned Lorikeet	
Passer domesticus	House sparrow	Y
Petrochelidon ariel	Fairy Martin	
Petrochelidon nigricans	Tree Martin	
Petroica goodenovii	Red-capped Robin	
Phalacrocorax carbo	Great Cormorant	
Phalacrocorax fuscescens	Black-faced Cormorant	
Phalacrocorax sulcirostris	Little Black Cormorant	
Phalacrocorax varius	Pied Cormorant	
Phaps chalcoptera	Common Bronzewing	
Phaps elegans	Brush Bronzewing	
Phylidonyris novaehollandiae	New Holland Honeyeater	
Plectorhyncha lanceolata	Striped Honeyeater	
Plegadis falcinellus	Glossy Ibis	
Podargus strigoides	Tawny Frogmouth	
Podiceps cristatus	Crested Grebe	
Poliocephalus poliocephalus	Hoary-headed Grebe	
Pomatostomus superciliosus	White-browed Babbler	
Porzana fluminea	Australian Spotted Crake	
Psephotus haematonotus	Red-rumped Parrot	
Psephotus varius	Mulga Parrot	
Ptilotula ornate	Yellow-plumed Honeyeater	
Rhipidura albiscapa	Grey Fantail	
Rhipidura leucophrys	Willie Wagtail	
Sericornis frontalis	White-browed Scrubwren	
Smicrornis brevirostris	Weebill	
Stiltia Isabella	Australian Pratincole	
Streptopelia chinensis	Spotted Turtle-dove	Y
Sturnus vulgaris	Starling	Y
Tachybaptus novaehollandiae	Australasian Little Grebe	
Threskiornis moluccus	Australian White Ibis	
Todiramphus sanctus	Sacred Kingfisher	
Tribonyx ventralis	Black-tailed Native-hen	
Trichoglossus haematodus	Rainbow Lorikeet	
Turdus merula	Blackbird	Y
Tyto javanica	Eastern Barn Owl	
Vanellus miles	Masked Lapwing	
Vanellus tricolor	Banded Lapwing	
Zosterops lateralis	Silvereye	

5 Threats and Mitigations

5.1 Weeds

Increasing weed invasion is one of the main threats to the vegetation in the grassland. The project area contains Declared Weeds (under the Landscape SA Act 2019) and Weeds of National Significance (WoNS) which have legislated control requirements, as well as serious environmental weeds and garden escapes.

Weeds such as Gazania and Galenia spread easily and take up space that would otherwise be free for grass tussocks or herbs. Similarly, introduced bulbs in the lily and iris families overtake the niche occupied by native lilies, orchids and the like, eventually reducing native species diversity. Gazania is a Declared Weed in South Australia.

Couch Grass is another difficult to manage weed on the site and it is particularly present in the storm water drainage channel in the west of the main grassland.

Aleppo Pines are a Declared Weed in South Australia. There are a number of Aleppo Pines near the corner of Bridge Rd and Park Tce, and there are dozens of seedlings originating from these trees which are currently hidden by weeds and the regular slashing. Juvenile trees also occur in Clay Gully and in areas of planted shrubs. Removal of all seedlings and gradual removal of the older trees is recommended.

Wards Weed (*Carrichtera annua*) has become a prolific weed within the fenced enclosure which makes control quite labour intensive. If labour resources are available the Wards Weed could be carefully hand-pulled or treated with a weed wiper and herbicide, creating a weed front which is revisited each year. Knapsack herbicide control (foliar spraying) is not recommended for this infestation due to the high density and diversity of native plants.

Clay Gully is heavily infested with weeds including serious weeds such as Bridal Creeper and African Boxthorn (both Declared and WoNS species), Ash Trees (*Fraxinus* spp.), a number of perennial grasses (Kikuyu, Rice Millet, Prairie Grass and Paspalum) and many broadleaf weeds (e.g. Galenia, Scabiosa, Ribwort and Fleabane). Western Coast Wattle (*Acacia cyclops*), Pepper Tree (*Schinus molle*) and Giant Reed (*Arundo donax*) also occur here. Removal of many of these weeds is necessary in order to eliminate a local seed source for these species.

Photo: Gazania plants amongst native grass tussocks

Table 5: Weed Species in the Park Terrace Grassland *(source: BDSA Survey 63, Sonia Croft 2020, and Adrian Shackley and Mick Durant 2021, compiled by A. Shackley)*

FAMILY NAME	SPECIES	COMMON NAME	Decl.*	WoNS**
LEGUMINOSAE	*Acacia cyclops*	Western Coastal Wattle		
CRASSULACEAE	*Aeonium arboretum****	Tree aeonium		
ALLIACEAE	*Allium sp****	Onion sp		
COMPOSITAE	*Arctotheca calendula*	Cape Weed		
LILIACEAE	*Asparagus asparagoides*	Bridal Creeper	Y	Y
LILIACEAE	*Asphodelus fistulosus*	Onion Weed		
COMPOSITAE	*Asteriscus spinosus*	Golden Pallensis		
GRAMINEAE	*Avena barbata*	Bearded Oat		
CRUCIFERAE	*Brassica sp.*	Wild Turnip		
GRAMINEAE	*Bromus rubens*	Red Brome		
GRAMINEAE	*Bromus sp*	Brome		
CRUCIFERAE	*Carrichtera annua*	Ward's Weed		
GRAMINEAE	*Cenchrus clandestinus*	Kikuyu		
GRAMINEAE	*Cynodon dactylon var. dactylon*	Couch Grass		
CYPERACEAE	*Cyperus isocladus*****	Dwarf Papyrus		
EUPHORBIACEAE	*Euphorbia terracina*	False Caper		
UMBELLIFERAE	*Foeniculum vulgare*	Fennel		
IRIDACEAE	*Freesia cultivar*	Freesia		
IRIDACEAE	*Freesia laxa*	Freesia		
AIOZOACEAE	*Galenia pubescens*	Galenia		
COMPOSITAE	*Gazania linearis*	Gazania	Y	
IRIDACEAE	*Iris albicans****	Iris		
IRIDACEAE	*Iris germanica*	Flag Iris		
COMPOSITAE	*Leontodon rhagadioloides*	Cretan Weed		
CRUCIFERAE	*Lepidium africanum*	Common Peppercress		
LINACEAE	*Linum strictum ssp. strictum*	Upright Yellow Flax		
GRAMINEAE	*Lolium rigidum*	Wimmera Ryegrass		
SOLANACEAE	*Lycium ferocissimum*	African Boxthorn	Y	Y
LEGUMINOSAE	*Medicago minima*	Little Medic		
LEGUMINOSAE	*Medicago sp.*	Medic		
IRIDACEAE	*Moraea setifolia*	Thread Iris		
OXALIDACEAE	*Oxalis pes-caprae*	Soursob		
PINACEAE	*Pinus halepensis*	Aleppo Pine	Y	
GRAMINEAE	*Paspalum dilitatum*	Paspalum		
GRAMINEAE	*Piptatherum milleaceum*	Rice Millet		
COMPOSITAE	*Reichardia tingitana*	False Sowthistle		
LABIATAE	*Salvia verbenaca var. verbenaca*	Wild Sage		
DIPSACACEAE	*Scabiosa atropurpurea*	Pincushion		
COMPOSITAE	*Sonchus oleraceus*	Common Sow-thistle		
LEGUMINOSAE	*Trifolium sp.*	Clover		
GRAMINEAE	*Vulpia sp.*	Ratstail Fescue		

*Declared Species (Landscape SA Act 2019), ** Weed of National Significance, **Observation of David Symon (SA Herbarium record).
**** Observation of Robert Bates (SA Herbarium record)

Strategies for weed control in the Project Area include:

- Control Gazania, Galenia, Wards Weed, bulbs and other broadleaf weeds where they occur
- Control and remove succulents and garden escape weeds from under the planted Mallee Box trees
- Control invasive woody weeds (e.g. Western Coast Wattle, Ash Tree, Giant Reed) and WonS/Declared weeds (e.g. African Boxthorn, Bridal Creeper, Gazania) from within the creek and cliffs and surrounds
- Trim or remove large tree and shrub weeds and/or planted species in the creekline to allow sunlight to hit the ground layer (i.e. to encourage native grass regeneration – and noting additional herbaceous weed control will be necessary)
- Manage annual grassy weeds as part of the mowing and slashing regime
- Actively search and monitor for alert weeds such as Buffel Grass and WoNS weeds such as Boneseed (particularly in the creek)
- Remove all seedlings and juveniles of Aleppo Pine and over time address the seed source by removing the mature trees in the north-west corner of the site
- Avoid new weed introductions by ensuring Council and other machinery being used on site are clean and free of weed seeds

5.2 Grassland Management Regime (Mowing / Slashing and Herbicide Spraying)

The mowing and slashing regime is both an important tool in maintaining and enhancing the site, and a potential degrading influence if not implemented carefully. The management regime in recent years has been to mow the vegetation regularly and close to the ground, partly with the aim of meeting community expectations around visual amenity.

In spring of 2020 as part of preparation for this plan the Council agreed to hold off from mowing during the main spring months. A slashing occurred at the end of spring after native grasses and herbs had an opportunity to set seed. This is the recommended strategy which reduces the competitive advantage of weeds which grow and flower earlier than most native species. The change was notified to local residents by Council and the response has been positive.

Slashing machinery can also cause damage to the soil crust due to tight turning circles and travelling speeds, particularly in lighter soils. This type of disturbance breaks the soil crust and can result in increased weed invasion. This type of damage can be minimised by working with Council staff to discuss and amend travelling speeds and patterns.

The current practice of using herbicide to control weeds of the road verge has resulted in a strip of weedy vegetation around the grassland which poses a heightened risk of weeds colonising the native vegetation. If herbicide control could be limited to within 2m from the edge of the road surface, or eliminated completely, the vegetation in this verge area could be maintained by mowing and overtime the native grass cover could return. Some discussion has occurred with Tidy Town volunteers who have 2 mowers capable of undertaking this limited mowing around edges. There is potential for a change of operation to benefit the site with regular mowing of the road edge reducing weeds and improving amenity. Similar considerations apply related to the formal gravel path just north of Clay Gully.

Strategies to improve the grassland management regime include:

- Timing: look to slash in late winter when annual weed grasses are close to flowering and then again in early summer when native grasses and herbs have flowered and set seed

- Train Council staff in identifying optimum times for slashing and the potential for soil damage when driving and turning quickly
- Continue to engage the local community about expectations for the area
- Raise the height of the mower to approximately 100 – 150mm to prevent tussock and herb damage and/or loss
- Eliminate roadside herbicide use or restrict to 2m width from the road edge and use mowing / slashing as the alternative control method
- Investigate the use of a native grass harvester as a substitute for slashing in early summer

5.3 Pedestrian Traffic

Whilst the number of people traversing the vegetation is low, currently there is no fencing or other indication for the general public that there is anything significant in the reserve (outside of the fenced enclosure). At the same time having people walking in the area to look at the vegetation and butterflies and other fauna is to be encouraged and will have minimal effect on the conservation integrity of the area. Signs may contain text such as 'Please take the time to have a look over the site to appreciate its values, and please be aware of where you are walking. Avoid creating regular paths'.

Strategies to minimise damage by pedestrian users include:

- Install signs on the boundary of the vegetation (i.e. Esplanade car park, Park Tce, Bridge Rd) to indicate the significant vegetation and minimise creation of informal paths by pedestrian entry on the vegetation while maximising use of the formed paths and road verges
- Investigate strategic locations for minimal access management infrastructure (e.g. formalised paths, seating)
- Encourage membership in the local Friends group (i.e. Friends of Park Terrace/Esplanade)

5.4 Stormwater Outlet

The stormwater outlet near the large pine trees is having a negative effect on the site by encouraging weeds that are replacing the native plants within the drain channel and on the southern side of the drain where water spreads. Discussions have occurred with the responsible Council staff regarding the possible removal of the stormwater outfall in the reserve. It appears that it would be relatively simple to join the pipework into the existing subterranean drainage network across Tiddy Widdy Road. This would have benefits in re-using the stormwater for the golf course or other Council gardens, and it may be cheaper in the long run to remove the source of the problem rather than continually managing the weeds that proliferate due to the run-off.

According to the Council "It would be possible to redirect the stormwater from this line to other infrastructure, but this would come at a cost, therefore it would require the support of the local community to request Council to consider this as a project in future budget deliberations." And "In recent years Council and the Ardrossan Progress Association have worked together to install infrastructure in various locations in Ardrossan to harvest stormwater, which is now used on the bowling greens, golf course and oval".

The removal of excess water from the site is a high priority action for limiting weed spread and improving grassland condition.

Strategies to mitigate the negative impacts of stormwater on the site include:

- Encourage community members to request the diversion of the stormwater into existing subterranean drainage network
- Undertake intensive weed control along the shallow drainage line created by the outlet
- Investigate direct seeding of the channel with native grasses and herbs following sufficient weed control.

5.5 Cliff erosion and climate change

The red cliffs at Ardrossan are composed of soft sediments which are highly vulnerable to water erosion and storm surge damage. The impacts of storm surges were already evident in the 1880s when Otto Tepper described it as follows:

> 'The above sketch of the geological history would hardly be complete if no illusion were made to the present. According to nearly three years' attentive observation it seems to me that the balance of evidence is inclining in favour of a slight subsidence prevailing just now. The facts are that during this interval the sea has gradually and steadily been encroaching upon the sand dunes fringing the steep cliffs or raised beaches to a great extent from the southern boundary of Muloowurtie to the northern limit of Cunningham, a distance of some 25 to 28 miles, and has swept away vast masses of sand, in some cases 20 to 30 yards' width of formerly permanent beach, as for example near Ardrossan. This had the immediate effect of the waves at high tides washing parts of the cliffs, which for many years had been protected therefrom, thus causing falls of undermined portions to occur more frequently than before. I am certainly aware that other causes may affect coasts facing the cast similarly, but the previous accumulation of the sands and other debris preclude them from offering a sufficient explanation of the observed phenomena, and it is now quite obvious in this part of the coast.' (Tepper 1882)

Given current climate and sea level rise predictions, without intervention it could be expected that the erosion of the base of the cliffs will accelerate and will undermine the road and carpark areas and eventually eat away at the grassland area. The grassy areas east of the Esplanade are especially at risk.

Coastal erosion was discussed by local residents at the October 2020 and more recent field days and residents are well aware of the issue and the efforts in recent years by Yorke Peninsula Council moving the safety fence along the cliffs back several metres.

An article related to Ardrossan in the late 1970s by Robert Bourman did attempt to provide some figures as shown in Figure 11. Bourman's conclusions on page 83 were:

> The amount of erosion varies along the coastline, from a minimum of 3.6m at site B to 32.3m at site A, which is near the town jetty. Even conceding that there may be some errors in the original and the recent surveys, it seems clear that the cliffs at Ardrossan have retreated quite considerably in the 107 year interval"

It does seem inherently unlikely however, that there would be such major differences in the amount of erosion over a length of about 750 metres as suggested by Bourman.

The 1872 Diagram Book Page 1 for Hundred of Cunningham (Figure 12) provides the basis for a reasonable estimate of changes from 1872 to present day.

These plans allow the distance to the coast at the points referred to by Bourman between North Terrace and South Terrace to be compared to the distance between East Terrace and West Terrace to produce a ratio for the distance from East Terrace to the top of the cliffs.

The same exercise can then be applied to current aerial photography such as contained on the Naturemaps website (https://data.environment.sa.gov.au/NatureMaps).

Using this method the rough estimates obtained are: A 10m (32.3m); B 12m (3.6m); C 13m (11.1m); D 6m (5.4m); E 6m (14.6m); and F 6m (3.8m) – the figures in brackets are from Bourman. Using the same methodology and the survey map Diagram Book 32 for the Park Terrace/High Street area, an estimate for erosion at Park Terrace of 6m and at High Street of 12m was obtained.

The calculations are based on the assumption that the roads were laid out on the ground where the surveyors intended them – almost certainly not exactly the case, and on the accuracy of the 1872 survey plans.

Figure 11: The working map produced by Bourman

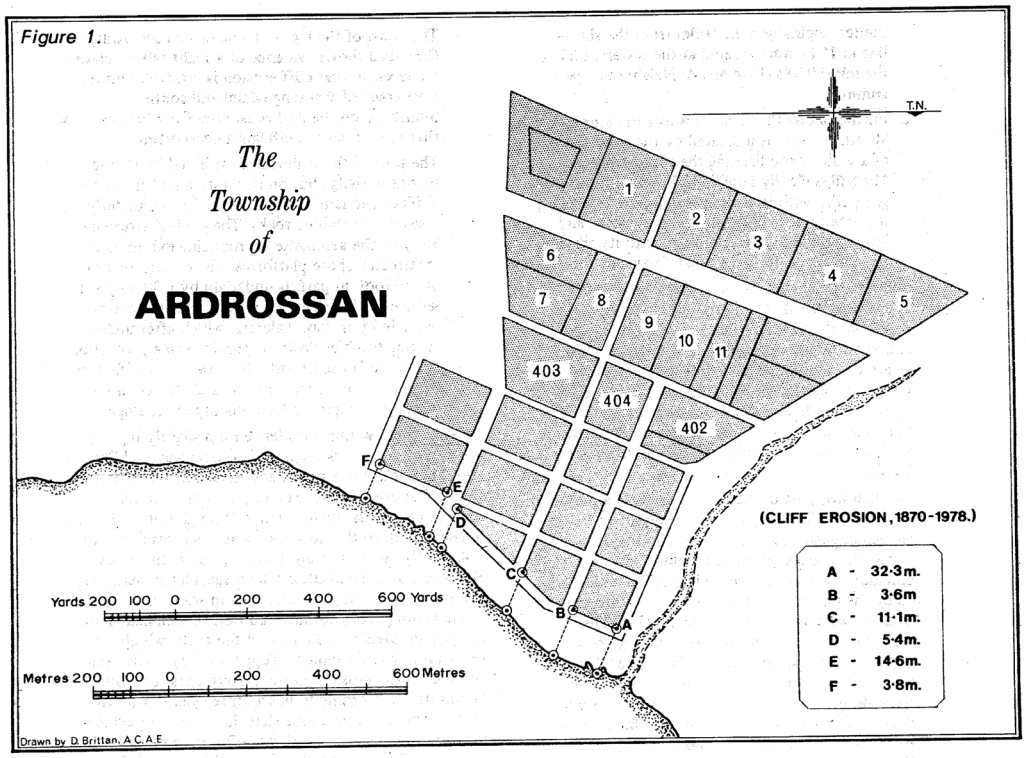
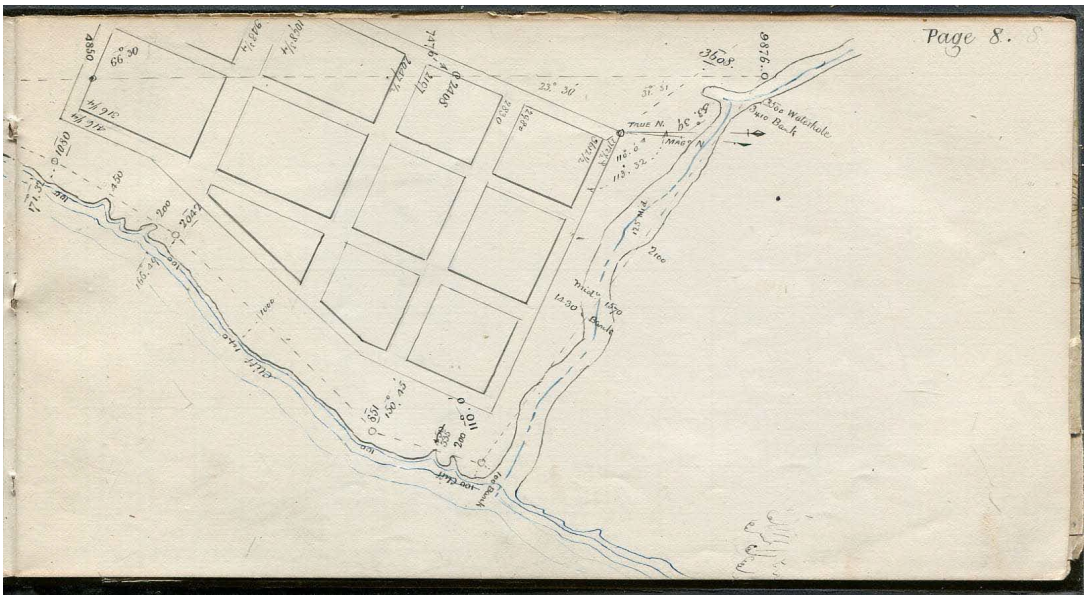


Figure 12: Page 1 of the Diagram Book for the Hd Cunningham



Without mitigation the erosion of coastal cliffs near the project site will continue and potentially even increase. Given the figures quoted above the grassland area is not expected to be affected for a number of years but the issue for local residents and the town generally is very significant.

The future of the small car park and access road on the site might be a pressing issue given it is as close as 14-15m from the cliff edge.

Photo: A recently collapsed part of the cliff line adjacent to the grassland site. The most distant part of the cliff visible in the photo also has a large crack forming a metre or two back from the edge.

Strategies to delay and minimise the impacts of cliff erosion may include:

- Plan any infrastructure to be well back from the cliff edge
- Manage pedestrian and vehicle access (particularly heavy vehicles) to maintain a buffer from the coast
- Encourage the establishment and regeneration of native vegetation
- Plant native shrubs in degraded areas to help hold the soil together and prevent soil cracking

5.2 Urban Development Potential

There has been recent discussion about the site as a potential area to expand development or infrastructure including a proposal for disc golf activities.

Given the restrictions on the area from an environmental perspective, promoting the site and educating the community (both local and non-local) to appreciate and value the site for its uniqueness and beauty is important for maintaining community support for the current parklands use.

Development on the site should be strongly opposed on the grounds of natural, cultural and historical value.

Strategies to maintain support for the environmental values of the area include:

- Circulate this Plan to Council staff, Coast Protection Board and other relevant planning agencies
- Raise the profile and awareness in the community with signage, community activities, exhibitions and the like.

5.6 Community and Narungga Support and Participation

A field day open to the public was held during the development of this plan in Spring 2020. Two additional on- site field days were held in May 2021 as part of public consultation for this plan (see Appendix 4 for more details). A number of local residents attended or indicated a wish to support the careful maintenance of the area. There will be significant benefits in developing active community support with volunteer weed control, replanting of weedy areas, monitoring flora and fauna on the site and the like. Further work and funding (with potential grants available from a number of sources) will be needed to make this a reality as the skills involved are not readily available. Having a trained weed control operator available to assist with community involvement would be a good step. Building relationships with community organisations with expertise such as the Northern Yorke branch of Australian Plants Society or Butterfly Conservation SA will assist.

Lack of understanding and appreciation for the natural values of the site can lead to unintentional damage and hence good information is an important component of managing the site. Community understanding can produce wonderful results over time. The success of Ardrossan Tidy Towns over many years is a good example.

Another important component of the site is to encourage the participation of the Narungga community in the management, naming and telling of stories about the value of the site. Strong support has already been received from Nharangga Aboriginal Progress Association and further involvement and guidance from the Traditional Custodians of the area will be encouraged.

Strategies to improve the community perception and care of the site might include:

- Update signs to include more historical, ecological and cultural information
- Include a display on Tepper and the original Ardrossan vegetation in the Ardrossan Museum
- Encourage and facilitate volunteer activities to care for the site
- Encourage formalisation of a local community group (i.e. Friends of Park Terrace/Esplanade Reserves)
- encourage the participation of the Narungga community in the management, naming and telling of stories about the value of the site.

Photo: October 2020 field day organised by the Friends group

6 Management Aims and Goals/Targets

The following aims are derived from the Authors and consultations with the various stakeholders, including the public meetings on site and the feedback received on the draft plan in May-June 2021. A consultation summary is contained in Appendix 4.

6.1 Aims (short & long-term vision)

Short-term Aims (1- 2yrs):

- Raise community awareness and participation in the management and care of the site
- Maintain and improve current vegetation condition by managing threats and maximising the beneficial use of slashing/mowing
- Minimise herbicide control on the road verge and adjacent the formal path to encourage native grass establishment
- Undertake sensitive bushcare weed control within the grassland and fenced areas
- Remove the storm water outlet
- Seek Narungga participation and a Narungga name for the site.

Medium and Longer-term Aims (3-20 plus yrs)

- Ensure the vegetation remains as a grassland reminiscent of the original vegetation of the area (as described by Tepper and others)
- Maintain the high diversity of plant species present
- Ensure no loss in the area of the grassland (seek to increase the native grass and herbaceous plant cover).
- Improve the edges of the area along roads and path and the stormwater drain with weed control and replanting
- Collect native seed from the site for use in educational gardens and re-establishment of grassland
- Improve the appearance and environmental values of the Clay Gully area with appropriate weed control, trimming of planted shrubs and trees and replacement with suitable species where applicable.

6.2 Management Zones

Identifying management zones within the Project Area can help communicate to managers about the location of threats and activities and help to plan future works. Figure 12 shows the Project Area divided into 7 zones based on different management requirements. These are then described in detail with key management issues identified.

Figure 12: Management Zones

Zone 1: Grassland 1 (main diverse grassland)

This is the main area of remnant grassland which contains a high diversity of native plant species and a healthy grassland structure dominated by perennial native grass tussocks with many herbaceous native plants. As discussed previously the main management activities recommended for this zone are to alter the timing and height of the mowing/slashing events, control Gazania, Galenia, bulbs and other broadleaf weeds and minimise herbicide use on the perimeter.

Additional activities include the removal of the Aleppo Pines and seedlings in the north-west corner, and the removal of the stormwater outlet with follow-up control/replacement of weeds in the drainage line.

Disturbance and Grassland Management

Managing the grassland remnant in the long term will benefit from understanding what has changed since the first impacts of European activity. A key factor affecting the ecosystem in earlier days would have been the impact of Narungga activities which included fire, hunting, digging for root and bulb foods and moving plants/seed around.

Photo: looking east across the mown grassland area. Good grassland structure with tussock grasses and herbaceous species in the inter-tussock spaces and plenty of sunlight hitting the ground.

The ecosystem functions provided by native mammals would have also influenced the ecology. Kangaroos, wallabies and their relatives along with a wide range of insects including caterpillars provided a constant grazing regime. The natural scarcity of surface water and traditional hunting likely kept the numbers of kangaroos, wallabies and other larger grazing animals relatively low.

Digging and scratching was a widespread activity of many animals, including mammals (e.g. bandicoots and bettongs) and birds. Making resting places, searching for food in the soil, digging burrows to hide, rest and breed would have influenced the soil and vegetation. Ants and other invertebrates living in the soil would also have been digging and mixing the soil and moving seeds around.

The result of all this activity was regular disturbance and apparently "softer" less compacted soil. The break-up of the soil crust (moss, lichens and other tiny plants and decaying matter), in the absence of weeds, would have helped light hit the ground which was a key factor in the germination and growth of small plants such as some daisies and small herbs, particularly annual species.

Many of these activities no longer occur or occur to a lesser extent. Other factors have been introduced especially many weeds, but also spraying and slashing. In many ways slashing is a substitute for grazing in keeping the canopy open. Slashing is effective in managing upright weeds but over time can benefit prostrate weeds such as Galenia, Wireweed and Couch Grass and adaptable weeds such as soursob. Slashing is less effective as a substitute for fire so there may be potential for small scale patch burning activities such as Adelaide City Council is planning in their parklands with Kaurna people. Consultation with locals would need to happen for this to occur.

The most vulnerable native species are often annual species which can be wiped out by weeds taking away sunlight and crowding out the space between perennial grasses and irongrasses. Of interest there are 4 annual daisy species still present on the site: *Asteridea athrixioides* (Wirewort); *Elachanthus pusillus* (Elachanth); *Euchiton sphaericus* (Annual Euchiton) and *Isoetopsis graminifolia* (Grass Cushion). There are quite a few annual species which were in Tepper's records from 1880 and these are in the list of priority species for revegetation (Appendix 1).

The other species that disappear from grasslands are low to the ground species such as most *Drosera* species (sundews), *Calandrinia* spp. and orchids. These are most vulnerable to being shaded out by weeds or even rotted out by weeds covering them and the moisture level being high for long periods. Soursobs seem particularly good at this form of competition. Many of these species are also on the missing list with potential to be re-established (Appendix 1).

Unfortunately, many of the missing species are also hard to re-establish so considerable expertise would need to be applied to finding seed or propagation material and producing plants in quantities to produce viable populations. If reintroduction of orchids is considered it would require additional survey and research into insect pollinators and soil fungi. The listing of most of the orchid species in Appendix 1 has not been based on detailed analysis.

Grasses on the other hand are relatively abundant and easy to collect. Using a grass harvester to substitute for the late spring/summer slashing could provide a valuable seed resource for restoring the sprayed-out edges of the grassland, and/or establishing grasslands elsewhere on the coastal plain.

Zone 2: Fenced Enclosure

The fenced enclosure was created by the State Government environment agencies and Council some years ago in recognition that the Park Terrace parkland contained a high diversity of native plant species.

Since it was fenced and excluded from the mowing regime the shrub vegetation has become more significant along with weed issues. The shrubs that have become dominant include *Pomaderris paniculosa* ssp. *paniculosa, Dodonaea baueri* and *Acrotriche patula*.

In response to recent dry seasons there has been quite a bit of dieback of these shrubs and some pruning can be considered as a way to remove dead material and improve growth.

Wards weed, Gazania and several bulbous weeds have become a serious issue in this Zone and will require labour-intensive control over the coming years. A couple of native Senna plants have appeared in recent years and these will likely have spread from seed introduced by birds from nearby gardens. The plants produce heavy seed loads and can rapidly change the nature of the area to a Senna shrubland. While they are native Australian plants they are not considered desirable in the grassland and should be removed as part of weed control activities. Similarly, there is a recently appearing *Acacia cyclops* plant that should be removed.

Photo: Eastern side of the fenced enclosure showing shrubs (Eremophila glabra ssp. in the foreground)

Zone 3: Grassland 2 (cliff top)

This narrow strip along the clifftop contains similar grassland vegetation to the main site but with a lower diversity of plant species and a higher cover of weeds. The management regime is currently the same as the other site but due to the lower diversity this part of the grassland may require additional weed control activities and revegetation in order to improve its condition.

Improving the condition can be approached through a 3-step process over a 3-5 year period:

- Step 1: Control broadleaf weeds to free up space for grass establishment (suggest a spot spray method – avoid boom sprays which will kill native herbs)
- Step 2: Manage the grassland to favour native grasses over annual weed grasses (use a similar mowing regime as the main grassland area)
- Select characteristic grasses and native herbs (including unusual / threatened species) for revegetation to improve diversity.

Over time the grassland should stabilise with native tussock grasses as the dominant plants. Table 1 and Appendix 1 contain a range of native herbs that could be used in revegetation.

Photo: Area between the Esplanade and the coast

Zone 4: Clay Gully

The early drawings, photos and descriptions of Clay Gully show that it was originally part of the open grassland country of Ardrossan. The Yorke Peninsula Council facilitated the planting of the creekline with a range of local and non-local native plants including River Red Gum (*Eucalyptus camaldulensis* ssp. *camaldulensis*) sourced from the rare Minlaton population, Mallee Box (*Eucalyptus porosa*) and a range of native wattles, sennas and other shrubs. This area has a similar diversity of remnant native species as the other zones with 40 species recorded, almost all on the northern bank, west of the wooden bridge across the gully.

Remnant patches of *Lomandra effusa* and *Dianella revoluta* remain and species such as Kangaroo Grass (*Themeda triandra*), Bulbine Lily (*Bulbine bulbosa*), Short-stem Flax Lily (*Dianella brevicaulis*), Nodding Vanilla-lily (*Arthropodium fimbriatum*), and Fuzzy New Holland Daisy (*Vittadinia cuneata*) have only been recorded in this zone. A few of the shrub species including Seabox (*Alyxia buxifolia*), Mallee Pomaderris (*Pomaderris paniculosa ssp. paniculosa*), Sweet Bursaria (*Bursaria spinosa*) and Nitrebush (*Nitraria billardierei*) appear to be remnants or naturally colonised.

Over time the creek bed has become weedy with large areas covered by Kikuyu and a range of herbaceous and grassy weeds. Serious environmental weeds such as African Boxthorn and Bridal Creeper occur and require control under legislation. Other woody weeds such as Ash Tree and Pepper Tree are also found in the creek.

The creekline could be enhanced by the removal of woody weeds, Bridal Creeper and Kikuyu, and there is potential for some revegetation of locally indigenous semi-aquatic sedges.

Photo: Western end of Clay Gully showing planted trees and shrubs with Kikuyu and Ash Tree saplings in the foreground

Zone 5: Coastal Cliffs

The coastal cliffs are fenced from the remainder of the Project Area. The narrow strip between the fence and the cliffs contains areas of native grassland, similar to the main site but less diverse, and a range of native shrubs including *Acacia oswaldii, Eremophila longifolia, Pittosporum angustifolium, Beyeria, lechenaultii, Acacia hakeoides* and *Hakea leucoptera*. There are also a number of weeds in this Zone including Galenia, Short-fruit Turnip and Western Coast Wattle (*Acacia cyclops*).

As discussed previously the cliffs in this location are actively eroding and this natural process is likely to be exacerbated by increased storm surge activity associated with sea-level rise and climate change. Vegetation should be encouraged to establish, including deep-rooted shrubs which may help prevent the cracks from widening. The impact of feral pigeons is also worth investigating as they play a role in undermining the cliff top.

Photo: Looking north along the red cliffs

Zone 6: Carpark and Road

The carpark and road are infrastructure features which are maintained by the Yorke Peninsula Council. While this zone has no natural value, it does serve as a key visible location for signs and information for the public. The Walk the Yorke trail also passes through this location.

Zone 7: Corner Flat

This is a small area which is quite separate to the remnant grassland and has little current conservation value. There are a number of exotic trees such as the Pepper Trees seen in the photo below, but weed risk is low and thus no need/low priority to remove or control them. It is an easily accessed public area which could in part be used for a display garden of Ardrossan native species suited to local gardens.

Photo: Lawn area, path and picnic table in Corner Flat

6.3 Summary of Management Recommendations

Table 6: Summary of Management Recommendations for the Ardrossan Park Terrace Esplanade Native Grassland

ACTIVITY	ZONE / LOCATION	TIMING COMMENTS	POTENTIAL CONTRIBUTORS
Weed Control			
Gazania, Galenia, introduced bulb and other broadleaf weed control by digging or herbicide spot spray.	Zone 1, Zone 2, Zone 3 and Zone 4 (north bank). Work from least dense areas toward the most dense	On-going. Start immediately. Mainly Winter or Spring while soil is moist	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Intensive Wards Weed control (hand weeding)	Zone 2 starting from least dense areas and creating a 'weed front' which can be slowly advanced	Start immediately. Winter/Spring	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Intensive broadleaf weed control (hand-weeding and/or broadleaf herbicide control)	Zone 1 along the shallow stormwater channel.	Following removal of the outlet. Winter/Spring	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board, NGOs, contractors
Remove succulents and garden escapes	Zone 1 beneath the Mallee Box trees	All year.	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
WoNS and woody weed removal (e.g. Boxthorn, Bridal Creeper, Ash Tree), including trimming of trees and shrubs to increase light reaching the native ground layer	Zone 4 in Clay Gully.	Autumn, Winter, Spring	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board, NGOs, contractors
Aleppo Pine removal – including seedlings and juveniles	Zone 1, north west corner Zone 4 in the creekline	All year	YP Council, volunteers Friends of Park Tce & Esplanade Reserves
Mowing, Slashing and Herbicide Regime			
Alter timing of slashing	Zone 1 and Zone 3	Late Winter and late Spring/early Summer. Trigger for slashing should be based on the plant growth stage.	YP Council, Ardrossan Progress/Tidy Towns on verges can be more regular
Alter the height of the mower blade to approximately 10-15 cm	Zone 1 and Zone 3	As soon as possible	YP Council, Ardrossan Progress/Tidy Towns on edges will be lower
Train Council operations staff in native grassland management	n/a	As soon as possible	YP Council, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board, NGOs
Reduce the width of herbicide control along road, path verges	Esplanade and Park Tce road verges, gravel path	As soon as possible	YP Council, Ardrossan Progress/Tidy Towns
Ensure mowing machinery in clean and does not bring additional weed seeds into the site	Zone 1, Zone 2, Zone 3	From next slashing event	YP Council, Ardrossan Progress/Tidy Towns

ACTIVITY	ZONE / LOCATION	TIMING COMMENTS	POTENTIAL CONTRIBUTORS
Use a native grass harvester to substitute for early summer slashing: collect and store seed for use in restoration projects	Zone 1 and Zone 3	Early Summer	NGOs, contractors
Stormwater Diversion			
Community to submit a formal request to remove the stormwater outlet	n/a	As soon as possible	Friends of Park Tce & Esplanade Reserves, Ardrossan Progress Association, local residents
Council to divert the stormwater into existing subterranean drainage network feeding to golf course	Zone 1	As soon as possible	YP Council
Pedestrian Access Management			
Install information signs and strategically placed infrastructure to help direct pedestrians to formal access points	Zone 1 and Zone 3	All year. Within 1 – 2 years	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Cliff-top Erosion			
Encourage vegetation establishment and where suitable revegetate with perennial shrubs to stabilise erodible cliff top	Zone 5	Winter. Lower urgency - 1- 3 years	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Urban Development			
Circulate this Plan to Council staff, Coast Protection Board and other relevant planning agencies	n/a	Short and long-term	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Raise the profile and awareness in the community.	n/a	Short and long-term	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board, community groups
Community and Narungga Participation			
Install signs: Update signs to include more historical, ecological and cultural information	Zone 1, Zone 2, Zone 3, Zone 4	All year. 1-2 years.	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Plant identification signs. Modern technology with QR codes and mobile phone apps provides ready opportunities to provide information on the site generally and individual plant species.	All Zones	Medium term	Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Include a display on Tepper and the original Ardrossan vegetation in the Ardrossan Museum. Ardrossan 150 event in 2023?	n/a	1-3 years. Low urgency	Ardrossan Museum Volunteers, Friends of Park Tce & Esplanade Reserves, Ardrossan

ACTIVITY	ZONE / LOCATION	TIMING COMMENTS	POTENTIAL CONTRIBUTORS
			Progress Association, Narungga
Encourage and facilitate volunteer activities / events to care for the site	n/a	All year. 1 – 2 years and ongoing	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board
Encourage the participation of the Narungga community in the management, naming and telling of stories about the value of the site	n/a	Short-term	Volunteers, Friends of Park Tce & Esplanade Reserves, YP Council, N&Y Landscape Board, Narungga groups
Investigate the establishment of native grassland species display gardens within the township, include the development of a plant list of hardy and available species. Also "missing" Tepper non-grassland plants suited to gardens.	Zone 6 or Zone 7	Medium-term. 1-5 years	YP Council, Friends of Park Tce & Esplanade Reserves, Ardrossan Progress Association, Narungga groups
Restoration and Revegetation			
Revegetation of heavily degraded grassland areas following extensive herbicide weed control	Zone 1 in the storm water channel and sprayed-out road verge	Early winter sowing/planting. 2-4 years.	Volunteers, Friends of Park Tce & Esplanade Reserves, NGOs, Narungga, YP Council, N&Y Landscape Board
Investigate the reintroduction of rare and previously occurring plants into the grassland (e.g. grasses, orchids and herbs)	Zone 1	Long-term 5-10 plus years	Volunteers, Friends of Park Tce & Esplanade Reserves, NGOs, Narungga, YP Council, N&Y Landscape Board, universities and research organisations

7 Monitoring and Adaptive Management

Monitoring is a broad term which can be applied in a variety of ways. For this site an appropriate monitoring program could include:

- Repeated photopoint monitoring for general site condition (annual repeated photos)
- Regular observations to identify weed control requirements
- Survey for insects and birds to add to the biodiversity inventory of the site (opportunity to involve volunteers and community)
- Monitor cliff recession along the coast immediately adjacent to the site and refine predictions of impact on the grassland
- Management effectiveness: ensure changes to the mowing management regime are having the desired impact by:
    - Repeated plot (quadrat or transect) monitoring to assess species diversity and grass tussock densities
    - Assess level of soil disturbance from machinery

8 Volunteering and the Role of Community

Given the proximity of the Ardrossan Native Grassland to the township and residents of Ardrossan, the site offers a great opportunity to raise awareness, engender a caring attitude to the native plants and animals and involve people in the management through volunteering activities and educational events.

Such a program could include:

- The formation and ongoing activity of the Friends of Park Terrace and Esplanade Ardrossan reserves group
- Engagement with the Ardrossan Progress Association, Tidy Towns and other community groups
- Volunteer weeding and planting events
- Schools education, monitoring and planting events
- An ongoing digital presence to record the history of the area and provide community education and engagement.

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Appendix 1: Grassland-Associated Species Suitable to Re-establish in the Ardrossan Grasslands

(compiled by Adrian Shackley, relevant to site in Tepper information – Coast or G. [General] designations)

SPECIES	**COMMON NAME**	**AUS**	**SA**	NY	**Derivation**	**Tepper 1880 article name, location**
Actinobole uliginosum	Flannel Actinobole			LC	Tepper, Tate etc ALA reference	Gnaphalodes uliginosum, A. Gray. G.
Amphibromus nervosus	Veined Swamp Wallaby-grass			VU	Tepper, Tate etc ALA ref	Danthonia nervosa, J. Hooker. Yorke Valley, T.
Amphipogon caricinus var. caricinus	Long Grey-beard Grass			RA	Tepper, Tate etc ALA ref	Amphipogon strictus, R. Brown. Coast and T. ? Sp
Anthosachne scabra	Native Wheat-grass			LC	Tepper, Tate etc ALA ref	Agropyrum scabrum, Beauvois. G.
Arthropodium minus	Small Vanilla-lily			NT	Tepper, Tate etc ALA ref	Arthropodium minus, R. Brown. G.
Astroloma humifusum	Cranberry Heath			NT	Tepper, Tate etc ALA ref	Styphelia humifusa, Labillardiere. T. & P.
Austrostipa nitida	Balcarra Spear-grass			LC	Tepper, Tate etc ALA ref	Species not recognised in 1880
Austrostipa scabra ssp. falcata	Slender Spear-grass			LC	Tepper, Tate etc ALA ref	Stipa scabra, Lindley. G.
Austrostipa scabra ssp. scabra	Rough Spear-grass			LC	Tepper, Tate etc ALA ref	Stipa scabra, Lindley. G.
Brachyscome ciliaris var. ciliaris	Variable Daisy			LC	Tepper, Tate etc ALA ref	Brachycome ciliaris, Leasing. Coast, T.
Brachyscome exilis	Slender Daisy			LC	Tepper, Tate etc ALA ref	Not mentioned Tepper 1880
Bromus arenarius	Sand Brome			NT	Tepper, Tate etc ALA ref	Bromus arenarius, Labillardiere. G.
Bulbine semibarbata	Small Leek-lily			RA	Tepper, Tate etc ALA ref	Bulbine semibarbata, Haworth. Yorke Valley, P.
Caladenia latifolia	Pink Caladenia			VU	Tepper, Tate etc ALA ref	Caladenia Patersoni, R. Brown. G., open ground,
Caladenia sanguinea	Crimson Daddy-long-legs		R	CR	Tepper, Tate etc ALA ref	
Calandrinia eremaea	Dryland Purslane			LC	Tepper, Tate etc ALA ref	Claytonia pusilla, F. M. Muloowurtie, C.

SPECIES	COMMON NAME	AUS	SA	NY	Derivation	Tepper 1880 article name, location
Calandrinia granulifera	Pigmy Purslane			RA	Tepper, Tate etc ALA ref	Claytonia pygmaea F. M. Muloowurtie, P.
Calostemma purpureum	Pink Garland-lily			NT	Tepper, Tate etc ALA ref	Calostemma purpureum, R. Brown.
Centipeda cunninghamii	Common Centipeda			NE	Tepper, Tate etc ALA ref	Centipeda Cunninghami, F. M. T. and P.
Centrolepis polygyna	Wiry Centrolepis			NT	Tepper, Tate etc ALA ref	Not in Tepper 1880
Cheilanthes austrotenuifolia	Annual Rock-fern			LC	ALA other c Ard	Cheilanthes austrotennifolia, Swartz. G.
Cheilanthes distans	Bristly Cloak-fern			LC	Tepper, Tate etc ALA ref	Cheilanthes distans, R. Brown.
Chenopodium desertorum ssp. microphyllum	Small-leaf Goosefoot			LC	Tepper, Tate etc ALA ref	Chenopodium microphyllum, F. M. P.
Chrysocephalum semipapposum	Clustered Everlasting			LC	Tepper, Tate etc ALA ref	Helichrysum semipapposum, De Candolle. G.
Cotula australis	Common Cotula			NT	Tepper, Tate etc ALA ref	Not in Tepper 1880
Cynoglossum suaveolens	Sweet Hound's-tongue			RA	Tepper, Tate etc ALA ref	Cynoglossum suaveolens, R. Brown. Yorke Valley, T. and P.
Cyrtostylis robusta	Robust Gnat-orchid			RA	Tepper, Tate etc ALA ref	
Dichelachne crinita	Long-hair Plume-grass			NT	Tepper, Tate etc ALA ref	Dichelachne crinita, J. Hooker. T.
Drosera glanduligera	Scarlet Sundew			VU	Tepper, Tate etc ALA ref	Drosera glanduligera, Lehmann. T.
Drosera macrantha ssp. planchonii	Climbing Sundew			RA	Tepper, Tate etc ALA ref	Drosera Menziesii, R. Brown. Coast and T.
Dysphania pumilio	Small Crumbplant			LC	ALA other c Ard	Not in Tepper 1880
Einadia nutans ssp. nutans	Climbing Saltbush			LC	Tepper, Tate etc ALA ref	Rhagodia nutans, R. Brown. G.
Erodium crinitum	Blue Heron's-bill			LC	Tepper, Tate etc ALA ref	Erodium cygnorum, Nees. G. maybe ?

SPECIES	COMMON NAME	AUS	SA	NY	Derivation	Tepper 1880 article name, location
Euphorbia dallachyana	Caustic Euphorbia			LC	Tepper, Tate etc ALA ref	Eupborbia Drummondi, Boissier. Open low ground, G.
Geococcus pusillus	Earth Cress			NT	Tepper, Tate etc ALA ref	Geococcus pusillus, Drummond and Harvey. C.
Genoplesium tepperi	Teppers Midge Orchid			ne	Tepper, Tate etc ALA ref	Check species
Geranium retrorsum	Grassland Geranium			NT	Tepper, Tate etc ALA ref	only Geranium dissectum?? Weed
Glycine rubiginosa	Twining Glycine			NT	Tepper, Tate etc ALA ref	Glycine clandestina, Wendland. G.
Goodenia varia	Sticky Goodenia			RA	Tepper, Tate etc ALA ref	Not in Tepper 1880
Halgania cyanea	Rough Blue-flower			NT	Tepper, Tate etc ALA ref	Halgania cyanea, Lindley. Yorke Valley, P.
Hyalosperma glutinosum ssp. glutinosum	Golden Sunray			LC	Tepper, Tate etc ALA ref	Helipterum hyalsopermum, F. M. Coast.
Hyalosperma semisterile	Orange Sunray			LC	Tepper, Tate etc ALA ref	Not in Tepper 1880
Isolepis marginata	Little Club-rush			LC	Tepper, Tate etc ALA ref	Scirpus cartilagineus, Sprengel. G., prefers burnt ground.
Kennedia prostrata	Scarlet Runner			NT	Tepper, Tate etc ALA ref	Kennedya prostrata, R. Brown. Coast and T.
Lachnagrostis filiformis (NC)	Common Blown-grass			NT	Tepper, Tate etc ALA ref	Agrostis Solander, F. M. G. ?? Name
Leptorhynchos tetrachaetus	Little Buttons			LC	Tepper, Tate etc ALA ref	Leptorrhynchus pulchellus, F. M. G. open ground,
Leptorhynchos waitzia	Button Immortelle			NT	Tepper, Tate etc ALA ref	Leptorrhynchus Waitzia, Sonder. P.
Levenhookia dubia	Hairy Stylewort			NT	Tepper, Tate etc ALA ref	Leeuwenhoekia dubia, Sonder. Coast.
Lobelia gibbosa (NC)	Tall Lobelia			VU	Tepper, Tate etc ALA ref	Lobelia microsperma, F. M. Ardrossan, G.
Lotus australis	Austral Trefoil			RA	Tepper, Tate etc ALA ref	Lotus australis, Seringe. Coast.

SPECIES	COMMON NAME	AUS	SA	NY	Derivation	Tepper 1880 article name, location
Lotus cruentus	Red-flower Lotus			LC	Tepper, Tate etc ALA ref	Lotus australis, var., Behriana. P hills.
Malva preissiana	Australian Hollyhock			RA	Tepper, Tate etc ALA ref	Lavatera plebeia, Sims. Coast and T.
Microseris lanceolata	Yam Daisy			RA	Tepper, Tate etc ALA ref	Microseris Forsteri, J. Hooker. Coast.
Microtis arenaria	Onion Orchid			LC	Tepper, Tate etc ALA ref	Microtis porrifolia, R. Brown. Coast and T.
Millotia muelleri	Common Bow-flower			RA	Tepper, Tate etc ALA ref	Toxanthus perpusillus, Turcz. G. ?? Sp
Minuria cunninghamii	Bush Minuria			LC	Tepper, Tate etc ALA ref	Minuria Cunninghami, Bentham. Coast.
Myoporum parvifolium	Creeping Boobialla		R	RA	Tepper, Tate etc ALA ref	Myoporum parvifolium, R. Brown. Coast.
Opercularia turpis	Twiggy Stinkweed			NT	Tepper, Tate etc ALA ref	Opercularia varia, J. Hooker. G. ?? Sp
Ophioglossum lusitanicum	Austral Adder's-tongue			LC	Tepper, Tate etc ALA ref	Ophioglossum vulgatum, Linne. Coast.
Pelargonium littorale	Native Pelargonium			NT	Tepper, Tate etc ALA ref	only P. australe
Pheladenia deformis	Bluebeard Orchid			RA	Tepper, Tate etc ALA ref	Caladenia deformis, R. Brown. Coast and T.
Pimelea curviflora var. sericea	Curved Riceflower			VU	Tepper, Tate etc ALA ref	Pimelea curviflora, R. Brown. Coast and T.
Plantago gaudichaudii	Narrow-leaf Plantain			NT	Tepper, Tate etc ALA ref	Not in Tepper 1880
Poa crassicaudex	Thick-stem Tussock-grass			RA	Tepper, Tate etc ALA ref	Not in Tepper 1880
Poa fax	Scaly Poa		R	RA	Tepper, Tate etc ALA ref	Poa lepida, F. M. Coast.
Podolepis canescens	Grey Copper-wire Daisy			NT	Tepper, Tate etc ALA ref	Podolepis canescens, A. Cunningham. T. and P.
Podolepis rugata var. rugata	Pleated Copper-wire Daisy			RA	Tepper, Tate etc ALA ref	Podolepis rugata, Labillardiere. P.

SPECIES	COMMON NAME	AUS	SA	NY	Derivation	Tepper 1880 article name, location
Podolepis tepperi	Delicate Copper-wire Daisy			NT	Tepper, Tate etc ALA ref	possibly Podolepis Lessoni, Bentham. Coast.
Pogonolepis muelleriana	Stiff Cup-flower			LC	Tepper, Tate etc ALA ref	Not in Tepper 1880
Prasophyllum occidentale	Plains Leek-orchid			VU	Tepper, Tate etc ALA ref	only lists Prasophyllum patens, R. Brown. G.
Prasophyllum odoratum	Scented Leek Orchid			ne	Tepper, Tate etc ALA ref	only lists Prasophyllum patens, R. Brown. G.
Psuedognaphalium luteoalbum	Jersey Cudweed			LC	Tepper, Tate etc ALA ref	Not in Tepper 1880
Pterostylis biseta (NC)	Two-bristle Greenhood			VU	Tepper, Tate etc ALA ref	Only P. longifolia listed
Pterostylis robusta	Large Shell-orchid			RA	Tepper, Tate etc ALA ref	Only P. longifolia listed
Pterostylis sanguinea	Blood Greenhood			RA	Tepper, Tate etc ALA ref	Only P. longifolia listed
Pyrorchis nigricans	Black Fire-orchid			EN	Tepper, Tate etc ALA ref	Lyperanthus nigricans, R. Br. Maitland sandhills, T.
Ranunculus sessiliflorus var. pilulifer	Annual Buttercup			EN	Tepper, Tate etc ALA ref	Ranunculus parviflorus, Linne. P.
Rhodanthe pygmaea	Pigmy Daisy			LC	Tepper, Tate etc ALA ref	Helipterum pygmaeum, F. M. Coast.
Roepera crenata	Notched Twinleaf			NT	Tepper, Tate etc ALA ref	Zygophyllum crenatum, F. M. Coast and T.
Rytidosperma erianthum	Hill Wallaby-grass			NT	Tepper, Tate etc ALA ref	only Danthonia penicillata, F. M. G.
Rytidosperma setaceum	Small-flower Wallaby-grass			LC	Tepper, Tate etc ALA ref	only Danthonia penicillata, F. M. G.
Sebaea ovata	Yellow Sebaea			NT	Tepper, Tate etc ALA ref	Sebaea ovata, R. Brown. Coast.
Senecio macrocarpus	Large-fruit Groundsel	VU	V	CR	Tepper, Tate etc ALA ref	Not in Tepper 1880

SPECIES	COMMON NAME	AUS	SA	NY	Derivation	Tepper 1880 article name, location
Senecio quadridentatus	Cotton Groundsel			LC	Tepper, Tate etc ALA ref	Senecio lautus, Forster. Coast.
Stackhousia subterranea	New species separate from Stackhousia monogyna ,			ne	ALA other c. Ard	Stackhousia linarifolia, Cunningham. Coast and T.
Stenanthemum leucophractum	White Cryptandra			VU	Tepper, Tate etc ALA ref	Not in Tepper 1880
Stenopetalum sphaerocarpum	Round-fruit Thread-petal			RE	Tepper, Tate etc ALA ref	Stenopetalum sphaerocarpum, F. M. Coast.
Swainsona fuscoviridis	Dark Green Swainson-pea		R	EN	Tepper, Tate etc ALA ref	Not in Tepper 1880
Teucrium racemosum	Grey Germander			LC	Tepper, Tate etc ALA ref	Teucrium racemosum, R. Brown. P.
Thelymitra antennifera	Lemon Sun-orchid			EN	Tepper, Tate etc ALA ref	Thelymitra antennifera, J. Hooker. P.
Threlkeldia diffusa	Coast Bonefruit			NT	ALA other c Ard	Not in Tepper 1880
Thysanotus patersonii	Twining Fringe-lily			LC	ALA other c Ard	Thysanotus Patersoni, R. Brown. Coast and T.
Wahlenbergia luteola	Yellow-wash Bluebell			LC	ALA other c Ard	Not in Tepper 1880
Wurmbea dioica subsp. dioica	Early Nancy. Now separate sub-species from ssp. brevifolia recorded on site			LC?	ALA other c Ard	Wurmbsea diotia, F. M. G.

Note: orchid species included above have not been researched for relationship to grassland areas.

Appendix 2: Photographic and other records related to the site.

In addition to the 1907 photo above, we have obtained many photos showing the site over the years. We have been unable to located originals of these first 2 very interesting photos in the Ardrossan bakery. They appear to be from New Year's Day events on the beach. One or both are postcards. Please help!

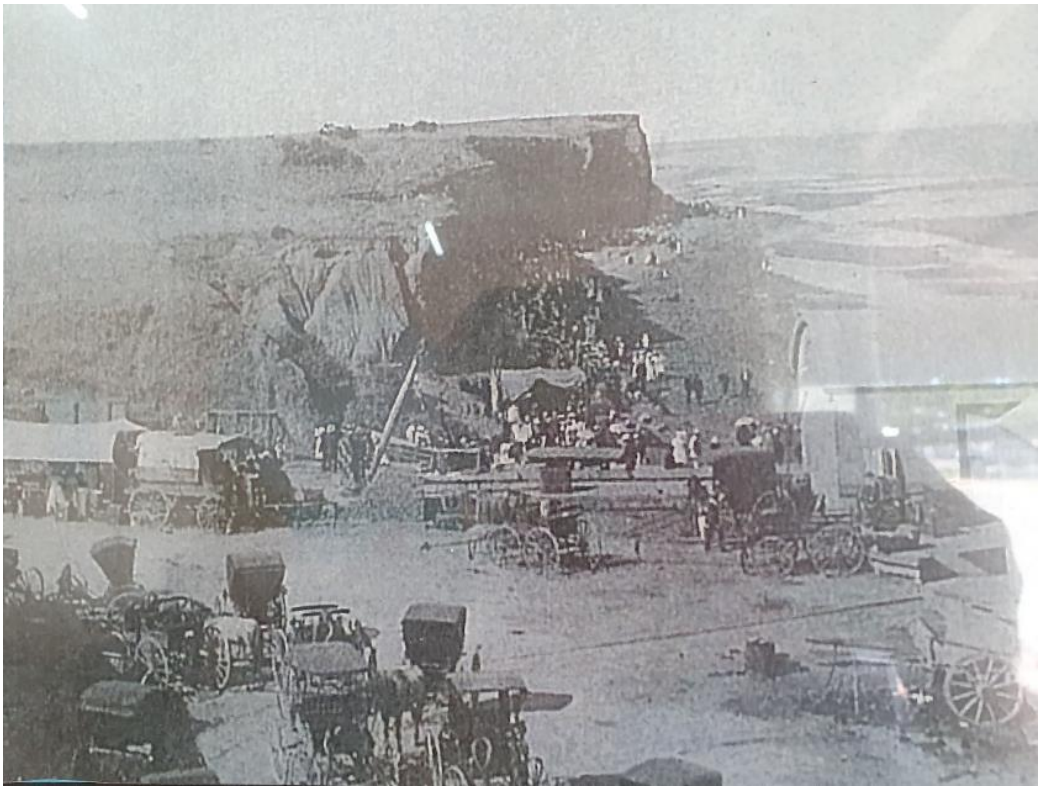
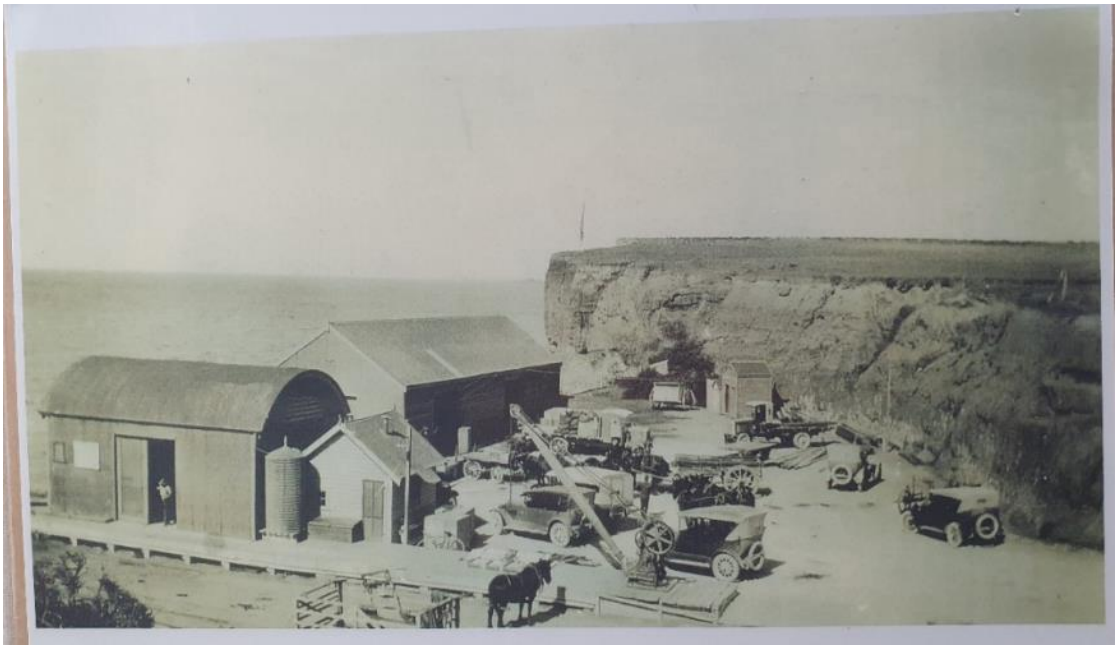


Photo in Ardrossan Bakery – Pre 1920?

Photo in Ardrossan Bakery – Late 1920s?



NTSA Ardrossan Museum photo. Parklands above cliffs on S side of Clay Gully – late 1920s?

[General description] A few pedestrians and a horse and cart meander along the unsealed road winding uphill into the township of Ardrossan. The Royal Oak Hotel can be seen on top of the hill. Other buildings seen on the left display large advertisements for Fry's Cocoa, Lion Flour, Burford's candles and soap and Robur Tea. [On back of photograph] 'Ardrossan / Jan 1928 / Reproduced in the "Chronicle" for Jan. 28, State Library 1928.'

1937 courtesy of Coast Protection Board. SLSA B 7234. Clay Gully area low grassland. Vegetation features Clay Gully devoid of significant trees and shrubs. Cemetery and other area of remnant Mallee woodland (now part of Golf Course) on west side of town. Close-up of Clay Gully portion below.

1945 aerial photograph. Caravan Park area has tree planting in creekline and across the whole caravan park area. Close-up also shows young plantings in the Jetty Rd/Bridge Rd/Clay Gully triangle and in the creekline just east of Bridge Rd.

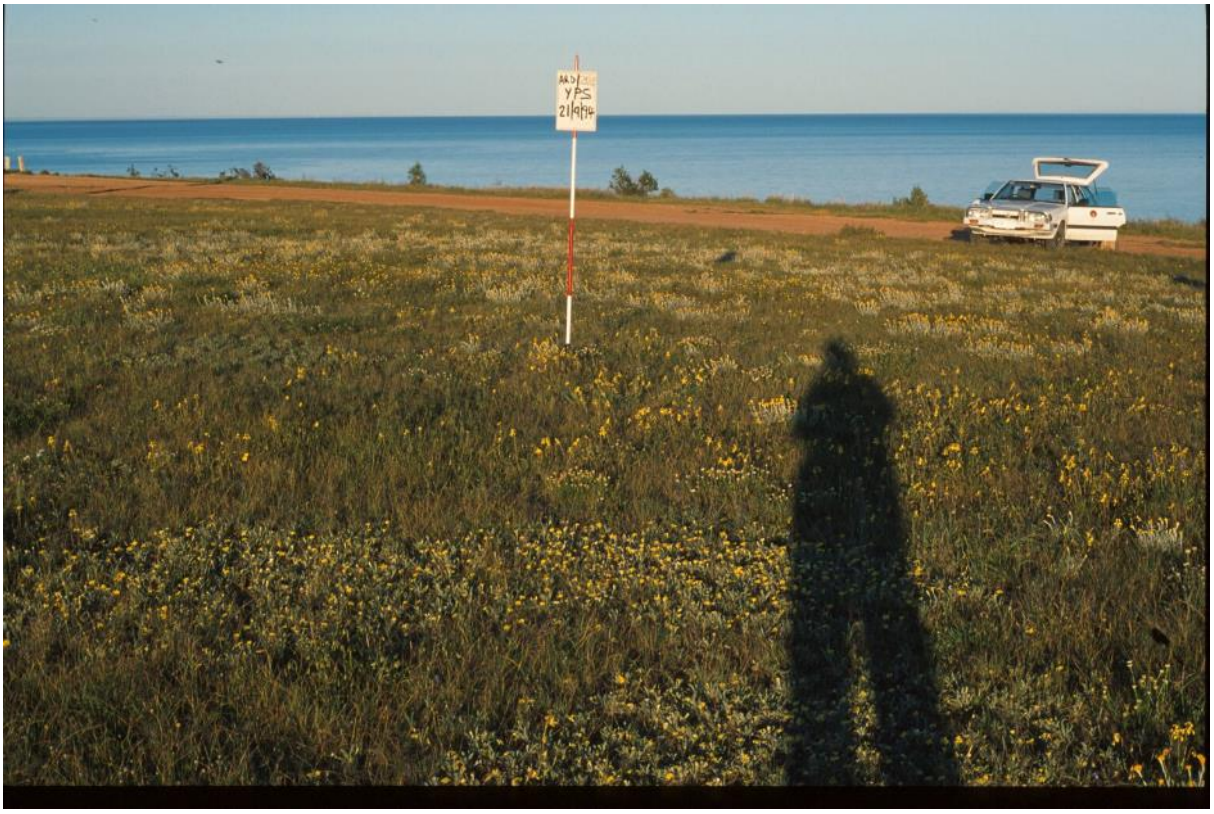
1946. Courtesy of Coast Protection Board. Shows tree planting in Caravan Park area. Before much housing development on Park Terrace, Esplanade. No tree planting in the site parklands area.

1977 Clay Gully north bank near coast – Tussock grass and other vegetation above erosion line. Courtesy of Coast Protection Board

1978 same bank – walkway construction underway. Courtesy of Coast Protection Board

1978 Ardrossan coastal area adjacent cliffs – showing informal carpark prior to construction of sealed carpark. Typical open grassy system with bluish Everlasting daisies also showing up. Courtesy of Coast Protection Board

1983 view across park lands to Park Terrace. Young pine trees and small eucalypt plantings in park. Courtesy of Coast Protection Board



September 1994 Biological Survey site photopoint looking towards coast. Courtesy of Department of Environment and Water

September 1994 Biological Survey photo of Minuria, Velleia, Chrysocephalum and other flowering natives. Beautiful "wildflower meadow". Courtesy of Department of Environment and Water

September 1997 view across park. Podolepis decipiens daisy with tall flower stems in centre. Courtesy of Department of Environment and Water

August 2020 Sonia and Tim Croft site assessment photo. Low slashing reducing plant cover.

October 2020 after about 2 months with no slashing. Endangered Leptorhynchos elongatus single upright cream coloured flower near centre outside fenced area. Goodenia willisiana yellow flower in foreground.

October 2020 view of part of fenced area with low shrubs and slashed area in background.

Small areas of remnant grassland remaining on the coastal plain near Ardrossan May 2021

Yorke Highway verge near Rogues Gully

Grassland verge Yorke Highway just S of Ardrossan

Native geranium in rocky section of Pavy Creek

Old *Acacia oswaldii* in Pavy Creek (Tepper recorded this species here in 1880)

Coastal grassland area near James Well

Arthurton Rd Kenny Rd intersection (includes Kangaroo Grass, Lilies, Everlasting daisies)

Appendix 3: Butterfly Species and their Food Plants

Species Potentially Using the Vegetation in the Project Site (Caton B et. al. 2006 Conservation Assessment of the Northern and Yorke Coast NY NRM Board)

Host Plant (Scientific Name)	Butterfly (Scientific Name)	Butterfly Common name	Conservation rating (R. Grund 2006)
Austrodanthonia caespitosa	*Anisynta cynone gracilis 1*	Cynone Grass-skipper	R
Austrodanthonia spp	*Anisynta cynone gracilis 1*	Cynone Grass-skipper	R
Austrostipa eremophila	*Herimosa albovenata albovenata 1*	White-veined Grass-skipper	V
Austrostipa scabra ssp. scabra	*Herimosa albovenata albovenata 1*	White-veined Grass-skipper	V
	Anisynta cynone gracilis	Cynone Grass-skipper	R
Austrostipa scabra ssp. falcata	*Herimosa albovenata albovenata 1*	White-veined Grass-skipper	V
Austrostipa semibarbata	*Herimosa albovenata albovenata 1*	White-veined Grass-skipper	V
Eremophila deserti	*Candalides heathi heathi 1*	Rayed Blue	R
Eremophila longifolia	*Candalides heathi heathi 1*	Rayed Blue	R
Gahnia deusta	*Antipodia atralba*	Black and White Sedge-skipper	R
	Hesperilla chrysotricha cyclospila	Chrysotricha Sedge-skipper	V
	Hesperilla donnysa donnysa - form flavescens 3	intermediate forms Donnysa Sedge-skipper	L
Gahnia lanigera	*Antipodia atralba*	Black and White Sedge-skipper	R
Lepidosperma concavum	*Motasingha trimaculata trimaculata 1*	Dingy four-spot Sedge-skipper	R
Lomandra densiflora	*Trapezites luteus luteus 1*	Rare White-spot Rush-skipper	V
Lomandra filiformis ssp. coriacea	*Trapezites luteus luteus 1*	Rare White-spot Rush-skipper	V
Lomandra longifolia	*Trapezites luteus luteus 1*	Rare White-spot Rush-skipper	V
Lomandra multiflora ssp. dura	*Trapezites luteus luteus 1*	Rare White-spot Rush-skipper	V
Oxalis perennans	*Lucia limbaria 1*	Small Copper	R
Pimelea sp.	*Candalides heathi heathi*	Rayed Blue	R

Appendix 4: Consultation Events Summary (By A. Shackley)

- Jan 2020. Meeting with National Trust Ardrossan Museum Committee. The Committee were mostly familiar with the area endorsed a project to conserve the Park Terrace area grasslands.
- Feb 2020. Article in Ardrossan Antics newspaper on conservation significance of Park Terrace area.
- July August 2020. Consultation with local residents, Landscape Board staff and Yorke Peninsula Council staff as part of Grassroots Grant application and successful outcome.
- August 2020. YP Council staff agree to have a break in slashing area from August through to late November as a trial to see results and to consult local community. Council provided information about the change in slashing times to residents via a leaflet and via Facebook. Results were positive.
- Oct 7 2020. Letter in YP Country Times about Oct 14 Field Day at Park Terrace.
- October Wed. 14 Field Day. Attendance included 2 YP Council staff involved in Council Coastal Action Plan., Ardrossan Progress Association, Landscape Board staff and several interested residents.
- October 2020 onwards. Preparation of draft management plan involved consultation with YP Council staff, Landscape Board staff, 4 Narungga community organisations, National Trust of SA, Australian Plant Society NYP branch, Coast Protection Board staff, State Herbarium staff, people with historical experience of the project area, Ardrossan Museum, Tidy Towns volunteers, Ardrossan Area School staff, Butterfly Conservation South Australia [BCSA] and local residents.
- Feb 2021. A management plan issues map was circulated to groups and about local 30 residents who had expressed an interest.
- May 2021. Draft management plan notified along with Flyer for 2 onsite public consultation events on 23 and 28 May to all organisations and individuals who had email addresses available.
- Flyer letterboxed to all residents of Park Terrace and Esplanade with details of public consultation and plan available by email. Printed copy of draft plan provided to Ardrossan Information Centre and Ardrossan Community Library.
- Flyer with details of consultation put on Ardrossan Information Centre Facebook page (3 “likes”).

Right: Flyer distributed to the community for the May workshops

Community Event:

Ardrossan Native Grassland

Come to a "Friends of Park Terrace and Esplanade reserves" information session and learn about a project to conserve a unique area of native grassland on the Ardrossan clifftops [managed by Yorke Peninsula Council].

Following an initial public field day in October 2020, a draft management plan has been developed by Mick Durant from Greening Australia. The Friends group invite the community to provide feedback on the plan which deals with weeds, timing of slashing, community involvement, educational and tourism possibilities and other issues related to management of the area.

A Friends group spokesperson said, "One exciting aspect in researching the plan, has been locating old photographs and surveyors' plans for Ardrossan and nearby areas. The survey plans show original waterholes in Clay Gully, descriptions of original vegetation around Ardrossan and allow an estimate of significant coastline erosion since 1872."

The community is encouraged to come to one of the information sessions.

WHERE: Park Terrace reserve, Ardrossan

WHEN: Sunday, 23 May 2pm – 3.30 and Repeat Friday 28 May 2.30pm.

Register Now

Friends of Park Terrace Esplanade Reserves - contact
Ian: 0428 498 408
Adrian: 0429 004 363
Email: finniss@bigpond.net.au

Draft Management Plan
Copies are available by contacting us on above phone numbers or email.

Submit comment by 10 June 2021
Email: finniss@bigpond.net.au

This event is an initiative of Friends of Park Terrace Esplanade reserves Ardrossan *and is funded by the Northern and Yorke Landscape Board's Grassroots Grant program.* Supported by National Trust of South Austral

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LANDSCAPE SOUTH AUSTRALIA NORTHERN AND YORKE

- May 7 2021. Letter in YP Country Times about draft management plan available by email and details of public consultation days.
- Sunday May 23 2021. Consultation at Park Terrace reserve. 8 people present plus Greening Australia consultant. Representatives from Tidy Towns explained their activities undertaken mowing reserve verges and under pine trees. Local YP Council councilor and manager of Ardrossan Caravan Park also present. Quite a few apologies.
- Door-knocking of houses facing Park Terrace and Esplanade reserves in the morning of May 23. About 60% were home and spoken with. General support for the project based on discussion.
- Friday May 28 2.30pm. Second consultation at Park Terrace. Additional 7 people present including Landscape Board representative.
- April May 2021. As part of understanding the historical vegetation of the Ardrossan area, contact was made with 10 landholders with remnant vegetation near Ardrossan which was assessed as having significant grassy composition. All landholders agreed to an assessment of their areas and site visits were conducted. Also checking of public areas such as along coastal reserves, Ardrossan town parklands and the Clay Gully creekline through the Caravan Park and Golf Course. A total of about 60 separate "sites" have been assessed. Almost all were original grassland or open woodland with grassy understorey. The highest number of species located on a site has been about 30. No sites were near the same diversity as the Park Terrace/Esplanade area. Follow-up visits are proposed in spring when additional species are likely to be located and native grasses can be better identified.

Issues discussed in consultation and feedback included:

- Education about the importance of the unique vegetation in the reserves – signs, QR code information, photos, displays [including mobile displays] etc.
- Potential for grants to assist with weed control especially woody weeds [including Aleppo pines], signs, displays, stormwater pipe redirection etc. Need for grants to employ trained/qualified people to assist volunteers.
- Strong support for keeping the reserves open and maintaining or restoring views across the parks to the sea, jetty, town centre etc.
- Tourism potential for visitors – caravan parks, grey nomads, Walk the Yorke walkers, nature-based tourists, Museum displays.
- Potential for School involvement. Follow up discussions are occurring on this.
- Weed management issues - multiple methods discussed for the range of weeds present. Reducing spraying on verges can reduce weed problems. Mowing verges best.
- Growing plants including possible display garden off site for plants suited to Ardrossan - with plants both from the grassland site but also the other many hundreds of species currently present in remnant vegetation near Ardrossan or identified in 1880 by Otto Tepper.
- Monitoring of fauna, especially insects and butterflies [BCSA have been asked to assist]. Potential for native Bee Hotel based on success of recent projects in Copper Triangle involving Ardrossan Mens Shed.
- Projects with Narungga people, including a name for the area. A letter of strong support for producing a management plan and ongoing site conservation and Narungga consultation received from Nharangga Aboriginal Progress Association.
- Issues with coastal cliff erosion affecting the area near the car park off corner of Park Terrace/Esplanade/elsewhere. Stabilising the cliffs needs to be discussed with relevant authorities.
- Managing public access – encouraging people to look around and enjoy the park areas, take pictures and undertake monitoring but avoiding creating worn paths.